

Badger Chemist

The Newsletter of the Department of Chemistry
at the University of Wisconsin-Madison

Established 1953, No. 58, 2015



DEPARTMENT OF
Chemistry

UNIVERSITY OF WISCONSIN-MADISON

Looking Back, Looking Ahead

For 135 years, students, faculty, and staff have shaped the Department of Chemistry into what it is today: a leading program centered upon chemistry education, research, and outreach. In the early days of the university, much uncertainty lay ahead. The thought that within a century the school would emerge as a world-class institution of higher education must have seemed improbable. Today we are able to look back and see the notable moments in the history of both the department and the university. We now see clearly the faces of those who helped to shape this history. Through excellent teaching, research, and outreach efforts, many individuals have

consistently pushed the boundaries of education, knowledge, and service through their dedication.



Individuals who will have made their own imprints on the fabric and history of this great department and university are among us even today. What's more, many of you, our alumni and dedicated friends, will be among those faces as you work to benefit the department and university, as well as your own workplaces and communities.

With this issue of the Badger Chemist, we hope to help you remain connected with the department and with your fellow Badger Chemists worldwide (page 4). Whether you would like to learn about the latest research in the department (page 8), remember the mentors who helped shape your path as a student (page 11), meet our newest professor (page 10), or see how our outreach programs make an impact in Madison and across the state (pages 17-20), we hope you will find this issue interesting and informative.

Finally, whether it's been a few years—or a few decades—since we last saw you, please stop by the Chemistry Building for a visit next time you're in Madison. In the meantime, we would also enjoy seeing you at our biannual department receptions at the ACS National Meetings.

With very best regards,

Robert McMahan
Helfaer Professor and Chair
chair@chem.wisc.edu

PS: If you would like to hear from us more frequently, please sign up for our alumni e-newsletter at go.wisc.edu/alumninews.

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

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Cover photo: Graduate student Ryan Van Hovel
works in the Schomaker lab with undergraduate
researcher Gabriel Le Gros. More on page 11.



DEPARTMENT OF
Chemistry
UNIVERSITY OF WISCONSIN-MADISON

New Badger Chemists

Ph.D.

DECEMBER 2013

Mary Beth Anzovino (Moore)

Assessing the impact of new research-inspired general chemistry laboratory experiments using the awareness of and attitudes toward scientific research inventory

Somenath Bakshi (Weisshaar)

Spatial biology of transcription and translation in live cell using super-resolution fluorescence microscopy

Christopher Brown (Kiessling)

Design, synthesis, and biological utility of polysaccharide-terminating glycosides

Lauren Buchanan (Zanni)

Mechanism of amyloid aggregation revealed by 2-D infrared spectroscopy

Renee Dalrymple (Weisshaar)

Super-resolution fluorescence microscopy studies of the F-actin cytoskeleton in PC12 cells and DNA loci in *E. coli*

John Degrave (Jin)

Investigation of exotic spin textures in chiral magnetic silicide nanowires for spintronics applications

Jeremiah Erickson (Dahl)

New CO/PR₃-ligated homo-palladium and heterometallic nickel-palladium nanoclusters

Puja Goyal (Cui)

The proton pumping mechanism of cytochrome c oxidase: Insights from QM/MM simulations

Jennifer Laaser (Zanni)

New methods in sum frequency generation for investigating structures of peptides at inorganic and biophysical interfaces

Matthew Riggsby (Stahl)

Surface-attached ruthenium complexes for oxidative electrochemistry and development of dimeric cobalt oxygen evolution electrocatalysts

Bradford Ryland (Stahl)

Elucidating the mechanisms of copper-catalyzed aerobic transformations from oxidative coupling of arylboronic acids and nucleophiles to copper/TEMPO-catalyzed alcohol oxidation

Alison Suess (Stahl)

Organometallic and single-electron-



transfer mechanisms of copper(II)-catalyzed aerobic C-H oxidation

Fei Wang (Wang)

Synthesis and application of zinc oxide nanostructures with controlled electrical properties

Paul White (Stahl)

Insight into the role of bipyridine ligands in palladium-catalyzed aerobic oxidation reactions

Justin Wiens (Nathanson)

The chemistry of solvated electrons at the vacuum-glycerol interface

MAY 2014

Tyler Adint (Landis)

Improving accessibility of asymmetric hydroformylation through ligand libraries and immobilization

Derek Bailey (Coon)

Intelligent data acquisition for mass spectrometry-based proteomics

Caleb Brian (L. Yu)

Surface diffusion of organic glasses

Caroline English (Hammers)

New approaches to organic-inorganic interfaces for solar energy applications

Milton Repollet-Pedrosa (Mahanthappa)

Manipulating the morphologies of poly(vinyl alcohol) blocks copolymers surfactants

Eleanor Rolfe (Landis)

Interception and characterization of catalyst species in rhodium bis(diazaphospholane)-catalyzed asymmetric hydroformylation

Yang Su (Burstyn)

Enzymological studies of cystathionine beta-synthase

Yuan Yuan (Smith)

Application of DNA arrays and development of sequence-specific capture of DNA/protein interactions

AUGUST 2014

Martha Abrams (Landis)

Applied asymmetric hydroformylation with rhodium-bisdiazaphospholane catalysts

Kenneth Barns (Weisshaar)

Symptoms of antimicrobial peptide stress: The attack of LL-37 and alamethicin on the model organism *bacillus subtilis*

Benjamin Bending (Ediger)

Investigation of segmental dynamics in polymer glasses during constant strain rate deformation

Veronica Berns (Fredrickson)

Structural plasticity in intermetallic compounds: Interpreting complexity as a structural response to chemical pressure

Joshua Carr (Skinner)

Revealing the structure and dynamics of small-molecule solutions and proteins using theoretical vibrational spectroscopy

Jeffrey Christianson (Schmidt)

Structure and dynamics at interfaces: Computational insight and implications for charge transfer

Matthew Faber (Jin)

Earth-abundant transition metal chalcogenide electrocatalysts for renewable energy applications

Joseph Gerdt (Blackwell)

Quorum sensing inhibition in *pseudomonas aeruginosa*: Investigations into mechanism and resistance development

David Grigg (Schomaker)

Benzyl functionalization through Cu(I)-catalyzed divergent reactivity of styrenes

Joseph Grim (Kiessling)

Chemical probes of dendritic cell c-type lectin receptors

Amelia Hadler (Fredrickson)

Bergman clusters, multiple bonds, and defect planes: Synthetic outcomes of chemical frustration in ternary intermetallic systems

Laura (Ruiz Espelt) Havens (Yoon)

Controlling the chemistry of photogenerated radicals with Lewis and Brønsted acid co-catalysts

Cornelia Heid (Crim)

Vibrational predissociation dynamics of the ammonia trimer and the 3-aminophenol-ammonia complex

Anna Hurlley (Yoon)

Diverse mechanistic approaches to [4+2] and [2+2] cycloadditions by transition metal photosensitization

Gloria (Sheynkman) Kreitinger (Smith)

Leveraging RNA-sequencing to detect novel protein variations via mass spectrometry

John Lukesh (Raines)

Thiol-disulfide interchange: design, synthesis, and evaluation of reagents and organocatalysts for chemical biology

Mario Martinez Farias (Kiessling)

Acceptor surrogates for mycobacterial glycosyltransferases

Fei Meng (Jin)

Screw dislocation-driven growth of one-dimensional nanomaterials

Anna (Larson) Merrill (Coon)

Global protein quantification using neutron-encoded mass signatures and high-resolution mass spectrometry

Rebecca Putans (Hammers)

Functionalization of nanomaterial surfaces for light-harvesting and nanotoxicology

Jared Rigoli (Schomaker)

Allene functionalization via bicyclic methylene aziridines

Emily Ruff (Record)

Polymerase and promoter DNA in *E. coli* transcription initiation

Adam Schmitt (Mahanthappa)

Tuning melt-phase morphology in block copolymers using block dispersity

Liang Shi (Skinner)

Theoretical vibrational spectroscopy of ice

Adam Weinstein (Stahl)

Development, application, and mechanistic investigation of palladium-catalyzed aerobic oxidative amination methods

M.S.

DECEMBER 2013

Jodie Greene (Stahl)

Elvin Morales (Moore)

Thomas Smith (Raines)

Jorge Torres (Landis)

Shuo Yang (Cui)

Joan Zuniga (Burke)

MAY 2014

Xinyu Chen (Gellman)

Nicholas Dolan (Schomaker)

Salih Hacialioglu (Jin)

Megan Livingston (Mahanthappa)

Carl McBurney (Gellman)

Nicholas Myllenbeck (Andrew)

James Sawicki (Yoon)

Julie Sawicki (Landis)

Kaylee Underkofler (Raines)

AUGUST 2014

Sucheewin Chotchatchawankul (Landis)

Nicholas Kaiser (Jin)

B.S. and B.A.

DECEMBER 2013

Bemis, Troy Allen

Brar, Mohanpreet Singh

Fager, Ryan Anthony

Gan, Roy JR Wei What

Judkins, Jesse Takeshi

Leitch, Michael Paul

Rennebohm, Kelly

Ripley, Eric Allen

Roche, Len John

Shi, Lijun

Strom, Bailey June

Zhang, Dongyu

MAY 2014

Albright, Haley Rae

Arellano-Ruiz, Erick Alexis

Choi, Timothy Jaehyun

Dziedzic, Rafal Miroslaw

Edel, Ross Anthony

Ferdinand III, Elton Fitz Bernell

Fix, Samantha Marie

Fox, Sierra Kristen

Harasimowicz, Michelle Teresa

He, Sisi

Hermsmeier, Brian James

Hinchman, Angelica Li

Huerta, Miguel Angel

Jackson, Kajsa Marie

Jedele, Andrea Maria

Kapitz, Michael Jon

Knight, Anders Matthew

Knuteson, Quin

Kwon, Min Ah

Lewandowski, Eric Stevan

Li, Xingyue

Lin, Yi-Chen

Linde, Laura Ashley

Luc, Michael T

Mao, Ailin

McQuiston, Kaitlyn Mayer

Mortimer, Michael John

Persing, Trenton James

Prabakaran, Jyothiprashanth

Preiner, Levi Leo

Presser, William Robert

Rashedi, Alexandra Shirin

Rathnam, Kashmila Rekha

Sargent, Brendon Travis

Schuman, David Phillip

Shutter, Joshua David

Smaglick, Jonathan James

Stanula, Katarzyna

Stegink, Jillian Christine

Vogt, Caleb David

Walters, Kevin Andrew

Wang, Si

Warnes, Samantha Jane

Weiss, Gerald Edward

Werbeckes, Jacob Daniel

White, M. Arthur Burriss

Willems, Brian David

Wischer, Kara Elizabeth

Xiong, Lue

Ye, Clara Yanglei

AUGUST 2014

Bartling, Andrew

Buttke, Carl

Houg, Blake Elliot

Kuang, Jun

Masse, Robert Carl

Punyatanasakchai, Chaval

Rosen, Max Asher

Svetlov, Dmitri Vladimirovic

Ticho, Andrew Isaac

Zager, Ethan Ronald

Zhou, Shengbo

Alumni News



In May 2014, John Green (Ph.D. '63, Margrave) and his wife, Carol, presented a gallery of photographs from their personal collection at the Chazen Museum of Art on the UW-Madison campus. The exhibition depicted artists in their daily surroundings, offering a unique window through which the artists are the subjects of the scrutiny they usually direct at others. Photo above, left: John and Carol Green with their son, Brian, at the Chazen gallery opening.

David Moore (Ph.D. '80, Wright) was recently named a Los Alamos National Laboratory (LANL) Fellow in recognition of sustained outstanding contributions to explosives detection, spectroscopy of shock-compressed materials, ultrafast laser-driven shock compression studies, and development of ultrafast optical diagnostics. The Fellows are limited to 2 percent of lab technical staff. He is group leader of LANL's Shock and Detonation Physics Group.

Christopher White (Ph.D. '94, Schrag), acting group leader of the Polymeric Materials Group (Engineering Laboratory) at the National Institute of Standards and Technology, has received the ASTM International Lou Toporcer Hall of Fame Award for his contributions to developing building industry standards.

In June, Bruce Bursten (Ph.D. '78, Fenske) will become provost at Worcester Polytechnic Institute. He is currently a distinguished professor of chemistry and former dean at the University of Tennessee, Knoxville.

Tim Lohman (Ph.D. '77, Record), Brennecke Professor of Biophysics at Washington University (St. Louis), was recently named a fellow of the Biophysical Society. He has also received a Washington University Distinguished Investigator Faculty Award.

Veronica Berns (Ph.D. '14, Fredrickson) has turned her chemistry thesis into a comic book and has successfully crowdfunded a print run of the book.



Leon Klatt (Ph.D. '67, Blaedel) received the 2013 Department of Energy Secretary's Award for Savannah River Site cleanup research and development as a member of the Salt Waste Disposal Team. From 1999 to 2001, Klatt managed the development of the Caustic Side Solvent Extraction project for the removal of radioactive cesium from SRS high-level waste. He retired from Oak Ridge National Laboratory in 2002. Photo above, right: Secretary of Energy Dr. Ernest Moniz (left), Klatt (center), and Deputy Secretary of Energy Dr. Daniel Poneman.

Alumni Robert Moore (B.S. '55, Ph.D. '62), Marilyn Olmstead (Ph.D. '69), and Kirk Peterson (Ph.D. '90) were named fellows of the American Chemical Society (ACS) in 2014.

Michelle Buchanan (Ph.D. '78, Taylor) is among the 2014 fellows of the American Association for the Advancement of Science.

William Evans (B.S. '69, Walters) will receive the 2015 ACS Award in Organometallic Chemistry.

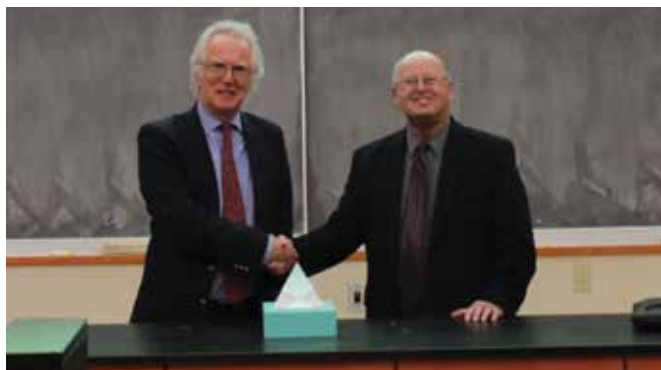
Larry Overman (Ph.D. '69, Whitlock) will receive the 2015 ACS Roger Adams Award in Organic Chemistry.

Amanda Jones (Ph.D. '07, Reich) is an assistant professor at Wake Forest University. In 2014, she received an NSF CAREER Award. Along with her husband, Jon Eilbes, she has opened The Homebrewer's Clubhouse, a Winston-Salem, N.C. store dedicated to the supply of brewing equipment.

Sannali "Toni" (Matheson) Dittli (Ph.D. '10, Markley) is an assistant professor of chemistry at Snow College in Ephraim, Utah.

Laura Navarre (B.S. '86) is a member of the 2014 AbbVie Outstanding Research Team.

Chemistry News



Paterson Gives Inaugural Stork Lectures

In November, the department welcomed Professor Ian Paterson for the inaugural 2014 Gilbert Stork Lectures. Paterson is a professor of chemistry at Cambridge University. The Stork Lectures were established this past year with the generous support of Gilbert Stork (Ph.D. '45, McElvain), an emeritus professor of chemistry at Columbia University. To watch a video of Paterson's first lecture, "Challenges and Discoveries in Complex Polyketide Synthesis," visit go.wisc.edu/Stork2014-1; to watch his second lecture, "Synthesis and Structure Determination of the Spirastrellolides," visit go.wisc.edu/Stork2014-2. Paterson is shown in the photo above with his host, Professor Steven Burke.

Schatz Receives Hirschfelder Prize

The 2014 Hirschfelder Prize in Theoretical Chemistry was awarded to Professor George Schatz of Northwestern University. Schatz visited the department Oct. 6-8, and he gave three talks: "Silver and Gold Nanoparticles," "Using Self-assembly to Make Functional Materials," and "Challenges with Harnessing the Properties of Carbon Nanotubes and Graphene for Making Strong Materials."

Morgridges Announce Matching Gift for Endowed Professorships

UW-Madison has received a landmark gift of \$100 million from alumni John and Tashia Morgridge. In an effort to recruit and retain a world-class faculty, their gift provides a one-to-one match for any other donor who makes a gift to endow a professorship, chair, or distinguished chair. The university currently has 34 fully endowed chairs and 102 fully endowed professorships, and this effort could double that number. Endowed professorships and chairs provide faculty with flexible annual funding and recognition for outstanding work in their fields. The department anticipates announcing several new professorships and chairs in the coming months.



Wisconsin Crystal-growing Contest Draws Participants from 17 Wisconsin Counties

The United Nations declared 2014 the International Year of Crystallography. To celebrate, the Molecular Structure Laboratory organized the very first Wisconsin Crystal-growing Competition. High school students from 26 schools across 17 Wisconsin counties participated in the competition. They spent several weeks in the spring growing large blue crystals of $\text{CuSO}_4 \cdot 5(\text{H}_2\text{O})$. Local expert crystallographers identified the top crystals, and their creators received cash prizes and certificates. In June, students, teachers, and parents visited the Department of Chemistry for an award ceremony, tour of the departmental X-ray facility, and reception. Dr. Iliia Guzei, director of the Molecular Structure Laboratory, will continue the competition in 2015. More information is available at xray.chem.wisc.edu. Two high school participants display their crystals in the photo above.

Grant Upgrades NMR Spectrometer

The NIH High End Instrumentation Program has awarded the department a \$1.1 million grant to upgrade an existing 600 MHz NMR spectrometer to state-of-the-art capabilities. The upgrade is scheduled for completion this spring. Along with other members of the department, Professor Silvia Cavagnero, principal investigator for the grant, and her group anticipate huge gains in sensitivity for a variety of NMR experiments. These gains will enable and facilitate a broad range of health-related experiments. Such projects could help advance new tools for fighting infections; strategies for addressing cancer and autoimmune diseases; modulation of disease-related phenomena involving carbohydrate-mediated cell-cell recognition; new techniques for delivery of anesthetics; and fundamental understanding of how molecular chaperones prevent protein misfolding and aberrant protein aggregation. The new instrument also will enhance training for young scientists who will play key roles in the scientific workforce of the future.



Middle School Students Visit Campus to Compete in Regional Science Bowl

Twenty middle school teams from five Wisconsin counties competed in the first Wisconsin regional Science Bowl competition for a chance to represent the state at the U.S. Department of Energy National Science Bowl. The competition was organized by the Department of Chemistry and held on campus at Engineering Hall. A team from Thomas Jefferson Middle School (Madison, Wis.) took first place (they are pictured above along with their coach, Sowmya Partha; Dr. Ieva Reich, lecturer emerita; and Joe L'Huillier, undergraduate volunteer organizer). The team and their coach will represent the state at the April 2015 National Science Bowl competition in Washington D.C. A team from Indian Mound Middle School (McFarland, Wis.) placed second, and a team from Wayne Bartels Middle School (Portage, Wis.) placed third.

Staff Additions and Moves

We have welcomed several new employees to the department recently: Nora Burnham, undergraduate services specialist; Dr. Arrietta Clauss, graduate student services coordinator; Patrick Egan, academic department manager; Dr. Heike Hofstetter, NMR facility assistant director; Lynn Malone, payroll coordinator; Luke Maroney, undergraduate services specialist; Elvin Morales, ICE outreach specialist; Jeff Nielsen, building manager; Zoe Samer, lab prep tech; Karen Stephens, organic path coordinator; Danielle Tesch, human resources specialist. Dr. Jeannine Szczech, faculty assistant, is now on staff with the Chemistry Learning Center.

Staff Retirement

Kat Myhre, who worked in the department for eight years, retired in 2014. She served as organic path coordinator.



Wisconsin Life Television Show Features Glass Shop's Tracy Drier

In 2014, the Wisconsin Life television series featured the departmental Glass Shop and Tracy Drier, master scientific glassblower. Drier continued collaborating on conservation efforts for the UW Zoological Museum's Blaschka glass invertebrate models. He also worked with Dr. Mohammad Rafiee, a postdoc in the Stahl group, and presented a poster on the construction and use of a rectangular electrochemical cell for research at the annual American Scientific Glassblowers Society (ASGS) conference. Additional glassblowing outreach throughout the year included a talk at Wednesday Nite @ the Lab and trips to the Madison Children's Museum, Wisconsin Science Festival (see photo above), Science Expeditions, and Middleton High School.

Faculty News

Professor Robert McMahon continues to serve as department chair and associate editor for the *Journal of Organic Chemistry*. He presented lectures at conferences in Hiroshima, Honolulu, San Francisco, Dallas, and Davis. McMahon also was selected as co-chair of the Governing Board of the International Symposia on Reactive Intermediates.

Professor John Wright and his wife, Carol, traveled to watch their son, David, and daughter-in-law, Liva, win their third national ballroom dance championship.

For Professor Emeritus Robert West, a highlight of the year was the International Silicon Symposium (ISIS) in Berlin, organized by Dr. Matthias Driess, his former postdoc. Silatronix, Inc., a spinoff company founded by West and Professor Robert Hamers, now has 16 employees, with company offices and laboratories on the east side of Madison. The company makes organosilicon electrolytes for lithium ion batteries. Muon resonance research frequently takes West to TRIUMF, the Canadian center for nuclear studies, located in Vancouver. On the personal front, West's partner, Dr. Petey Young, is finally well again and able to travel.

Shakhashiri 75th Birthday Symposium

In August, Professor Bassam Shakhashiri's colleagues, collaborators, friends, and family gathered to celebrate his 75th birthday at the ACS fall meeting in San Francisco. The theme of the symposium was "Advancing Chemistry and Communicating Chemistry: Looking Around and Looking Ahead with Bassam Shakhashiri," and the symposium examined current and future challenges to science and society. The talks covered a rich array of perspectives and commentary on science and science communication. Speakers included Caltech Professor Harry Gray, author and UW-Madison Professor Deborah Blum, UW-Madison Professor



John Wright, former University of Texas-Austin president Dr. Larry Faulkner, WISL's Dr. Jerry Bell, AAAS CEO Dr. Alan Leshner, newly retired NSF Deputy Director Cora Marrett, Harvard Professor George Whitesides, Stanford Professor Richard Zare, retired chemistry teacher Ron Perkins, University of Michigan Professor Brian Coppola (Ph.D. '84, Trost), WISL's Rodney Schreiner (Ph.D. '81, Shakhashiri), Cornell University Professor Emeritus Roald Hoffmann, freelance science reporter Nadia Drake (Shakhashiri's niece), University of Oregon Professor Geraldine Richmond, and Elizabeth Reynolds (Shakhashiri's daughter). ACS members may log in to listen to the talks online. The morning session is available at go.wisc.edu/shak-1, and the afternoon session is available at go.wisc.edu/shak-2.

Skinner and Reich Celebration Symposia

Alumni and friends returned to Madison in May 2014 to celebrate important milestones along with Professor James Skinner and Professor Hans Reich. The Skinner Celebration Symposium was held on the occasion of Skinner's 60th birthday. The Reich Celebration Symposium was held in honor of Reich upon his retirement. The photo below shows attendees at the Reich Celebration. The photo to the right shows attendees at the Skinner Celebration.



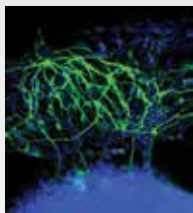
Research and Innovation

KIESSLING GROUP

Surfaces Matter in Stem Cell Differentiation

Figuring out how blank slate stem cells decide which kind of cell they want to be has been no small task for science. Human pluripotent stem cells, the undifferentiated cells that have the potential to become any of the 220 types of cells in the body, are influenced in the lab dish by the cocktail of chemical factors and proteins upon which they are grown. Now, Professor Laura Kiessling and colleagues have added a new wrinkle to the cell differentiation equation, showing that the stiffness of the surfaces on which stem cells grow influences the cells' fate.

>> [More at go.wisc.edu/surfaces](http://go.wisc.edu/surfaces)



Kiessling group

STAHL GROUP

New Process Transforms Lignin into Valuable Chemicals

Professor Shannon Stahl and colleagues have disclosed a new method to convert lignin, a biomass waste product, into simple chemicals. The innovation is an important step toward replacing petroleum-based fuels and chemicals with biorenewable materials. Lignin is found in trees and cornstalks, and it accounts for nearly 30 percent of the organic carbon in the biosphere. The researchers showed that high yields of aromatics may be obtained by exposure of lignin to oxygen followed by treatment with a weak acid under mild conditions.

>> [More at go.wisc.edu/lignin](http://go.wisc.edu/lignin)



YOON GROUP

Wielding Light for Controlled Chemical Reactions

Because the sun is an abundant source of clean and renewable energy, the ability to use visible light to synthesize chemical materials would yield significant environmental benefits. But photochemical reactions are notoriously difficult to control. Professor Tehshik Yoon and colleagues have reported a new strategy that provides unprecedented control over the 3-D structures of molecules that are made with visible light. Many chemicals exist in two forms that are mirror images, and the researchers are interested in reactions that make only one of those images.

>> [More at go.wisc.edu/light](http://go.wisc.edu/light)



CHOI GROUP

Inexpensive Production Materials Boost Promise of Hydrogen Fuel

Generating electricity is not the only way to turn sunlight into energy. The sun can also drive reactions to create chemical fuels, such as hydrogen, that can power cars or trains. The trouble with solar fuel production is the cost—the most efficient materials are too expensive. Professor Kyoung-Shin Choi and colleagues combined cheap, oxide-based materials to split water into hydrogen and oxygen gases using solar energy with a solar-to-hydrogen conversion efficiency of 1.7 percent, the highest reported for any oxide-based photoelectrode system.

>> [More at go.wisc.edu/solar](http://go.wisc.edu/solar)



JIN GROUP

Fool's Gold in Solar Cells?

As solar cells become more common, scientists are looking for inexpensive materials beyond the traditional silicon that can efficiently convert sunlight into electricity. Theoretically, iron pyrite—a cheap compound that makes a common mineral known as fool's gold—could do the job, but when it works at all, the conversion efficiency remains frustratingly low. Professor Song Jin and colleagues have discovered defects in the body of the iron pyrite material and have suggested how improvements in this promising material could lead to inexpensive yet efficient solar cells.

>> [More at go.wisc.edu/fools-gold](http://go.wisc.edu/fools-gold)



UW Geology Museum

GELLMAN GROUP

Chemical Strategy Hints at Better Peptide Drug Delivery Options

By swapping replacement parts into the backbone of a synthetic hormone, Professor Samuel Gellman and collaborators have built a version of a parathyroid hormone that resists degradation in laboratory mice. As a result, the altered hormone can stay around longer and at a higher concentration. This strategy could potentially allow oral dosing of fragile peptide drugs, which today must be injected to avoid destruction in the stomach and small intestine. By protecting the drugs from degrading enzymes, the new approach also could help sustain higher drug concentrations in the bloodstream.

>> [More at go.wisc.edu/peptide](http://go.wisc.edu/peptide)



Chemistry Building Project

Planning toward modern instructional spaces for undergraduates

As enrollments have steadily increased throughout the last two decades, the Department of Chemistry has recognized the critical importance of planning for additional space to accommodate the soaring demand for undergraduate chemistry courses.

General Chemistry 103 and 104 are the courses with the highest enrollments on campus during the fall and spring semesters, respectively. Undergraduate labs currently run from 7:45 a.m. to 9:45 p.m. on weekdays. In recent years, the department has had to cut lab frequency for General Chemistry 103 and 104 from weekly to every other week.

Virtually all students majoring in the sciences, engineering, and health professions require chemistry courses as prerequisites for courses in their majors. Therefore, the ability to accommodate large freshman general chemistry and sophomore organic chemistry enrollments is an

important factor influencing time-to-degree for a significant number of undergraduates on campus.

In March 2013, the State of Wisconsin Building Commission voted to recommend that UW-Madison move forward with the design phase of the Chemistry Building Project. In fall 2014, the State of Wisconsin Department of Administration signed a contract for the design phase of the project, and design work has now begun in earnest. The project is being considered as part of the state's capital budget for the 2015-17 biennium.

How you can help: Become an advocate

Are you a Wisconsin resident? If so, please consider contacting your elected state officials to encourage funding for the Chemistry Building Project and strong support for the overall university budget as part of the state's biennial budgeting process.

A VISION FOR THE FUTURE

The photos below show current 1960s-era undergraduate teaching facilities alongside ideas for future instructional spaces. Although the design phase is not yet complete, the renderings depict the types of modern teaching and learning spaces that could be part of the project.



Meet Professor Timothy Bertram

Sarah Morton, College of Letters & Science



Assistant Professor Timothy Bertram had no qualms about trading the sunshine of San Diego for the snow and cold of Madison, even in January—the dead of winter.

“I was a Nordic skier well before I was a chemist,” he says.

Since 2009, Bertram has served as assistant professor at the University of California, San Diego. He previously earned a Ph.D. in physical chemistry at the University of California, Berkeley and served as a postdoctoral fellow at the University of Washington. His atmospheric chemistry research program complements the department’s growing focus on sustainable and environmental chemistry.

“It’s a pleasure to welcome Tim to campus. He is an expert in atmospheric chemistry, specializing in laboratory experiments and field observations of atmospheric aerosols and the ocean,” Professor Gil Nathanson says. “Tim’s broad research program will help unite students and faculty from around the campus in our efforts to unravel the forces that control climate change and air quality.”

Read on to learn more about research in the Bertram group, and Bertram’s interest in interdisciplinary collaborations.

Q: What is the focus of your research?

TB: My group’s current research efforts are focused on the study of chemical reactions and trace gas-exchange at atmospheric interfaces. What sets our group apart from others in the field is that we study reaction and exchange on atmospheric interfaces in situ, using a combination of field- and laboratory-based techniques for probing these interfaces (e.g., air-sea and air-particle) in their native states.

Q: What are a few of your group’s current projects?

TB: Current projects in my group span from ship-based observations of air-sea exchange conducted in the north Atlantic Ocean to probing chemical reactions occurring on the surface of aerosol particles formed from biogenic processes to the development of atmospheric instrumentation for sensing the composition of the atmosphere on a wide array of spatial and temporal scales.

Q: What most excites you about coming to UW-Madison?

TB: The engaged, inspired community. UW-Madison’s

relentless commitment to serve the community through both research and teaching is unmatched by its peer institutions. I am thrilled to join and serve the Madison community and provide opportunities for students to learn about the Earth system and how chemical processes impact our environment.

Q: What classes will you teach?

TB: I will start by teaching General Chemistry 104 this spring.

Q: With which research groups will you work closely, both in the department and across campus?

TB: I will most closely work with the Nathanson group within the department, and I will look for opportunities to build collaborations with atmospheric scientists (Professor Tracey Holloway) and engineers (Professor Jamie Schauer).

Q: Who is a scientist who has played a role in inspiring your work?

TB: I have been fortunate to have many formal and informal mentors, in addition to a host of colleagues that provide continued inspiration. However, I will always be grateful to Professor Barry Huebert for fostering a deep sense of scientific curiosity and creativity.

Q: What unique strength do you hope to bring to the department?

TB: Beyond my extensive collection of Swagelok [fittings, valves, tubing, and gauges], perhaps my most significant contribution to the department will be a unique perspective on environmental chemistry that will help foster the new connections and collaborations between divisions required to address current questions in atmospheric chemistry.

Q: Where did you grow up?

TB: I am from a one-stoplight town in western New York, Honeoye Falls.

Q: What do you enjoy doing outside of your work?

TB: I am thrilled to be returning to winter and am already registered for the Birkie [the American Birkebeiner ski race] this February. Outside of that, I spend most of my free time with my wife, Lisa, an assistant professor of kinesiology, and our 4-year-old son, Andrew, and 2-year-old daughter, Claire.

To learn more about the Bertram group, visit bertram.chem.wisc.edu.



Undergraduate researcher Gabriel Le Gros, right, and his graduate student mentor, Ryan Van Hovel, process a sample in the NMR facility. Both students are members of the Schomaker research group.

One Lab, Three Takes on Mentoring

High expectations paired with a good dose of support make for individualized outcomes in the Schomaker group

The Graduate Student

Ryan Van Hovel might be busy with his own research, but he's not too busy to come and see how his three Chem 346 (Intermediate Organic Chemistry Laboratory) mentees are faring at their first poster session. As they've worked on independent projects involving multi-step synthetic processes, the three students have spent 6 weeks of the fall semester getting their first tastes of research. The consensus among the students is that they find the steps and problem-solving involved in the projects interesting but also sometimes frustrating.

A fifth-year chemistry graduate student working with Assistant Professor Jennifer Schomaker, Van Hovel divides his time among research, working as a teaching assistant, and mentoring undergraduate researchers like the three at the poster session. And the mentoring is no small task. To date, he's mentored eight undergraduates.

"Most people go through grad school with one or two undergrads," Van Hovel says. "Eight is a little on the fringes, if you will."

These days, most of Van Hovel's satisfaction comes from mentoring and teaching. In order to continue focusing on those areas, he hopes to become a professor at a liberal arts college. As an undergraduate at Bradley University, Van Hovel took note of how his mentor, Professor Brad Andersh, cultivated his and other students' scientific skills. Andersh had him repeat reactions over and over until he felt comfortable. Then, Andersh would push him to try something slightly harder.

Van Hovel has adopted this same approach with his own mentees. Experiments designed for undergraduate teaching labs typically have a set outcome and a defined path to that outcome. Doing real research projects in a chemistry lab is entirely different. He primes the undergraduates to expect only the occasional success as they work through tricky processes in the lab.

"Research chemistry is a complete crapshoot," Van Hovel says. "You have no idea if it's going to work ahead of time or not."

The Undergraduate Researcher

You wouldn't necessarily expect to find UW Marching Band trombonist Gabriel Le Gros ('15) in a chemistry research lab. That's because he's a senior biology major, and he will be going to dental school at the University of Michigan upon graduating. But biology majors are required to take three organic chemistry classes, Chem 343 (Introductory Organic Chemistry), 344 (Introductory Organic Chemistry Lab), and 345 (Intermediate Organic Chemistry). In 2013, as a student in Chem 344, Le Gros had Van Hoveltn as his teaching assistant.

"Ryan is the best teacher I've ever had in my entire life," Le Gros says.

As he finished Chem 344, Le Gros talked to Van Hoveltn about getting involved in research on campus. He didn't want to wash glassware, and his previous efforts to find a lab hadn't been successful. Van Hoveltn coached him through the process of finding a lab and recommended that Le Gros email his graduate adviser, Professor Jennifer Schomaker. Le Gros sent an email in spring 2013, Van Hoveltn jumped at the chance to continue working with Le Gros, and the rest is history.

"Research helps me think in an entirely different way," Le Gros says. "It's taught me a lot beyond a textbook. It's one thing to see something on paper and another thing to do it in real life."

Since joining the Schomaker group, and with a bit of prodding and encouragement from his research mentors, Le Gros has taken a graduate-level advanced organic chemistry class. He excelled in the course.

"Three of my undergrads took the graduate synthesis course," Schomaker says. "One of my grad students was #1 in the class, then the undergrads were #2, #3, and #4."

The Principal Investigator

Schomaker takes a systematic approach to mentoring, but it doesn't result in a one-size-fits-all solution. Her approach involves 1) asking what her graduate students want to get out of their graduate school experiences, 2) setting high expectations that are clear and specific, and 3) helping the students see when they've made progress toward their goals.

"The first thing I had to realize is that my students aren't me," Schomaker says. "The second thing that helped me become a better mentor was really trying to understand what they want out of the experience, because they all want different things."

For some graduate students, the experience of being a mentor helps them hone existing skills or develop new skills like management and communication.

Schomaker asks her group members to identify students they click with when they're working as teaching assistants. This approach helps the graduate students become invested in the process—it also results in the graduate students fully welcoming the undergraduates into their lab community. In return, the undergraduates must really commit to the group. When they can, they're expected to come in and work 20 hours a week in the lab. High expectations permeate the lab culture and trickle down from Schomaker to the graduate students and from the graduate student mentors to the undergraduate mentees.

"At least half of my group members are mentoring at any given time," Schomaker says. "Ryan is mentoring three students right now—he's been really successful."

Schomaker takes a systematic approach to mentoring, but it doesn't result in a one-size-fits-all solution.



Several mentors helped shape Schomaker's own academic and career path along the way. She worked at Dow Chemical Company as a college student and also following college. Colleagues at Dow encouraged her to keep developing her teaching skills in anticipation that she might have a chance to pursue graduate studies down the road. Their confidence in her pushed her in that direction even when it wasn't obvious that it would all work out in the end. Thankfully, it did work out, and she began graduate school several years later.

Then, as a postdoctoral fellow working with Professor Robert Bergman (Ph.D. '66, Berson) at the University of California, Berkeley, Schomaker began paying close attention to his mentoring methods.

"[Bergman] was always honest and direct, and it scared me at first," Schomaker says. "He was very clear about the standards he expected me to meet, and he challenged me to think deeply about my experiments."

Throughout her first five years as a professor, Schomaker has adopted and begun to hone that same approach to mentoring in her own lab.

Even though some of the undergraduates who walk through the lab's doors aren't chemistry majors when they set out, many become chemistry majors along the way or wind up wishing they weren't too far along to change majors. It seems the Schomaker group's approach to mentoring is working.

Awards and Honors



Professor Daniel Fredrickson with speakers at the ExxonMobil Solid State Chemistry Faculty Fellowship symposium



Professor Lingjun Li receives the Biemann Medal from ASMS President Susan Weintraub

FACULTY

Professor Samuel Gellman was elected to the U.S. National Academy of Sciences.

Professor Shannon Stahl was one of five scientists nationwide to receive a Presidential Green Chemistry Challenge Award from the U.S. Environmental Protection Agency.

Professor Trisha Andrew was one of 18 early career U.S. scientists selected as a Packard Fellow for Science and Engineering.

The Camille Dreyfus Teacher-Scholar Awards Program, which supports the research and teaching careers of talented young faculty, selected Professor J.R. Schmidt as a 2014 award-winner.

Professor Tehshik Yoon received an Alexander von Humboldt Foundation Friedrich Wilhelm Bessel Research Award.

American Society for Mass Spectrometry (ASMS) awarded Professor Lingjun Li the 2014 Biemann Medal. The award recognizes Li's contributions in the field of mass spectrometric study of neuropeptides and functional peptidomics.

In March, Professor Mark Ediger will receive the American Physical Society's Polymer Physics Prize.

Professor James Skinner was appointed to the Welch Foundation Scientific Advisory Board and was named deputy editor of the *Journal of Chemical Physics*.

ACS Division of Inorganic Chemistry awarded Professor Daniel Fredrickson the ExxonMobil Solid State Chemistry Faculty Fellowship.

ACS Division of Energy and Fuels selected Professor Ivo Hermans as its 2014 Emerging Researcher.

In March 2015, Professor Catherine Middlecamp will receive the ACS Award for Encouraging Disadvantaged Students into Careers in the Chemical Sciences. She also was recently elected chair of the Education Section of the AAAS.

ACS Division of Inorganic Chemistry named Professor Song Jin the 2014 recipient of the Nanoscience Award.

Professor Robert Hamers was named UW-Madison Steenbock Professor of Physical Sciences and UW System Wisconsin Distinguished Professor.

Three faculty received notable UW-Madison faculty research awards. Professors Joshua Coon and David Lynn received WARF Romnes Faculty Fellowships, and Professor Qiang Cui was named a Vilas Associate.

Professor Claude Woods received the first UW-Madison Outstanding Undergraduate Mentoring Award in the Physical Sciences.

Emeritus Professor Robert West is the first non-Japanese honorary member of the Japan Silicon Society.

STAFF

Sue Martin-Zernicke, analytical and materials path coordinator, was one of five UW-Madison Classified Employee Recognition Award recipients.

Staff members Matthew Martin, advanced instrument maker, and Cecilia Stodd, grants specialist, received College

of Letters & Science Classified Staff Excellence Awards for their leadership, creativity, and service.

The College of Letters & Science honored Dr. Cheri Barta, undergraduate research coordinator, with an Early Career Award and Executive Director Dr. Matthew Sanders with an Academic Staff Excellence Award.

Tracy Drier, master scientific glassblower, received the Karl Walther Award from the American Scientific Glassblowers Society Northeast section.

STUDENTS

As part of the WARF Discovery Challenge, graduate student Ross Cheloha (Gellman), along with pharmacy graduate students Bingming Chen (Li) and Niyanta Kumar, received a Discovery Challenge Research Award to work on a collaborative project.

Student attendees at the Feb. 2014 Peptides Gordon Research Symposium elected James Checco (Gellman) to give a talk at the following Peptides Gordon Research Conference. Checco also earned 'best lecture' honors at the departmental Chemical Biology Fourth-year Student Symposium in May 2014.

Two graduate students received poster prizes at the 2014 meeting of the American Crystallographic Association. Brian Dolinar (Berry) received the Oxford Cryosystems Low Temperature Prize. Dale Kreitler (Gellman) received the Muttaiya Sundaralingam Pauling Poster Prize.

Graduate student Linsen Li (Jin) earned a Graduate Student Gold Award from the Materials Research Society (MRS). Li was awarded a cash prize at the society's fall meeting. Fei Meng (Jin) received a Graduate Student Silver Award.

Graduate student Robert Newberry (Raines) received an ACS Division of Organic Chemistry Graduate Fellowship.

Stahl group graduate student Alison Wendlandt received an Alfred R. Bader Award for Student Innovation in Synthetic Organic Chemistry and Chemical Biology, sponsored by Sigma-Aldrich.

In January 2014, biophysics graduate student Rayna Addabbo (Cavagnero) gave an oral presentation at the 19th Stress Response and Molecular Chaperone Meeting.

Chemistry major and undergraduate researcher Joshua Shutter (B.S. '14, McMahan/Woods) received a Churchill Scholarship to complete a master's program at Cambridge University.

Senior chemistry major and undergraduate researcher Tong Wang (Gellman) received a prestigious Barry M. Goldwater Scholarship in 2014.

STUDENT DEPARTMENTAL AWARDS 2014-15

SUMMER UNDERGRADUATE RESEARCH AWARDS

- Ackerman Scholarship/Don Brouse Scholarship: Michael Freidberg
- Ackerman Scholarship/Karen Telander Research Fellowship: Meghan Turner
- Edward Panek Memorial Scholarship/Edwin & Kathryn Larsen Scholarship: Kevin O'Connor
- Eugene & Patricia Kreger Herscher Scholarship: Kyle Desrochers, Samantha Fix
- Walter & Young-Ja Toy Scholarship: Bowen Hu
- Undergraduate Student Support in Chemistry Scholarship: Trevor Schell, Tyler Slade, Carly Trapp

ACADEMIC YEAR UNDERGRADUATE AWARDS

- Ackerman Scholarship: Yicong Ge, Bowen Hu, Gabriel Le Gros
- Margaret McLean Bender Scholarship: Elliot Eklund
- Andrew Dorsey Memorial Scholarship: Sohil Shah
- Henry & Eleanor Firminhac Scholarship: Kimberly Dinh, McKenna Goetz, Theodore Jennaro, Natalie Lenz, Tong Wang
- Richard Fischer Scholarship/Ackerman Scholarship: Jeffrey Ehrhardt
- Eugene & Patricia Kreger Herscher Scholarship: Trevor Lardinois, Melissa Stagg, Alexandra Tamerius, Emily Zytkeiwicz
- Wayland Noland Undergraduate Research Fellowship: Tyler Slade
- Lindsay Theresa Plank & Richard Putze Memorial Scholarship: Alexandra Tamerius
- Ieva Reich Undergraduate Scholarship: Michael Freidberg
- Mabel Duthey Reiner Scholarship/Ackerman Scholarship: Jane Goh
- Robert Franklin Taylor Scholarship: Ben Gibbs
- Undergraduate Student Support in Chemistry

Scholarship: Alexander Johnson, Alexander Peterson, Lucas Zarling

- Martha Gunhild Week Scholarship: Sherry Lixue Cheng, Sin Chan
- George & Arleen Ziarnik Scholarship: Sean Slattery
- Francis Craig Krauskopf Memorial Awards: Stephen Idlas, Lucille Kohlenberg, Daniel Reasa, Megan Seeley, Eric Stuebs, Meng Xu
- John & Elizabeth Moore Awards for Excellence: Cory Hawley, Dominic Hurtig, Yutong Pang, Guohong Yang

CAMPUS/OTHER UNDERGRADUATE AWARDS

- ACS Undergraduate Award in Organic Chemistry: Carl Buttke
- ACS Undergraduate Award in Inorganic Chemistry: Haley Albright
- ACS-Hach Land Grant Undergraduate Scholarship: Benjamin Ruffolo
- Alpha Chi Sigma Alumni Scholarship: Adam Awe
- ACS Awards (Wisconsin Section): Michael Soukup, Aniruddha Srivastava, Kimberly Dinh, Mark Kelly, Joshua Taylor, Benjamin Van Domelen, Allison Weisnicht, Laura Zimny, Kaitlyn Mayer, Justin Swaney
- UW-Madison Hilldale Undergraduate/Faculty Research Fellowships: Jenna Becker, Sin Chan, Sherry Lixue Cheng, Jeffrey Ehrhardt, Ben Gibbs, Alexandra Mechler-Hickson, Trevor Schell, Sohil Shah, Meghan Turner, Tianyao Wu

UNDERGRADUATE/GRADUATE AWARDS

- Stephen Morton Research Award – Undergraduate Mentee: Hong-en Chen
- Stephen Morton Research Award – Graduate Mentor: Miguel Cabán-Acevedo (Jin)

GRADUATE AWARDS

- Leah Cohodas Berk Award for Excellence in Chemistry Research: Gloria Sheynkman (Smith)
- Roger Carlson Award: Erin Boyle (Wright)
- Goering Organic Chemistry Award: Christopher Adams

(Schomaker), Robert David Grigg (Schomaker), Laura Ruiz Espelt (Yoon), Janelle Steves (Stahl)

- Hirschfelder Prize Graduate Award: Liang Shi (Skinner)
- Hirschmann/Rich Graduate Award in Bioorganic Chemistry: Ross Cheloha (Gellman), Robert Guenette (Strieter), Vivian Trang (Strieter)
- Michael McCoy Memorial Award: Becca Putans (Hamers)
- Gary Parr Memorial Award: Julia Kennedy-Darling (Smith)
- K.V. Reddy Award in Physical Chemistry: David Skoff (Zanni)
- Charles & Martha Casey Excellence in Research Awards: Analytical Chemistry: Anna Merrill (Coon), Chemical Biology Nitasha Bennett (Kiessling), Inorganic Chemistry Amelia Hadler (Fredrickson), Materials Chemistry Adam Schmitt (Mahanthappa), Organic Chemistry Alison Wendlandt (Stahl), Physical Chemistry Jesse McDaniel (Schmidt)
- John Schrag Analytical Fund Travel Awards: Erin Boyle (Wright), Matt Faber (Jin), Rachel Knoener (Smith), Sam Krerowicz (Schwartz), Anna Merrill (Coon), Wenting Li (Weisshaar), Brett Marsh (Garand), Ranga Nambirajan (Weisshaar), Gloria Sheynkman (Smith), Kate Skog (Keutsch), Laura Slaymaker (Hamers), Chenxi Yang (Li)

How do scholarships and fellowships impact chemistry students?

“This award has granted me the freedom to travel [to a conference] and pursue my research.”

“I feel greatly motivated and inspired to pursue my dream, and now I am one step closer to it.”

“This scholarship will help further my education by making it possible to continue being involved in undergraduate research instead of working in a less fulfilling job.”

“I am now able to concentrate on what is important—my education.”

“My undergraduate research projects and involvement have helped shape who I am today, and I am incredibly grateful.”

STUDENT AWARDS CEREMONY 2014

In total, 75 students were honored at the April 2014 Student Awards Ceremony. Thanks to the generosity of alumni and friends of the department, students received more than \$124,000 in departmental scholarships and fellowships.



GRADUATION CELEBRATION

The department recognized graduating chemistry majors and graduate students at a May 2014 graduation ceremony. Family members, friends, and research mentors gathered to honor the graduates.



Institute for Chemical Education



Under the direction of Professor John Moore, director, and Dr. Andrew Greenberg, associate director, the Institute



for Chemical Education (ICE) offers a variety of programs and

provides outreach expertise to the UW-Madison Nanoscale Science and Engineering Center (NSEC) and Materials Research Science and Engineering Center (MRSEC), as well as other campus groups.

Fusion Science Theater Kits

ICE recently began a new venture, developing kits for Fusion Science Theater (FST) shows. The shows use demonstrations, prediction, audience participation, modeling, and embedded assessment to produce demonstrable gains in learning, interest, and self-efficacy. Each show addresses a science concept and incorporates it into a story for children in grades 1-5. ICE has developed performance kits for three FST shows with more to follow. Each kit contains a script, a link to a video of a live performance, a properties list, guidance for assessing results, performance tips, and alignment with the Next Generation Science Standards. Photo, above: Kids at a Fusion Science Theater event engage in the topic of the play, wondering “Will It Light?”

Chem Camps

Hundreds of middle school students enjoyed the thrills of chemistry during the 40th year of ICE’s Chemistry Camps.

This summer, sessions ranged from general chemistry and forensic science to chemical inventions. Chemistry Inventions camp was a successful collaborative effort with the MRSEC. Students explored the minute details of the materials they created as well as other objects in the lab using a scanning electron microscope borrowed from the MRSEC. Undergraduates served as group leaders and provided direct and individualized instruction to campers as they performed lab experiments. For the first time, students in the REU program also volunteered, helping out with engineering-related activities at the end of each day.

SCIENCountErs

SCIENCountErs is an after-school science outreach program organized in cooperation with Boys & Girls Clubs throughout the country to increase diversity in STEM fields. Thanks to continued support from NSF, the NSEC, the Boys & Girls Clubs of Dane County, and Sigma-Aldrich Corporation, SCIENCountErs thrived during 2014. More than 400 children from the Boys & Girls Clubs participated in the program, and more than 50 undergraduates and graduate students volunteered to guide the children through inquiry-based activities. For the first time this year, a dozen Sigma-Aldrich employees also volunteered with the program, providing mentorship for both the participants and the student volunteers. At each meeting, children who might have limited opportunities to participate in extra-curricular science or interact with scientists built up their scientific confidence and knowledge. SCIENCountErs continues to expand nationwide; contact ICE for more information about starting a new site.

Students Participating in Chemical Education (SPICE)

This year, SPICE students continued their traditional outreach efforts, visiting schools, museums, libraries, and performing demonstration shows for student groups visiting campus. They participated in more than 30 events during the course of the school year. SPICE and Brendon Sargent (B.S. '14), 2013 SPICE president, receive an ACS Wisconsin Local Section Outreach Award in recognition of the program's outstanding efforts in the community.

25 Years of Science Kits and Publications

ICE has distributed science kits and publications about science outreach for 25 years. Many of these tools are based on the work of scientists and engineers in centers such as the NSEC and MRSEC. In 2014, the group disseminated about 780 kits and publications. ICE also continues to help maintain the tens of thousands of kits already in the hands of science educators. This year, ICE provided about 4,500 replacement parts to those using ICE kits.

NSEC Outreach

ICE continues to organize the education and outreach activities of the UW-Madison NSEC, which is now in its final year of a 5-year \$14 million grant renewal. The center explores self-assembly at the nanoscale. ICE students and staff guide all NSEC education outreach programs. The main NSEC outreach programs this year were Research Experience for Undergraduates (REU) and SCIENCountErs.

Research Experience for Undergraduates (REU)

In summer 2014, ICE hosted four NSF-funded REU programs and organized a new research exchange program with the University of Science and Technology of China (USTC), the latter in cooperation with Professor Qiang Cui. Two students from the NSF-funded Center for Sustainable Nanotechnology, led by Professor Robert Hamers, joined ICE in these efforts. Together, the programs attracted 48 students from the U.S., Puerto Rico, and China, who spent 10 weeks as researcher in labs across campus. The Department of Chemistry hosted 21 of these students in the labs of Professors Andrew, Blackwell, Burstyn, Gellman, Goldsmith, Gopalan, Hamers, Jin, Kiessling, Mahanthappa, Schmidt, Strieter, and Wright.

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



Top: Students at a 2014 Chemistry Camp; Middle: Students at the after-school SCIENCountErs program with volunteer Mikayla Lyons; Bottom: Sigma-Aldrich employees and SCIENCountErs volunteers, Jon Parrish and Jamie Morrone, work with students at the Boys & Girls Clubs of Dane County

Wisconsin Initiative for Science Literacy



Dorothy, played by local talent Kailey Boyle, joined Shakhshiri for the 45th anniversary of “Once Upon a Christmas Cheery, in the Lab of Shakhshiri.”



Professor Michael Leckrone and members of the UW Marching Band entertained the Fourth of July crowd at the Memorial Union Terrace during a Science is Fun event.

“Public sentiment is everything,” Abraham Lincoln said. “With public sentiment, nothing can fail; without it, nothing can succeed.”

Wisconsin Initiative for Science Literacy (WISL) seeks to promote literacy in science, mathematics, and technology among the general public and to attract future generations to careers in research, teaching, and public service. WISL advocates for national and local policies to enhance the quality of scientific research and education practice for the benefit of society. The group’s programs, including Science Is Fun presentations, foster public awareness and appreciation of science everywhere—at malls, science centers, schools, colleges, professional organization meetings, and before gatherings of civic, religious, and community organizations, in the U.S. and around the world.

WISL helps people explore, discuss, and cultivate the intellectual and emotional links between science, the arts, and the humanities. Creativity, passion, and the urge for expression and exploration are essential human qualities that inspire all of these disciplines. WISL focuses on the relationships, similarities, and differences in inquiry, creativity, and personal expression among scientists, artists, and humanists. Through WISL programming, musicians, artists, writers, and performers gain an appreciation for science and seek to understand the connections between science and the arts.

Engaging the Public: A WISL hallmark

For the well-being of society, it is essential that citizens develop an appreciation for science, the benefits of technology, and the potential risks associated with advances

in both. This appreciation is fostered when scientists deliberately engage the public in a variety of settings. In 2014, WISL engaged with the public in a variety of ways in order to influence attitudes toward science. Professor Bassam Shakhshiri, WISL director, appeared on Wisconsin Public Radio’s Larry Meiller show, spoke at the 27th annual Faraday Lecture in Pittsburgh, gave a Fourth of July “Science of Fireworks” show at the Memorial Union Terrace, and welcomed author Theodore Gray for a special joint event at the Wisconsin Science Festival. Shakhshiri also gave dozens of invited talks this year throughout the U.S. and in Norway.

45th Annual Holiday Show

The year ended with a bang at the 45th anniversary celebration of “Once Upon a Christmas Cheery, in the Lab of Shakhshiri,” held for the first time in the newly remodeled Wisconsin Union Theater and featuring guests Professor Michael Leckrone and the UW Marching Band, the Madison Youth Choir, Professor Clint Sprott, and Bucky Badger. The goal of this annual event has remained the same for the last 45 years: connecting with the audience. The ultimate purpose, beyond the dazzling colors and exciting explosions that everyone enjoys, is to trigger engagement and enjoyment in order to heighten the audience’s joy in learning. Watch this year’s show at go.wisc.edu/scifun14.

Demonstration Development

WISL staff and collaborators are working on a companion to the collection of demonstrations dealing with color, light, vision, and perception that are compiled in Volume 5 of “Chemical Demonstrations: A Handbook for Teachers of Chemistry.” This companion collection concentrates

on sound and hearing and includes demonstrations of how sound is produced, detected, and perceived. Last summer, WISL faculty fellow and professor of kinesiology Peter Van Kan began research on the sense of touch. He aims to incorporate basic scientific discoveries related to neurophysiological, behavioral, social, and cognitive aspects of somatosensation into scholarly, accessible, and effective demonstrations. The research takes advantage of recent advances in perceptual neuroscience and psychology in order to extend WISL's approach of communicating basic science from the physical world of chemistry and physics to the realm of physiology, social cognition, and behavior.

Sharing Research with the Public

WISL encourages chemistry doctoral students to include a chapter in their theses communicating their research to non-scientists. The goal is to explain the candidate's research and its significance to audiences such as family, friends, students, and lawmakers. In return, participants receive a cash award.

Nearly 30 recent graduates have participated in this program. Matthew Windsor (Ph.D. '11, Gellman) recently reflected upon how writing his chapter has affected his career and his views on science. He now serves as advocacy and outreach manager for the Association for Research in Vision and Ophthalmology, where he encourages scientists to share their passions for science with policy-makers and the public.

"Writing the chapter for non-scientists helped me realize just how much I enjoy and value communicating science to the public," Windsor says. "I'm not sure I would have discovered my passion for science communication."

Each participant approaches the task in a different way; the best chapters come from those who take a unique approach. Several excerpts are shared below, and full chapters are available at scifun.org.

J.P. Gerdt (Ph.D. '14, Blackwell)

Postdoctoral fellow, Harvard University

"One of the most fascinating things about bacteria is how they adapt to environmental changes. Imagine a bacterial cell as a self-sustaining factory of robots. It has a set of instructions that govern every aspect of how the factory should run, the DNA. And, it has thousands of different robots all with important functions—the proteins. Some robots maintain the physical structure of the factory. Some work to make sure all the other robots have fuel. Some robots make new robots as old ones break or as the factory determines that its output needs require a different



collection of robots. Some robots get rid of waste or fix broken robots, and so much more. Bacterial cells are similar ..."

Laura (Ruiz Espelt) Havens (Ph.D. '14, Yoon)

Senior chemist, Dow Corning Corp.

"Light is both abundant and free, making it the ideal energy source for chemistry. Plants use light as the energy source for photosynthesis—the sunlight allows molecules inside plants to recombine in new ways that provide energy and allow them to grow and reproduce. If we could use natural light as the energy source for all chemical reactions, we'd be able to do chemistry at almost no cost. Imagine a world where every drug, every plastic, and every gallon of gasoline could be made without having to spend a dime on the energy necessary to make those reactions happen."



Amber Jain (Ph.D. '14, Sibert)

Postdoctoral fellow, University of Pennsylvania

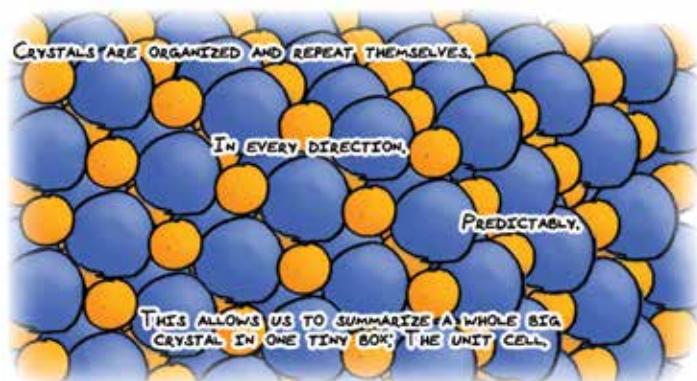
"I study a phenomenon found in nature called tunneling. It is so bizarre that we do not have any direct physical experience of it. Imagine hitting a baseball with a bat, and imagine a full head-on collision. Well the ball will bounce back from the bat, right? Almost always! It turns out that if you follow the laws of quantum mechanics, a theory developed in the last century, there exists a very, very small probability that the ball will pass right through the bat. These probabilities are much larger at atomic scales."



Veronica Berns (Ph.D. '14, Fredrickson)

Senior scientist/engineer, Honeywell UOP

Rather than sharing her thesis with the public in pure written form, Berns made her research project accessible to non-scientists by translating it into an illustrated comic book (one image is shown below). Learn more about her efforts at go.wisc.edu/berns.



In Memoriam

Robert A. Alberty (Ph.D. '47, Williams)

Alberty, 92, died Jan. 18, 2014. He received a bachelor's degree from University of Nebraska in 1943, followed by a master's from the same university. In 1947, he received his doctorate in chemistry from UW-Madison and immediately became an instructor at the institution. He moved up the ranks, becoming a full professor in 1956. In 1962, he became associate dean of the College of Letters & Science before being appointed as dean of the Graduate School in 1963. He transitioned to MIT to serve as dean of the School of Science and professor of chemistry in 1967. He became professor emeritus in 1991. Alberty's seminal contributions to the thermodynamics and kinetics of biochemical reactions are still at the forefront of chemistry. Physical Chemistry, a textbook he co-authored with Professor Farrington Daniels in 1955, was his most esteemed work. Alberty was a member of the National Academy of Sciences, the American Academy of Arts and Sciences, and the Institute of Medicine. His wife of 66 years, Lillian, died before him.

Donald P. Ames (B.S. '44, Ph.D. '50, Willard)

Ames, 91, died Jan. 2, 2014. He was a former vice president of research for McDonnell Douglas Research Laboratories and MDC distinguished fellow. Ames was drafted into the U.S. Army in 1942 as a chemist for the Manhattan Project. He was married to Doris, his wife, for 64 years.

Thomas I. Bair II (Ph.D. '66, Wharton)

Bair, 76, died April 15, 2014. He was born Feb. 12, 1938 in Grier City, Pa. He received a bachelor's in chemistry from Pennsylvania State University in 1960 and a doctorate in organic chemistry from UW-Madison in 1966. In 1965, Bair joined DuPont in the company's fiber research organization. His early research led to the development of the commercial process for Kevlar. He held 13 patents in production processes and various absorbent materials. He retired as a research fellow in 1996. Bair is survived by his wife of 48 years, former Delaware State Senator Myrna Bair (Ph.D. '68, Larsen).

Roger M. Christenson (B.S. '41, Ph.D. '44, Schuette)

Christenson, 94, died April 29, 2014, after a long battle with Parkinson's disease. He was born Sept. 28, 1919. After he received a doctorate from UW-Madison in 1944, he joined PPG Industries, Inc., as a research chemist at the Milwaukee, Wis., coatings and resins research facility. During his career with PPG, he held a variety of research supervisory positions. In 1980, he was named director of research for the coatings and resins group. Most notably, Christenson led the development of electrodeposition, a paint process used to protect cars from rust. He retired in 1985 as the inventor or co-inventor for 136 U.S. patents. During his career, he received two PPG President's Awards for Outstanding Technical Achievement and was honored as a charter member of the PPG Collegium. In 1997, he was inducted into the National Inventors Hall of Fame as a Distinguished Corporate Inventor. He is survived by his wife of 66 years, Patricia.

Carl Djerassi (Ph.D. '45, Wilds)

Djerassi, 91, died Jan. 30, 2015 after a long and distinguished career as chemist, and later a poet and playwright. Born in Vienna, Djerassi emigrated to the U.S. in 1939. Although his most enduring fame came from developing a practical synthesis of the steroid norethindrone in 1951 with his coworkers at Syntex Corp., Djerassi's intellectual pursuits spanned the worlds of science and art. He was on the faculty at Wayne State University and later at Stanford University; he authored more than 1,200 scientific papers. In the last two decades of his life, Djerassi largely put aside research to explore scientific themes through literature, penning dozens of novels, plays, poems, and essays. "Carl lived an extraordinary life and was truly a citizen of the world," says Robert McMahon, Helfaer professor and chair at UW-Madison Department of Chemistry. "Anyone who met Carl knew immediately that they were in the presence of a remarkable man."

William D. Ehmann (B.S. '52, M.S. '54, Willard)

Ehmann, 82, died Dec. 17, 2013. He was born Feb. 7, 1931, in Madison, Wis. He earned both a bachelor's and master's degree in chemistry from UW-Madison. He married Nancy Gallagher on July 16, 1955. In 1957, he received a doctorate in radiochemistry from Carnegie Mellon University. After working at Argonne National Laboratory, Ehmann became a professor of chemistry at the University of Kentucky. In 1964, as a Fulbright Research Scholar, he traveled to Australia for a year and conducted groundbreaking research on meteorites. In the 1970s, NASA chose Ehmann to join the first group of scientists to analyze moon samples from the Apollo missions. He published more than 275 papers. He also served as chair of the Chemistry Department and associate dean for research in the Graduate School at the University of Kentucky. Ehmann is survived by his wife, Nancy.

David C. England (Ph.D. '43, Adkins)

England, 95, died Nov. 2, 2014. He was born in Portland, Ore. on March 5, 1919. He attended the University of Oregon and graduated from Oregon State. He then earned a doctorate in chemistry from UW-Madison, where he met his wife of 54 years, Barbara, who died before him. England worked as an organic research chemist at the Dupont Experimental Station in Wilmington, Del., for 42 years, held 61 patents, and was a DuPont Charles Pederson medalist. In 1997, he received the Lavoisier Medal for Technical Achievement, DuPont's highest honor for scientists.

William H. "Bill" Glaze (M.S. '58, West/Ferry)

Glaze, 80, was born Nov. 21, 1934 and died Dec. 17, 2014. He attended Southwestern University (Texas) graduating with a bachelor's in 1956. He received a master's in chemistry from UW-Madison in 1958 and later a doctorate. In 1961, he became a professor of chemistry at what is now the University of North Texas. He left UNT for the University of Texas at Dallas in 1980. In 1984, he became the director of the Department of Environmental Sciences at UCLA. In 1989, he moved to the University of North Carolina as chair of the Department of Environmental Sciences

and Engineering. He was founding director of the Carolina Environmental Program from 1997 to 2002. He served as editor of Environmental Science and Technology from 1988 to 2002. ACS named him one of 15 “Legends of Environmental Chemistry.” He is survived by his wife, Erma.

Alex Kotch

Kotch, 87, died March 8, 2014. He was born Aug. 8, 1926. He attended Pennsylvania State University and received a doctorate in organic chemistry from the University of Illinois at Urbana-Champaign in 1950. While on a Fulbright fellowship in the Netherlands, he met his wife, Anne, whom he married in 1952. Kotch was a research chemist for DuPont, program director for organic chemistry at the National Science Foundation, professor and associate chair of the UW-Madison Department of Chemistry, assistant director for information and education at the Solar Energy Research Institute (NREL), and director of research and program development and professor of chemistry at the University of North Dakota-Grand Forks. He is survived by his wife, Anne.

William G. Larson (B.S. '52)

Larson, 87, died Aug. 22, 2014. He served in the U.S. Army during World War II as a technical sergeant in the Philippines. Following his military service, he earned a bachelor's in chemistry from UW-Madison in 1952. Early in his career, Larson joined the Seagram's distillery in Lawrenceburg, Ind. From 1953 until 1973, he worked in the development and application of industrial coatings. He then worked as a meat-processing chemist until he retired in 1992. His wife of 44 years, Ann, died before him.

Robert G. “Bob” Lewis (Ph.D. '65, Zimmerman)

Lewis, 77, died Aug. 28, 2014. He was born Nov. 11, 1937. He earned a bachelor's in chemistry from the University of North Carolina in 1960 and a doctorate in chemistry from UW-Madison in 1965. Lewis retired in 2005 after 35 years of service as a science advisor, research manager, branch chief, and section chief with the U.S. Environmental Protection Agency (EPA). He received one of the very few EPA Distinguished Service Awards. Lewis is survived by his wife, Sue.

Cynthia K. “Cyd” McClure (M.S. '77, Ph.D. '85, Vedejs)

McClure, 60, was born Sept. 20, 1953 and died May 6, 2014. She earned a bachelor's in chemistry from Northwestern University in 1975 and a master's in chemistry from UW-Madison in 1977. She worked for the Upjohn Company prior to earning her doctorate in organic chemistry in 1985. She then worked as a postdoctoral fellow at Cambridge University. Her first job in academia was in the Department of Chemistry and Biochemistry at the University of Delaware. Shortly after earning tenure, McClure moved to the Department of Chemistry and Biochemistry at Montana State University, where she was the first woman faculty member. She was a champion for women in science and retired in 2009.

Melvin A. Neuman (Ph.D. '66, Dahl)

Neuman, 75, died Feb. 1, 2014. He received a bachelor's in chemistry from UW-Milwaukee and a doctorate in physical chemistry from UW-Madison. He loved teaching chemistry at Macalester College, Grand Valley State University, and UW-Marathon County. His wife, Carol “Connie” (Sweeney) Neuman (M.S. '67) died before him.

V. N. Mallikarjuna “Malli” Rao (Postdoc '69-73, West)

Rao, 77, died Dec. 2, 2014. Born in 1937 in India, he received his bachelor's and master's degrees from Pachaiyappa's College in 1959. He came to the U.S. on a Fulbright fellowship and earned a doctorate in chemistry at the University of Idaho. Rao worked as a postdoc at the University of Chicago then returned to India, where he managed 800 employees in an Ovaltine malted milk plant. He moved to the U.S. and worked as a postdoctoral fellow at UW-Madison prior to joining the DuPont Experimental Station in 1973. Early in his DuPont career, Rao worked on tetrahydrofuran. In 1980, he invented a safer process to make methyl isocyanate in situ, improving the safety of transportation and storage. He was a prolific inventor in catalysis and organofluorine chemistry—especially chlorofluorocarbon alternatives. Named a DuPont fellow and distinguished scientist, Rao held nearly 200 patents. In 1999, he received the DuPont Lavoisier Medal. In 2014, he received the Stephanie Kwolek Inventor Award. A champion of diversity, Malli mentored young scientists from all backgrounds. He is survived by his wife, Vera.

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

Ellen Bunyan (Ph.D. '50, Hirschfelder)
 Barbara J. Carlson (B.S. '49)
 Carol J. Ebert (B.A. '51, McElvain)
 Irvin Fuhr (B.S. '37, Hart)
 Ralph E. Harpt (B.S. '44, Johnson)
 Eugene F. Haugh (B.S. '51, Hirschfelder)
 John F. Helms (M.P.H. '43, Johnson)
 Evalyn R. Hornig (Ph.D. '56, Willard)
 King L. Howe (Ph.D. '57, Goering)
 Gary H. Klein (B.S. '69, Fenske)
 Richard N. Lovett (B.S. '40, Klein)
 Chetan Mahajan (Postdoc '13-14, Cui)
 Jean P. Manion (B.S. '43, Wilds)
 Sylvia G. Martin (B.S. '44, McElvain)
 Leonard A. Mattano (B.S. '41, Schuette)
 Arthur W. McRowe (Ph.D. '66, Berson)
 Patricia A. Mondloch (B.S. '65)
 Lois R. Morrison (M.A. '65, West)
 Richard D. Mullineaux (Ph.D. '51, McElvain)
 Melvin A. Rebenstorf (M.S. '48, Adkins)
 Fred J. Reichley (M.S. '66, Wharton)
 James H. Rosenow (B.S. '65, Ferry)
 Ernell F. Rothe (B.A. '47)
 Stephen R. Schoening (B.S. '70, Kotch)
 Ralph W. Scott (B.S. '47, Sorum)
 Donald H. Secrest (Ph.D. '61, Hirschfelder)
 Rubin Shapiro (Ph.D. '53, Meloche)
 Robert W. Siegfried (Ph.D. '53, Ihde)
 Myron G. Silbert (B.S. '51, Willard)
 Richard C. Stewart (M.S. '74, Nelsen)
 William F. Tousignant (M.S. '51, Van Tamelen)
 Hendrik E. Tuinstra (Ph.D. '78, Casey)
 Vincent J. Webers (B.S. '43, Johnson)
 Gene W. Wong (Ph.D. '12, Landis)



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