

Badger Chemist

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

Established 1953, No. 56, 2013



DEPARTMENT OF
Chemistry

UNIVERSITY OF WISCONSIN-MADISON

Building on Our Legacy

Farrington Daniels. Joseph Hirschfelder. Howard Zimmerman. These are just a few of the many names that come to mind when I think about our department's research contributions over the last century. But we have also been adding to another equally important list—the ever-growing group of faculty who are truly dedicated to our tradition of excellent teaching. Professors Ned Sibert and Tehshik Yoon were just awarded the UW-Madison Chancellor's Distinguished Teaching Award for 2013. Thanks to these and many other professors and staff in the department, we are on track to innovate in the classroom while remaining

committed to our history of excellence in teaching and research.



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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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Our \$103.5 million Chemistry Instructional Addition and Renovation project is now among the highest building priorities for the UW System Board of Regents (see page 15). This spring, the Wisconsin State Legislature will have the opportunity to include the first phase of this project in the 2013-15 biennial budget. This building project would provide the instructional space we need to accommodate our current students and growing enrollments. And, when combined with our focus on teaching innovations, this project would give us the tools we need to prepare the next generation of chemists for their own notable industrial and academic research contributions.

Time flies when you're having fun. This is my third and last message to you as department chair. I will hand the baton to Professor Bob McMahon in July. Although I've truly enjoyed most aspects of my time as chair, I am quite eager to spend more quality time with my research group in the coming years.

Enjoy the *Badger Chemist* in its new format. And best wishes for a great 2013!

With very best regards,

James C. Weisshaar
Professor and Chair
weisshaar@chem.wisc.edu

PS: Please plan to join us at our social event at the ACS Meeting in New Orleans, on April 7 from 5-7 p.m. at the New Orleans Downtown Marriott at the Convention Center.

New Badger Chemists

Ph.D.

AUGUST 2011

Reto Frei (Blackwell)

Development of Metal-Mediated SPOT-Synthesis Methods for the Efficient Construction of Small-Molecule Macroarrays. II. Design and Synthesis of Novel Bacterial Biofilm Inhibitors

Melissa Marie Galloway (Keutsch)

Mechanisms of VOC Oxidation and Aerosol Formation: Atmospheric Organic Chemistry of Glyoxal

Stephanie Ruth Hogendoorn (Hamers)

Functionalization and Electrocatalysis on Carbon Nanofibers

Michael A. Ischay (Yoon)

Visible Light Photocatalysis of [2+2] Cycloaddition Reactions

Almaz Jalilov (Nelsen)

Through Space Pi-dimeric (Long-Bonded) Interactions of Organic Radical Ions

Corinne Elizabeth Lipscomb

(Mahanthappa)

The Development and Characterization of Degradable Poly(vinyl ester) and Poly(vinyl ester)/PEO Block Copolymers

Andrew Gerrit Lohse (Hsung)

Divergent [4 + 2] and [4 + 3] Cycloadditions Utilizing Allenamides

Amanda Kae Musch Long (Berry)

New Diruthenium Nitrido Compounds and Intra- and Intermolecular Reactivity with Aryl Carbon-Hydrogen Bonds

Christine Elizabeth McInnis (Blackwell)

Design, Synthesis, and Mechanistic Characterization of Non-Native Quorum Sensing Modulators

Justin Matthew Shorb (Moore)

Development and Implementation of an Empirical Frequency Map for Use in MD Simulations of Isotope-Edited Proteins, and, Development, Implementation,



Photo by Jeff Miller, University Communications

and Evaluation of an Online Student Portal as a Textbook Replacement in an Advanced General Chemistry Course

Jenny Belle Werness (Tang)

Preparation of Functionalized Allenes by Intramolecular 1,4-addition to Unactivated Conjugated Enynes and the Application to the Total Synthesis of (-)-kumausallene

Lena Ashley Yurs (Wright)

Multiresonant Coherent Multidimensional Spectroscopy of Quantum Confined Nanomaterials

DECEMBER 2011

Benjamin Paul Bratton (Weisshaar)

Dynamics of RNA Polymerase and DNA Foci in Live Escherichia coli

Kevin James Dawson (Ediger)

Exploration of Molecular Packing and Vapor Uptake in Stable Glasses of Indomethacin and Tis-naphthylbenzene Isomers

John Bruce Feltenberger (Hsung)

Thermal [2 + 2] and [4 + 2] Cycloadditions of Vinyl Acetals, Enamides, and Allenamides

Michael William Giuliano (Gellman)

Complementary Strategies for the Design of Protein-like Structure in

Unnatural Peptides

Alexis Miyuki Johnson (Nathanson)

Collision and Reaction Dynamics at the Surfaces of Sulfuric Acid Aerosols and Jet Fuel Droplets

Jagannath Mondal (Yethiraj)

Multiscale Computer Simulation Study of Amphiphilic Macromolecules

Kem Alyce Sochacki (Weisshaar)

Quantitative Fluorescence Microscopy on the Escherichia coli Cell Envelope: Protein Diffusion in the Periplasm and Attack of the Human Antimicrobial Peptide

Rebecca Anne Splain (Kiessling)

Synthesis of Galactofuranose-Based Acceptor Substrates for the Study of Galactan Biosynthesis

Wei Xiong (Zanni)

Development and Applications of Shaper-Based Two-Dimensional IR and SFG Spectroscopy

MAY 2012

Sayani Chattopadhyay (Raines)

Collagen Mimetic Peptides for Wound Assessment and Healing

Kyle Austin DeKorver (Hsung)

Palladium-Catalyzed and Thermal Rearrangements of N-allyl Ynamides

- Joshua Paul DiGangi** (Keutsch)
Formaldehyde as a Probe of Rural Volatile Organic Compound Oxidation
- Holly Suzanne Haase** (Gellman)
Alpha/Beta-Peptide Inhibitor Development for the Disruption of Protein-Protein Interactions: Studies to Target VEGF and Bcl-2 Family Proteins
- Limei Hui** (Li)
Probing Neuropeptidomics by Mass Spectrometry
- Aaron Robert Ledvina** (Coon)
The Development and Implementation of Novel Peptide Fragmentation Methods for Proteomics
- Fu Li** (Skinner)
Vibrational Spectroscopy of Ice Ih
- Jayashree Nagesh** (Sibert)
Spectroscopy and Vibrational Dynamics of Methoxy and D-Methoxy Radicals
- Thanit Praneenarat** (Blackwell)
New Chemical Tools and Methods for the Modulation of Quorum Sensing in Gram-Negative Bacteria
- Thomas Joel Preston** (Crim)
Formation and Relaxation Dynamics of Condensed-Phase Polyhalomethane Isomers
- Aaron Tyler Smith** (Burstyn)
Spectral Characterization of Thiolate-Mediated Metalloporphyrin-Protein Interactions and Their Functional Implications
- Olivia Eve Watkins** (Brunold)
Spectroscopic and Computational Studies of Biological and Synthetic Nickel Systems
- Ann Marie Woys** (Zanni)
Developing Two-Dimensional IR Spectroscopy as a Quantitative Probe for Protein Structure
- AUGUST 2012**
- Andrew Eric Berke** (Crim)
Reactions Near Their Energetic Limit: Methane and Monodeuterated Methane with Chlorine and Bromine Atoms
- Stephen Benjamin Block** (Wright)
Picosecond and Femtosecond Coherent Multidimensional Spectroscopy of Colloidal Lead Selenide Quantum Dot Structure and Dynamics
- Benjamin Richard Caes** (Raines)
Catalytic Systems for Carbohydrate Conversions
- Weifeng Cao** (Li)
MS Informatics: Using Bioinformatic Tools to Enhance MS-based Neuropeptidomics and Proteomics
- Xin Chen** (Hamers)
Chemistry at the Organosilicon-Based Electrolyte/Electrode Interface in Lithium-ion Batteries
- John Aaron Crapster** (Blackwell)
The Design and Construction of Discretely Folded Peptoids
- Juana Du** (Yoon)
Enones in Visible Light Photocatalysis
- Brian John Esselman** (McMahon)
Computational and Spectroscopic Investigations of Species of Astrochemical Relevance
- Guanhua Hou** (Cui)
QM/MM studies of Phosphoryl Transfer Reactions in Alkaline Phosphatase Superfamily
- Laura Anne Kopff** (McMahon)
Matrix-Isolation, Photochemistry, and Spectroscopy of Benzothienyl Diazo Compound
- Kacie Marie Louis** (Hamers)
Surface Functionalization of TiO₂ Nanoparticles: Photo-Stability and Reactive Oxygen Species Generation
- Jason Dale Russell** (Coon)
Strategies for Protein and Peptide Characterization and Quantification using Electron-Transfer Dissociation Mass Spectrometry and Intrinsic Fluorescence
- Rose Emily Ruther** (Hamers)
Molecular Interfaces to Electronic Materials
- Joan Widin Schroeder** (Mahanthappa)
Manipulating Phase Behavior in Block Copolymers Using Polydispersity
- Rachel Sarah Selinsky** (Jin)
Synthesis and Characterization of Inorganic Semiconducting Nanocrystals for Solar and Spintronics Applications
- Jay Daniel Steinkruger** (Gellman)
Exploration of Sequence-Stability Relationships in Model Proteins Using Thioester Exchange and Lipid Cubic Mesophase Crystallization Attempts Using Helical Transmembrane Peptides
- George Henry Timmer** (Berry)
Quantum Chemical Investigation of Metal-Metal Bonded Paddlewheel Complexes: Electronic Structure and Reactivity
- Yevgeniya Turov** (Berry)
New Axial Reactivity of Trimetallic Compounds
- Lu Wang** (Skinner)
Theoretical Vibrational Spectroscopy of Proteins
- Margaret L. Wong** (Kiessling)
Chemistry for Probing Protein-Protein Interactions
- Zhe Wu** (Cui)
Understanding Peptide-Induced Membrane Curvature: New Coarse-Grained Force Field Development and Its Applications
- Shu Yao** (Berry)
Part I. The Quest of the Chalcogen-Chalcogen Half Bond: with Traditional Organometallic Synthesis and Modern Spectroscopy; Part II. Synthetic Design of Metalloporphyrins: Heterobimetallic and Heterogeneous

B.S. and B.A.

AUGUST 2011

Dettmann, Melissa Eileen
Fank, Michael Robert
Johnson, Kevin Charles
Lee, Han-Kyung
Lesi, Adeyinka Ahmed
Messineo, Jay
Patnode, Scott Thomas
Tran, Tuan Minh
Vrana, Justin Dane

DECEMBER 2011

Aasen, Amanda Leigh
 Brady, Kevin Fitzpatrick
 Brekke, John Charles
 Clermont, Josh Michael
 Hoganson, Andrew Jon
 Kwon, Min Ah
 Lin, Lin
 Markwardt, John
 McMahon, Timothy Mark
 Narayan, Riju
 Nguyen, Anh The
 Schumann, Cory Brent
 Scott, Matthew Walter
 Slukvin, Jr., Igor
 Tepper, Michelle Dawn
 Turner, Isabel Faith Edel
 Weber, Stephanie Marie
 Zhang, Weicheng

MAY 2012

Ackerman, Lauren Ann
 Ament, Michael Stephen
 Arunrattanamook, Nattapol
 Bayer, Amanda Rose
 Benedict, Alex Edward
 Betts, Bradley James
 Brummond, Jacob William
 Buckley, Lauren E

Budoff, Greg Elliott
 Carey, Thomas James
 Chen, Xinyu
 Collins, Jack Walter
 Denton, Brent David
 Denzin, Nathan Jacob
 Eide, Jacob George
 Fleischman, Anna Mary
 Frazier, Stuart Marshall
 Gong, Justin Ziyang
 Harris, Nicholas Andrew
 Hensen, Broderick Scott
 Holley, Ryan Matthew
 Kreitinger, Jordan Anthony
 Krejci, Austin Lee
 Langel, Thomas Patrick
 Lin, Terri Chai
 Linzmeier, Peggy Ann
 Livingston, Matthew J.
 Markus, Charles Richmond
 Maza, Andrew M.
 Meis, Alan Ronald
 Mihas, Matthew Michael
 Mischler, Adam Paul
 Mueller, Brandon James
 Oja, Stephen Matthew
 Oskowsky, Jordan Ross
 Peacock, David Matthew
 Prehn, Jr., Frederick C.
 Rodriguez, Antonio James

Schwarzman, Garrett Reiss
 Segar, Maxwell Brinson
 Sijan, Zana
 Tessner, Joshua David
 Turner, Maximilian Ivan
 Valenti-Hein, Gabrielle Leigh
 Wadzinski, Tyler Joseph
 Walton, Mary Catherine
 Wiseman, David Alexander
 Wu, Yufan
 Yun, Hyun Gi
 Zhu, Haoyue
 Zywojko, David Richard

AUGUST 2012

Baker, Brooke Ashton
 Becknell, Nigel Hajj
 Chen, Sylvia
 Feick, Kevin James
 Fern, Joshua Louis
 Goodman, Samuel Martin
 Kortuem, Charles Ray
 Li, Rebecca
 Luzhansky, Igor Dmitry
 Scifo, Daniel Joseph
 Tantitham, Tharn
 White, Aaron Christopher

Stay in Touch with Your Fellow Badger Chemists

Find out news about the department, UW-Madison, and upcoming alumni events by signing up for our new Alumni E-News. Visit bit.ly/UWChemAlumniENews to sign up today! Then, watch your inbox for our first issue, which will arrive later this spring.

You can also connect with fellow alumni by joining our University of Wisconsin Department of Chemistry Alumni group on LinkedIn by visiting bit.ly/UWChemAlumni.

Find us on Facebook: facebook.com/UWMadisonChem

Follow us on Twitter: twitter.com/UWMadisonChem



Photo by Bryce Richter, University Communications

Chemistry News

Crim Begins Leadership Role at NSF

In January, Professor **Fleming Crim** began to serve as assistant director for the National Science Foundation (NSF) Directorate of Mathematical and Physical Sciences (MPS). MPS supports core research in astronomy, chemistry, physics, materials research and mathematics. Crim will lead a staff of 160 and administer an annual budget of \$1.3 billion. “We greatly look forward to [Crim’s] contributions to NSF. We have tremendous confidence in his ability to keep MPS and the agency at the cutting edge of research and technology in the 21st century,” NSF Director Subra Suresh says.



New Outreach Programs Allow Students to Explore Graduate School in Chemistry

About 20 college juniors and seniors visited the department in October as part of our new Chemistry Opportunities (CHOPs) program. The program, which is supported by a grant from the Dow Chemical Company, provided an opportunity for underrepresented minority students who are good candidates for our program to find out about the rigors of graduate school at a research-intensive university and to meet professors and current graduate students.

An additional grant from Proctor & Gamble will allow us to continue developing CHOPs and to expand this effort through our new Partners for Graduate School Experience in Chemistry (PGSEC) program. PGSEC will be held in conjunction with the CHOPs visit weekend in 2013, and will allow the department to establish partnerships with several undergraduate institutions to help students explore graduate school in chemistry. This program is designed to be a service to the chemistry field by reaching out to students who may not have considered graduate school as a career path.

Materials Research Partnership Established Between Dow Chemical and UW-Madison

Dow Chemical Company selected Professor **Robert Hamers**

to lead a multidisciplinary team of researchers investigating next-generation cathode materials for lithium-ion batteries. Dow selected UW-Madison as one of 11 strategic universities with which the company wants to establish closer relationships through joint R&D grants. Dow has provided a \$2.7 million, five-year grant to Hamers, Professor **Mahesh Mahanthappa**, Professor Tom Kuech (chemical and biological engineering), and Professor Dane Morgan (materials science and engineering) to develop new coatings to improve the performance of next-generation cathode materials, in collaboration with Dr. **Michael Olken** (Ph.D. '84), a scientist at Dow, and other Dow researchers.

Parrinello Wins 2012 Hirschfelder Prize

Michele Parrinello of ETH-Zurich won the 2012-13 Hirschfelder Prize in Theoretical Chemistry. Prof. Parrinello invented the field of *ab initio* molecular dynamics, and is a world leader in the development and application of simulation techniques. He gave three lectures during his fall visit to the department.

MUACC Conference Held at UW-Madison

In September, the department hosted the annual Midwestern Universities Analytical Chemistry Conference (MUACC). MUACC provides an opportunity for those interested in research, teaching, and service in the context of analytical chemistry to exchange ideas and report on cutting-edge work. Many faculty members and graduate students from the department gave talks and presented posters at the event.



Zimmerman Remembrance Celebration

Family and friends of Professor Emeritus **Howard Zimmerman**, who died Feb. 11, 2012, gathered for a remembrance celebration in September. Many family members and colleagues of Zimmerman attended. Robert McMahon, Stephen Nelsen, Ieva Reich, Steve Burke, Hans Reich, Samuel Gellman, Fleming Crim, Hyuk Yu, Martha Casey, Frank Weinhold, Laura Kiessling, Ed Vedejs, and Peggy Zimmerman all gave remarks.



Department Promotes Three Professors

The faculty recommended three professors for promotion with tenure this year. **John Berry**, **Frank Keutsch**, and **Mahesh Mahanthappa** were all promoted to associate professor. Along with other newly tenured UW-Madison faculty members, they were honored at a reception at the Chancellor's Residence in November.

Staff Retirements

In 2011, **Roger Clausen**, who maintained EPR, crystallography, and mass spectrometry equipment, retired. He had worked in the department for 20 years.

In 2012, **Jeff Burkett**, senior chemistry lab technician, retired. He had worked in the department for more than 30 years.

New Staff Additions

We've welcomed several new faces to the department recently. **Paul Benedict** joins the Business Office as a financial specialist; **Cecilia Stodd** joins the Business Office as a grants specialist; **Chelle Walton** joins the Business Office as a payroll and benefits specialist; **Joe Wright** joins the Undergraduate Chemistry Office as an instructional support specialist; **Francisca Jofre** joins ICE as an outreach specialist; **Libby Dowdall** joins the Business Office as a communications specialist. Also, **Jeanne Hamers** has

Demo Lab Evolving to Support Digital Teaching and Learning Methods

The demo lab is in a period of transition in response to the new digital and interactive classroom learning strategies the department has begun to implement. We are working with faculty and instructors on many new ideas to adopt best practices for modern teaching and learning (e.g., using interactive anonymous classroom response systems to survey students during classes). We are also experimenting with using tablets and Smartboards to document lecture material as an online resource. All these preparations may well help us decide how to design effective teaching and learning spaces as we enter into the design and building of the new instructional addition to the building. We are also busy creating new demos to address the needs of our lecturers. The first draft of the Reversible folding of BSA is done.

— *Jim Maynard, Lecture Demonstrator*

Outreach Opportunities Abound for Glass Shop's Tracy Drier

The Glass Shop recently relocated from the third floor to the basement. The new space is approximately the same size as the old, with an efficient layout and improved ventilation. This year's annual American Scientific Glassblowers Symposium was held in Corning, New York. I took the Wisconsin FireWagon with me, and co-presented a seminar on presenting glassblowing demonstrations to the public. I also presented a poster on light-induced color-changing glasses that were co-created with Kate Baldwin (molecular biology) and Fritz Schomburg (biochemistry). I have also continued doing demonstrations for the Madison Children's Museum through a new program called Creative Collaborations. Children visit the museum and create drawings. Then, they are invited back to watch me create glassware based on their drawings. The photo to the right is of a similar effort at the 2011 Science Festival at the Wisconsin Institute for Discovery.

— *Tracy Drier, Master Glassblower*



transitioned from her previous role as faculty associate to a new role as undergraduate chemistry coordinator.

Faculty News

Professor **Mark Ediger** has traveled to Austria and the Netherlands to give talks, in addition to presentations at U.S. universities and at the national ACS and APS meetings.

Professor **Robert McMahon** traveled to conferences in Ascona, Switzerland; Columbia; Davis; San Diego; and Vancouver. He continues to serve as an associate editor for the *Journal of Organic Chemistry* and is editor of the Zimmerman Memorial Issue of *JOC* scheduled for publication this spring. McMahon is also a member of the International Organizing

Committee, Symposia on Matrix Isolation Spectroscopy and Low-Temperature Chemistry, and a member of the steering committee of the Midwest Astrochemistry Consortium.

As 2012 ACS president, Professor **Bassam Shkhashiri** commissioned a valuable Presidential Commission on Graduate Education in the Chemical Sciences. The commission released its report, "Advancing Graduate Education in the Chemical Sciences," in December.

Professor **Thomas Record** and his group are focusing on determining the mechanism by which the RNA polymerase molecular machine puts promoter DNA in the active site cleft, opens it using binding free energy, and then stabilizes

X-Ray Crystallography Laboratory Adds Powder Diffractometer

We are excited to report the addition of an X-ray powder diffractometer — one of the most essential tools in the structural characterization of materials — to the X-Ray Crystallography Laboratory. The new instrument, installed in August, complements the two existing state-of-the-art single-crystal diffractometers and enhances our research capabilities. The new Bruker D8 Advance powder diffractometer is equipped with a water-cooled copper X-ray tube source, an 192-channel Lynxeye detector that is 192 times more sensitive than a conventional detector, and two lasers for sample alignment. Two computers help govern the instrument and process the data.

Powder diffraction allows for an expeditious, non-destructive analysis of solid-state pure compounds and mixtures, both in powders and thin films. It is used for materials analysis by means of X-rays, covering almost every scientific field, including compelling research areas such as nanoscale materials, microelectronics, and energy generation and storage. Typical applications include phase identification and determination of phase composition, d-spacing, lattice symmetry, crystallite size, and preferred orientation.

The arrival of this high-precision instrument will benefit the research of many groups in the department and

across campus, particularly those of chemistry Professors Kyoung-Shin Choi and Song Jin. The Choi group will use it in design, synthesis, and characterization of semiconducting and metallic crystals and thin film-type electrodes with controlled micro- and nano-structures for use in electrochemical and photoelectrochemical devices (e.g., photoelectrochemical cells, fuel cells, rechargeable batteries, and sensors). The new X-ray diffractometer will help the Jin group identify the crystalline phases of the new solid state and nanoscale materials for solid energy conversion, thermoelectric energy conversion, battery electrodes, and other applications.

This powder diffractometer, financed by gifts to the Paul J. and Margaret M. Bender Fund for the Department of Chemistry, is an important addition to the Chemistry Instrument Center. It is much faster and has higher resolution than the instruments previously available on campus, thus the experimental work has become substantially more efficient.

— *Iliia Guzei, X-Ray Crystallography Lab Director*

the initial unstable open complex by folding and assembly of mobile regions of core polymerase on the downstream duplex. The lab is also working on quantifying noncovalent interactions of individual biochemical functional groups in water, of relevance for understanding how biochemical solutes like urea and osmolytes interact with proteins and nucleic acid as well as for understanding the contributions of various noncovalent interactions to protein and nucleic acid self-assembly processes. The group also recently moved to a new space in the Biochemical Sciences Building.

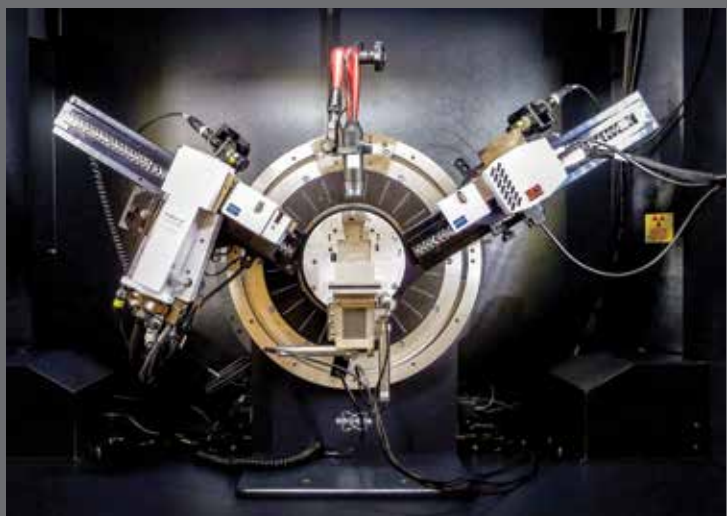
The last year has been full of excitement for Professor Emeritus **Robert West**. He has continued his research and moved his lab into a new space on the eighth floor of the Shain Research Tower. West's travels to Korea this last year completed his three-year contract to teach two to three months a year at Yonsei University as a visiting

distinguished professor. In April, he spent 10 days in Israel working on his grant on organosilicon theory with Prof. Apeloig of the Technion. Later that month he participated in the North American Silicon Symposium in Ontario, Canada. In August, West was an invited speaker at IRIS-13 in Victoria, Canada, where he and his colleague Paul Percival surprised the audience by leading them into the mysteries of muon spectroscopy. He did all this while seeing Petey's lymphoma into recession.

Professors **Robert Hamers** and **Robert West's** spin-off company, Silatronix, has expanded to 16 employees and is integrating non-flammable organosilicon-based electrolytes (from West's lab) with novel electrode materials (from Hamers' lab) to create safer, longer-lasting lithium-ion batteries.

Professor **Robert Hamers** is director of the new Center for Sustainable Nanotechnology (CSN). The CSN is funded by the National Science Foundation's Centers for Chemical Innovation program. The newly funded Phase I center includes a three-year, \$1.75 million grant and the opportunity to compete at the end of the second year for a longer and larger Phase II center grant. Nanoparticles are playing an important role in many existing and emerging technologies, and although they have great potential to improve society, relatively little is known about how they interact with organisms and how the unintentional release of nanoparticles from consumer or industrial products might impact the environment. To this end, the CSN seeks to understand the molecular-level chemical and physical principles that govern how nanoparticles interact with living systems. The CSN is a collaboration between UW-Madison, University of Minnesota, UW-Milwaukee, Northwestern University, University of Illinois, and the Pacific Northwest National Laboratory. Learn more about the center at susnano.chem.wisc.edu.

Professor **John Moore** has been involved in a planning group for the NextGen project, the successor to the National Science Digital Library, which will become a self-sustaining repository of online materials for teaching chemistry in all disciplines. He organized and chaired a symposium held in July at the Biennial Conference on Chemical Education. Moore presented two seminars for the Center and the Chemistry Department at the University of Maryland in April. He is currently collaborating on a revision of his general chemistry textbook, *Chemistry: The Molecular Science*. The revised textbook is expected to be available in 2014.



Above: The goniometer inside the enclosure: the sample stage is in the center, the X-ray tube on the left arm, and the detector on the right arm.

Left: The name on the instrument front panel reads "D8 Discover" rather than "D8 Advance;" this is because our new D8 Advance powder diffractometer system occupies a larger D8 Discover enclosure, to leave room for future instrument upgrades. Photos by Iliia Guzei

Conserving a Rare and Treasured Scientific Glassware Collection

Chemistry staff members Tracy Drier, master glassblower, and Ilia Guzei, director of X-ray crystallography, have collaborated with Laura Halverson Monahan, curator of collections for the Zoological Museum at UW-Madison, on an Academic Staff Art Gallery exhibition of conservation photographs depicting the museum's Blaschka glassware collection.

The exhibition is titled "Gorgeous Invertebrates:

Anatomically accurate representations of exotic species in the intricate Blaschka glassware" and runs through the summer. Acquired by the university in 1890, the collection of intricate models was originally used for teaching students about invertebrates. The collection is made out of glass. The models were made by Leopold Blaschka (1822-95) and his son Rudolph Blaschka (1857-

1939), who are now famous in the glass world for their rare collections, which are primarily housed at universities. Unfortunately, many of these collections, including the one at UW-Madison, have begun to deteriorate. The goal of the exhibition is to raise awareness of the collection and its current state.



Alumni and Friends Help Celebrate Crim's Sixty-Fifth Birthday

In May, the department welcomed alumni and friends to campus to celebrate Professor Fleming Crim's sixty-fifth birthday. Attendees enjoyed reuniting for scientific talks and a celebratory banquet. The event was held at the new Wisconsin Institutes for Discovery building, which is near the Chemistry Building and offers a collaborative and entrepreneurial space for campus and community to come together.



Simulations Confirm Ediger Group's Speculations About Molecular Structure of Ultrastable Glasses

Recent computational studies have confirmed Professor Mark Ediger and colleagues' laboratory studies showing that ultrastable glasses can be produced in days or hours with properties corresponding to those that have been aged for thousands of years. Aging makes for higher quality glassy materials because they have slowly evolved toward a more stable molecular condition. This evolution can take thousands or millions of years. A *Nature Materials* paper describes computer simulations UW-Madison and University of Chicago researchers conducted to follow up intriguing results from Ediger's laboratory. Ediger and his colleagues, like researchers for decades before him, had been growing materials via vapor deposition in a vacuum chamber. – *Steve Koppes, University of Chicago*

>> [READ MORE at chem.wisc.edu/content/ultrastable-glasses](http://chem.wisc.edu/content/ultrastable-glasses)

Blackwell and Colleagues Identify Chemicals to Thwart Stubborn Pathogen

Acinetobacter baumannii, a pathogenic bacterium that is a poster child of deadly hospital acquired infections, is seemingly immune to disinfectants, and can survive desiccation with ease. It is the bane of hospitals, opportunistically infecting patients through open wounds, catheters, and breathing tubes. But in order to unleash its pathogenic potential, current research suggests that it must accumulate into large colonies or aggregate into biofilms. To do this, it uses quorum sensing, where chemical signals are used by the bacterium to gather and sense a critical mass of cells, which then act in unison to exert virulence. Professor Helen Blackwell and her colleagues, in a paper published online in *ACS Chemical Biology*, identify certain small molecule chemicals that can disrupt quorum sensing in *A. baumannii*, providing a glimmer of hope that the stubborn pathogen can be tamed. – *Terry Devitt, University Communications*

>> [READ MORE at chem.wisc.edu/content/a-baumannii-quorum-sensing](http://chem.wisc.edu/content/a-baumannii-quorum-sensing)

Keutsch Group Participates in Atmospheric Science Field Campaign in Europe

Last summer, Professor Frank Keutsch and several members of his group relocated to Europe to conduct field research. They collaborated with the Pan-European Gas-Aerosol-Climate Interaction Study (PEGASOS). Thanks to their lightweight and unique fiber laser-induced-fluorescence (LIF) formaldehyde instrument, the Keutsch group was the only U.S.-based group invited to participate in the project's Zeppelin component, the first of its kind. PEGASOS involves atmospheric chemists from more than 15 countries who are working to study and address the impact of air quality on climate change. The approximately 82-yard-long Zeppelin was equipped to house more than one ton of research instruments from collaborating institutions. During the campaign, the Zeppelin travelled through the Netherlands, Germany, Austria, Slovenia, and Italy; one scientist travelled onboard during each trip, and the trips averaged about six hours. The Keutsch group plans to remain involved in the project during the next field campaign, which will take place in Finland.

>> [READ MORE at chem.wisc.edu/content/zeppelin-field-campaign](http://chem.wisc.edu/content/zeppelin-field-campaign)

Stahl Group's High-Speed Method to Aid Search for Solar Energy Storage Catalysts

Finding an efficient way to store solar energy is a major goal for science and society. Today, efforts focus on electrolysis reactions that use sunlight to convert water, carbon dioxide, or other abundant feedstocks into chemicals that can be stored for use any time. A key stumbling block, however, is finding inexpensive and earth-abundant electrocatalysts that facilitate these solar-driven reactions. The quest for these catalysts may become easier thanks to a new high-throughput method to identify electrocatalysts for water oxidation identified by Professor Shannon Stahl and his colleagues. They have identified a screening method capable of rapidly evaluating potential new electrocatalysts. In simple terms, the technique works using ultraviolet light and a fluorescent paint to test prospective metal-oxide electrocatalysts.

– *Terry Devitt, University Communications*

>> [READ MORE at news.wisc.edu/20724](http://news.wisc.edu/20724)

Awards and Honors



Photo by Jeff Miller, University Communications

FACULTY AND STAFF

The department boasted three American Chemical Society (ACS) national award winners for 2012. Professor **Robert Hamers** received the ACS Award in Colloid and Surface Chemistry for insights into the chemistry of materials that lead to the creation of surfaces with exceptional selectivity and stability. Professor **Hans Reich** received the James Flack Norris Award in Physical Organic Chemistry for advances in understanding the structure and reactivity of organometallic reagents. Professor **James Skinner** received the Irving Langmuir Award in Chemical Physics for theoretical models and calculations that describe the spectroscopy and dynamics of molecules in condensed phases.

Professor **Clark Landis**, Professor **James Skinner**, and **Martha Casey**, former research chemist and vice chancellor for academic planning and analysis at UW-Madison, became fellows of the American Chemical Society (ACS) in 2012. Skinner also was elected to the National Academy of Sciences and received the 2011 ACS Division of Physical Chemistry Award in Theoretical Chemistry.

The Division of Carbohydrate Chemistry of the ACS recently awarded the 2013 Claude S. Hudson Award to Professor **Laura Kiessling**. The Hudson Award was established in 1946 to recognize outstanding contributions to carbohydrate chemistry in education, research, or applications. Kiessling also won the 2013 Murray Goodman Memorial Prize. This award recognizes seminal contributions in the area of molecular glycobiology and carbohydrate biochemistry.

Professor **Mark Ediger** won a WARF Named Professorship Award in 2012. This is one of the highest honors UW-Madison

gives to faculty members. Ediger has named his professorship for Professor Emeritus Hyuk Yu, who has been an important mentor to Ediger and many others. Ediger also has received the 2013 ACS Joel Henry Hildebrand Award in the Theoretical & Experimental Chemistry of Liquids.

Associate Professor **Mahesh Mahanthappa** won the American Physical Society John H. Dillon Medal, which recognizes “outstanding research accomplishments by young polymer physicists who have demonstrated exceptional research promise early in their careers.”

Professor **Josh Coon** won a Klaus Biemann Medal from the American Society for Mass Spectrometry. “The field is about making instruments designed to measure the mass of molecules,” Coon says. “From that, you can figure out all kinds of things about them: their formation, the structure, the amount you have. You can get really creative once you have mass, and that all started with Klaus Biemann in the 1960s.”

In 2011, Assistant Professor **Danny Fredrickson** won a Presidential Early Career Award for Scientists and Engineers from the Department of Energy. Awardees are selected for their research at the frontiers of science and technology and for their commitments to community service and outreach.

Assistant Professor **J.R. Schmidt** has been named an Alfred P. Sloan Fellow. This fellowship recognizes promising early-career scientists from the U.S. and Canada.

Assistant Professor **Trisha Andrew** has been named to Forbes magazine’s 30 Under 30 in Energy. The list recognizes talented young innovators whose work holds potential for the energy landscape of the future.

Professor **Helen Blackwell** was selected as one of two WARF H.I. Romnes Faculty Fellowship award-winners for 2012-13.

Associate Professor **Song Jin** and Professor **Thomas Brunold** won UW-Madison Vilas Associate Awards for 2012-13.

The Wisconsin Alumni Research Foundation (WARF) has begun honoring inventors for the year's most exceptional UW-Madison inventions. Professor **Robert Hamers**, along with colleagues **Di Zhu**, a graduate student, and **Nigel Becknell**, a former undergraduate student, submitted one of the six inventions selected as finalists for this year's WARF Innovation Awards. Their invention, "Photocatalytic activation and conversion of N₂ and other small molecules," is a new method of photocatalytically converting nitrogen to ammonia at room temperature using diamond dust for greater efficiency and energy savings.

The following faculty and staff were named University Housing Honored Instructors: Alice Reznickova, Cheri Barta, Clark Landis, Daniel Fredrickson, Eric Strieter, Fabian Suchy, Fleming Crim, Gilbert Nathanson, Jeanne Hamers, Jeannine Szczech, John Moore, Jorge Torres, J.R. Schmidt, Matthew Bowman, Nuru Stracey, Oana Martin, Paula Piccoli, Steve Hutchison, Teresa Larson, Tracey Oudenhoven, and Shea Ramey.

At the American Scientific Glassblowers Symposium, **Tracy Drier**, master glassblower, was honored with three awards. The first was the Helmut E. Dreschel Memorial Achievement Award for having devoted time, knowledge, and abilities to the advancement of the ASGS; the second was the annual Wale Award for the most outstanding technical poster presented by a member at the 2011 symposium; the third was the Karl Walther Award presented by the Northeast section of the ASGS for the best technical article published in *Fusion*, the society's journal. Along with **Jim Maynard**, lecture demonstrator, Drier also received a 2012 College of Letters & Science Mid-Career Award.

Jim Maynard was appointed to the campus-wide Academic Staff Executive Committee. Additionally, he also exhibited a set of 13 photographs called "Chemistry as Art" at Bascom Hall.

For the 2011-12 academic year, **Kat Myhre**, organic divisional and chemical biology program coordinator; **Rosana Pérez-Ellmann**, department administrator; and **Ed Vasiukevicius**, machinist, won Classified Staff Excellence Awards from the College of Letters & Science. Pérez-Ellmann also was honored as one of five UW-Madison Classified Employee Recognition Award winners.

Jeanne Hamers, undergraduate chemistry coordinator, received the department's James Taylor Outstanding Chemistry Teaching Award.

Kristi Heming, inorganic divisional and chemical biology program coordinator, received the Partners in Giving Governor's Award and a plaque signed by the governor for her outstanding efforts with the campus-wide Partners in Giving charitable campaign.

STUDENTS

Graduate student **Brian Esselman** (McMahon) won a 2011 Campus-Wide Teaching Assistant Award for Innovation. Esselman was nominated for his work on the development and use of computational chemistry in organic teaching labs.

2012 Undergraduate Poster Session prize-winners included **Joshua Shutter** (McMahon/Woods), **Thomas Carey** (Landis), **Nick Sanchez** (Strieter), **Jacob Brummond** (Blackwell), **Tyler Wadzinski** (Stahl), and **Anders Knight** (Cavagnero).

Sohil Shah, a high school senior at Memorial High School, recently was named a finalist in the Siemens Competition in Math, Science and Technology. Shah has conducted research in the department for the past several semesters and summers. He works with Professor Robert Hamers on projects related to nanoscience.

Anders Knight, an undergraduate chemistry researcher with the Cavagnero group, was awarded a James Schleifer Undergraduate Scholarship from the Department of Chemical and Biological Engineering in July.

Graduate student **Arellys Rosado** recently was awarded a one-year UW-Madison Biotechnology Trainee Program fellowship.

In April 2012, graduate student **Rayna Addabbo** was awarded an NSF Graduate Fellowship.

In October 2011, graduate student **Daria Fedyukina** won third prize in a research competition organized by Graduate Women in Science.

Chemistry Outstanding TA Awards 2011-12

- Hannah Bowman (Burstyn)
- Travis Blum (Yoon)
- Laura Kopff (McMahon)
- Terese Kreifels (McMahon)
- Alice Reznickova (Nathanson)
- Kate Skog (Keutsch)
- Kristine Smith (Brunold)



Graduate Poster Awards 2011-12

Top Honor: Renee Dalrymple (Weisshaar), Brian Esselman (McMahon), Lisa Johnson (Gellman), Matt Rigsby (Stahl)
 Honorable Mentions: Somenath Bakshi (Weisshaar), Ben Bending (Ediger), Ross Cheloha (Gellman), Joshua Fishman (Kiessling)



2012 Summer Research Scholarships

- Student Support in Chemistry Scholarship: Seth Berger, Chau Phan, David Schuman
- Ackerman Scholarship: Brian Cornille, Zachary Niemeyer, Megan Walters
- Edwin M. and Kathryn M. Larsen Scholarship: Jero Bean, Zachary Degregorio
- Walter W. and Young-Ja C. Toy Scholarship: Noah Bown, Clara Ye
- Eugene and Patricia Kreger Herscher Scholarship: Sylvia Chen, Gergana Hinrichs
- Telander Undergraduate Research Fellowship: Si Wang

2012 Chemistry Department Scholarships

- Henry and Eleanor Firminhac Scholarship: Wenting Cai, Kimberly Dinh
- Ackerman Scholarship: Anders Knight, Robert Masse,

Jonathan Schellenberg, Amanda Zuberbier

- Wayland Noland Scholarship: Zachary Degregorio
- Martha Gunhild Week Scholarship: Amy Davis
- Margaret McLean Bender Scholarship: Clara Chow
- Richard Fischer Scholarship: Brian Cornille
- Mable Duthey Reiner Scholarship: Sara Karraker
- Student Support in Chemistry Scholarship: Jonathan Lang, Nicholas Sanchez, Eric Wiensch
- George J. & Arleen D. Ziarnik Scholarship: Joshua Shutter
- Eugene and Patricia Kreger Herscher Scholarship: Chau Phan, Megan Walters
- Andrew Dorsey Memorial Scholarship: Jero Bean
- Plank Scholarship: Brendon Sargent

Other Undergraduate Awards

- Alpha Chi Sigma Alumni Scholarship: Si Wang
- Hach Teaching Fellowship: Leif Gilbertson, Andrew Killeen
- Hypercube Scholar: Thomas Carey
- Francis Craig Krauskopf Memorial Award: Dylan Braun, Rachel Dvorak, Kristopher Kennedy, Jackson Nyman, Dustin Richter, Jack Vidani
- John and Elizabeth Moore Award for Excellence: Jiayao Chen, Emily Gasteyer, Douglas Lee, Dan Magyar, Huey Huey Wong
- ACS Excellence in Analytical Chemistry: Clara Chow
- ACS Excellence in Inorganic Chemistry: Stephen Oja
- ACS Excellence in Organic Chemistry: Jingyi Chi, Timothy Peterson
- ACS Excellence in Physical Chemistry: Nick Proubsky
- Berbee-Walsh Excellence in Analytical Chemistry: Daniel Magyar
- Berbee-Walsh Excellence in Organic Chemistry: Axel Adams, Natalie Dosch, Samuel Emmerich, Polly Godfrey, Tom Stadelman, Fabian Suchy

These scholarships and awards would not be possible without the support of our generous alumni and friends. To encourage future chemists, please consider making a gift in support of student scholarships at go.wisc.edu/SupportChemistry.

Alumni News

Kean Named Interim Dean for Graduate College of Education at San Francisco State University

Elizabeth “Betsy” Kean (Ph.D. ‘74, West) became interim dean of the Graduate College of Education at San Francisco State University in July. Kean previously served as director for the Center for Education Excellence, where she developed and expanded the school’s network of pre-university programs. Prior to working at SF State, she was a professor of curriculum and instruction at the University of Nebraska-Lincoln and a professor of teacher education at CSU Sacramento. Kean holds a Ph.D. in inorganic chemistry and a master’s in education from UW-Madison.

Bloomfield Retires from University of Minnesota

Victor Bloomfield (Ph.D. ‘62, Alberty) retired in 2011 as professor of biochemistry, molecular biology, and biophysics at the University of Minnesota. In 1964 he moved to the University of Illinois in Urbana-Champaign, where he spent six years as assistant and associate professor of chemistry. He joined the Biochemistry Department at the University of Minnesota in 1970.

Bloomfield has written more than 200 scientific papers focusing on biophysical chemistry of DNA, polyelectrolytes, and viruses, polymer hydrodynamics, light scattering, and single molecule manipulations. He was president of the Biophysical Society, editor of *Biophysical Journal*, and is an elected fellow of the AAAS. Perhaps his proudest academic accomplishment, however, was serving as a Ph.D advisor at Illinois to Phillip Sharp, who shared the 1993 Nobel Prize in physiology or medicine for the discovery of interrupted genes. At Minnesota he was head of the Biochemistry Department, dean of the Graduate School, vice provost for research, and associate vice president for public engagement.

Curtis Pulliam Wins Distinguished Teaching Award at Utica College

Associate Professor of Chemistry Curtis Pulliam (Ph.D. ‘86, Dahl) received the Dr. Virgil Crisafulli Distinguished Teaching Award in May 2012. The award is considered the highest faculty honor at Utica College. Pulliam “is praised as an educator by students both past and present,” says Judith Kirkpatrick, provost and vice president of academic affairs. “He is described as the most approachable professor students have had and one who works with them in and out of class.” Pulliam has been at Utica College since 1987 and is not the first Badger Chemist to win the award; Professor William Pfeiffer (M.S. ‘66, Ferry) received the award in 1986.



Reich and Hamers Groups Reunite at ACS Meeting in San Diego

At the 2012 ACS meeting, the Reich group held a mini-reunion to celebrate Reich’s James Flack Norris Award in Physical Organic Chemistry. Above from left: Amanda Jones (Ph.D. ‘07, assistant professor at Wake Forest University), Jim Renga (Ph.D. ‘75, Dow-Elanco), Hans Reich, Kris Kolonko (Ph.D. ‘09, Sienna College), Rick Olson (Ph.D. ‘82, Bristol-Meyers Squibb), John Trend (Ph.D. ‘76, 3M retired).



The Hamers group also reunited to celebrate Hamers’ Award in Colloid and Surface Chemistry. Above from left: Lee Bishop (postdoc), Michelle Benson (Ph.D. ‘13), Robert Hamers, Kacie Louis (Ph.D. ‘12), Molly McGuire (Ph.D. ‘01, associate professor at Bucknell University), Christina Hacker (Ph.D. ‘04, NIST), Allie Cardiel (REU student ‘11, Carleton College), and Sarah Coulter (Ph.D. ‘01, Clorox).

Yu-Shan Lin (Ph.D. ‘09, Skinner) is now an assistant professor at Tufts University in Boston.

Rolf Dessauer (Ph.D. ‘52, Wilds) worked at DuPont from 1952-91 and retired as a senior research associate. While at DuPont, he won the Pedersen and Plambeck Awards. He holds 30 U.S. patents in research related to color and photoimaging processes, he invented DYLUK printing proof paper, and he discovered applications of hexaarylbiimidazoles as photoinitiators and photooxidants. He also has written several books and book chapters. Today, he is a consultant in imaging technology and lives in Greenville, Del. He is active with the Hagley Foundation and the Chemical Heritage Foundation.

UW System Approves Chemistry Building Instructional Addition and Renovation

In September, the UW System Board of Regents voted to include the \$103.5 million Chemistry Building Project in the capital budget for the 2013-15 biennium. This is an important step in the approval process, but it is not the final step. This spring, the next step is for the State Building Commission and/or the State Legislature to approve the project.

Fifty-five percent of entering freshmen take a chemistry course during their undergraduate careers. Chemistry 103 and Chemistry 104 are the highest-enrollment courses on campus during the fall and spring semesters, respectively. Because virtually all students majoring in science, engineering, and allied health fields require chemistry courses as prerequisites for courses in their majors, the ability to accommodate large general chemistry (freshman) and organic chemistry (sophomore) enrollments is a crucial factor in influencing the time-to-degree for a large fraction of all undergraduates on campus.

Watch chem.wisc.edu for updates as we learn more about the next steps involved in the project.



The Chemistry Building Project would help us:

- Accommodate increasing demand for chemistry courses
- Eliminate organic chemistry course bottlenecks to help students graduate on time
- Create research laboratories for new focus areas such as energy and materials
- Implement modern teaching pedagogy and enhance undergraduate research
- Expand and renovate general chemistry labs
- Provide new organic and analytical chemistry labs

WE NEED YOUR HELP!

Do you live in Wisconsin? We're counting on you to contact your state legislators. Let them know you support the UW-Madison chemistry building project, and tell them how your chemistry degree has helped you make a difference in Wisconsin. Visit legis.wisconsin.gov to find contact information for your state legislators.

If you live outside Wisconsin but still want to help, email badgerchemist@chem.wisc.edu and tell us how your experience here has impacted your life and career.



Opposite: View of the proposed addition from the northeast side of the building, along University Ave.

Top left: A new General Chemistry teaching laboratory, which would help meet demand for introductory chemistry courses and labs



Bottom left: New organic chemistry teaching laboratories would help accommodate additional undergraduates who take organic chemistry as a prerequisite for related majors. Our undergraduate organic chemistry courses are currently considered some of the highest-priority undergraduate "bottleneck" courses.

Meet Our New Faculty

Professor Kyoung-Shin Choi

Kyoung-Shin Choi joins us as a full professor. Her work spans the areas of analytical, inorganic, and materials chemistry. She comes to us from Purdue University, where she was an associate professor. Choi completed her undergraduate work and master's at Seoul National University in Korea. She then earned a Ph.D. from Michigan State University and served as a postdoctoral research associate at University of California, Santa Barbara.

Research in the Choi lab focuses on the design, synthesis, and characterization of semiconducting and metallic crystals and thin film-type electrodes with controlled micro- and nano-structures for use in electrochemical and photoelectrochemical devices (e.g., fuel cells, rechargeable batteries, and sensors). The work spans the disciplines of inorganic chemistry, solid state chemistry, electrochemistry, materials chemistry, and nanoscale science.

When electrochemical and photoelectrochemical devices contain polycrystalline electrodes or catalysts, variances of particle shapes, sizes, orientations, and interconnections significantly affect the chemical and physical factors that define the energetics and kinetics of these electrodes or catalysts. Thus, controlling and understanding the effects of micro- and nano-structural features at the interface on functional

properties are the keys to producing highly efficient, cost-effective, and lightweight devices.

The Choi group develops new electrochemical synthetic strategies that can make a significant advancement in constructing polycrystalline electrode materials. They do so by combining compositionally versatile electrodeposition methods with various new synthetic concepts and techniques that can allow for precise morphological control at various length scales (e.g., electrochemical interfacial supramolecular templating, controlled electrocrystallization). Since electrodeposition is based on a low-temperature solution-based method with many variables that can be precisely controlled, this approach allows for the assembly of a broad range of inorganic electrodes with systematically varying micro- and nano-structural features (e.g., mesoporous films, nano- and micro-scale crystal engineering).

The functional properties we currently investigate in conjunction with morphological variation include optical, electrochemical, photoelectrochemical, and photo-/electro-catalytic properties. By pursuing an in-depth atomic level understanding of structure-property relationships as well as efficiency enhancement by interfacial engineering, the group attempts to bridge the gap between chemistry and materials engineering.

“Everybody in this department is really enthusiastic and caring about what they do and about the department as a whole, which makes for a uniquely positive, congenial, and engaging atmosphere.”

— Kyoung-Shin Choi



Assistant Professor Etienne Garand

Assistant Professor Etienne Garand joins the faculty of our analytical and physical divisions and graduate paths. Garand completed his undergraduate and master's programs at Université de Sherbrooke in Quebec, Canada. He earned a Ph.D. from the University of California, Berkeley, where he studied with Professor Daniel Neumark. He subsequently served as a postdoctoral associate at Yale University.

Research in the Garand lab aims to provide a molecular-level understanding of complex chemical reaction dynamics and mechanisms. The group employs mass spectrometry, laser spectroscopy, and electronic structure calculations to probe the reaction intermediates directly involved in a broad array of chemical systems such as green energy production, organic synthesis, molecular recognition, and biological processes.

The Garand lab's strategy involves the isolation of intermediates and transient complexes from solution using variants of electrospray ionization that allow for the retention of condensed-phase structure and primary solvent interactions. These species are then cooled (~10 K) in a cryogenic ion trap to lock their fluxional motion into a plethora of well-defined local minima along the complex reactive landscape. The cold molecules are separated according to their molecular masses before being interrogated by precise, isomer-selective, vibrational, and electronic spectroscopy. This approach yields snapshots of the key species involved in various chemical reactions and processes that can be

compared with theoretical predictions and connected with observed kinetics and selectivity.

Current areas of interest include:

- Mechanisms of proton coupled electron transfer in catalytic water oxidation and CO₂ reduction for solar fuels production.
- Mechanisms, intermediates, and metal-alkane interactions involved in selective C-H activation and functionalization
- Roles of non-covalent interactions (H-bonding, Pi-stacking, hydrophobic interactions, etc.) and solvent effects in site-selective catalysis, molecular recognition and tertiary structure of biopolymers
- Instrumentation and methodology development for analytical applications requiring the high sensitivity of mass spectrometry and precise structural characterization of infrared spectroscopy

The scope of the group's experimental physical chemistry research program, which effectively bridges theoretical predictions with contemporary applications of carefully designed molecular systems, is well centered within the greater chemistry community. Garand's approach is designed to be very versatile in order to tackle the ever-evolving landscape of chemical problems involving molecular interactions.



“The Department of Chemistry at UW-Madison is amazing. There are so many great faculty members and the atmosphere is very friendly. Being part of such a team is very exciting!”

— Etienne Garand

Assistant Professor Trisha Andrew

Trisha Andrew, assistant professor, works across the disciplines of analytical, materials, organic, and physical chemistry. Andrew completed her undergraduate education at the University of Washington. She then earned a Ph.D. from the Massachusetts Institute of Technology (MIT), where she worked with Professor Timothy Swager. She remained at MIT for a postdoctoral fellowship in electrical engineering and computer science.

The Andrew lab includes synthetic chemists and device engineers who are interested in exploring the role of electron spin in light-emitting diodes, photovoltaic cells and memory-storage devices. The group synthesizes brightly-colored and highly-fluorescent organic dyes that are tailor-made and construct unique device architectures from the novel materials generated in our labs. Their research focuses on synthesizing optically- and electronically-interesting materials, and fabricating optoelectronic or spintronic devices using these materials. Andrew is interested in understanding the role of electron spin on organic light-emitting diodes (OLEDs) and photovoltaic cells (OPVs). The group also aims to show the utility of organic radical-containing materials in magnetic spin valves and magneto-optic devices.

Understanding the Effect of Electron Spin in Optoelectronic Devices

The electronic and morphological factors that affect charge separation events in organic optoelectronic devices have been (and continue to be) widely studied.

However, using spin dynamics to control charge transport within individual molecules and thin films has received comparatively little attention. The group intends to fabricate simple OLEDs and OPVs containing a redox-active organic radical interlayer and characterize the resulting effects on device metrics. This project involves synthesizing analogs of prevalent small-molecule and polymeric donor materials containing stable radical moieties and studying the effects of electron spin within specific layers of a nanostructured OLED and OPV.

Organic Nanostructured Magnetic and Magneto-Optic Devices

The Andrew group is interested in studying spin-dependent charge transport in organic thin films. This project involves both the design of interesting, magnetically-active organic materials and the fabrication of appropriate device architectures that take advantage of our unique material systems. Examples of materials include: conjugated polymers containing either pendant or directly-conjugated organic radicals; and small-molecule organic radicals that can either be thermally-evaporated or possess anchoring groups, which will allow adsorption onto SiO₂, metal oxides or carbon nanotubes. The group aims to fabricate transistor-like spin valves using these materials to characterize their magnetic properties.

“I am excited to be part of the wonderfully collaborative environment of Wisconsin. It is a privilege and honor to have colleagues who inspire, challenge, and look out for me every day.”

— Trisha Andrew



Institute for Chemical Education

Over the course of the last year, the Institute for Chemical Education (ICE), has worked with and impacted the lives of students, teachers, and families in Dane County, throughout Wisconsin, and even across the U.S. ICE has had the



opportunity to work with local ChemCamps campers, new SCI

ENCountErs participants at the Boys and Girls Clubs of Chippewa Valley, science teachers from throughout Wisconsin, Carbon Playground visitors from throughout the Wisconsin/Illinois region, and REU students from across the U.S.

Carbon Playground

Oct. 25 was the grand opening of the Carbon Playground at the Discovery Center Museum in Rockford, Ill. This project was inspired by Jim Maynard, lecture demonstrator, and has been in the works for several years. The Carbon Playground allows children to learn about buckyball, graphene, and carbon nanotubes by climbing on the large-scale models, which are 2.7 billion times larger than the actual molecular structures. This special project was funded by the Camille and Henry Dreyfus Foundation and supported by the National Science Foundation (NSF) through the UW-Madison Nanoscale Science and Engineering Center (NSEC).

The Carbon Playground equipment currently consists of a buckyball that is nearly two meters tall and a carbon nanotube that is about 2 meters in diameter. The team is working on finalizing the placement for a graphene sheet that is about 3 meters long. Everything has been done to scale, and all bond angles and lengths were carefully measured. The buckminsterfullerene model is fastened to the ground and serves as a jungle gym where children can get inside the structure and climb on it. The carbon nanotube is constructed from rope and children can crawl through it. The graphene sheet (monkey bars) will likely be mounted horizontally at an appropriate height so that children can swing from one carbon-carbon bond to another.

In addition to the visual and tactile learning opportunities the Carbon Playground presents, it also includes complementary educational signage, materials, and online resources. Postdoctoral Fellow Angela Jones created a website (carbon.chem.wisc.edu) and a printed book to enhance understanding of the playground. Visit the website to see Allotrope Island, Discovery Projects, and the story of Carl Carbon's Career Quest. There are ten Discovery



Projects, activities families can do at home to explore the uses and structure of carbon.

To watch a video about the grand opening of the playground, please visit youtube.com/chemistryuwmadison. And, if a school, science museum, or children's museums in your area would be interested in creating its own carbon playground, contact ICE Director Professor John Moore (jwmoore@chem.wisc.edu) for more information.

NSEC Outreach Activities

ICE has continued its role in organizing the education and outreach activities of the NSEC. The NSEC, in its third year of a five-year \$14 million renewal of funding from NSF, includes four interdisciplinary research thrusts, a group exploring the societal implications of nanoscience, and the ICE education and outreach group. The NSEC, which includes faculty participants from 14 departments in four colleges (College of Letters & Science, College of Engineering, College of Agriculture & Life Sciences, and School of Pharmacy) explores complementary concepts around the central theme of self-assembly at the nanoscale. The NSEC education and outreach program aims to cultivate the next generation of nanoscale science and engineering experts, building on UW-Madison's vast experience in science education and infrastructure provided by ICE. Chemistry graduate students and staff guide all NSEC education outreach programs.

Research Experience for Teachers (RET)

ICE and the NSEC continued to host the annual summer Research Experience for Teachers (RET) program. Through the program, ICE and NSEC worked with three local Wisconsin teachers. Jeanne Nye, a seventh-grade teacher at

Lake Mills Middle School, returned for her seventh summer with the NSEC. She completed her fifth in a series of middle school web-based lessons. Nye's Nano Job Fair webquest has middle school students exploring careers in nanotechnology. Also returning was Jason Strauss, a chemistry teacher at Verona High School, who worked with Andrew Greenberg, NSEC outreach coordinator, to develop an online nanoscience course for high school students. Strauss will teach this course to high school students this summer. Jeanine Gelhaus returned for her seventh summer with ICE and the NSEC. She started planning for a YouTube nanotechnology channel. She also developed a "Powers of Ten" lesson for online distribution.



ASM Materials Teacher Camp

ICE hosted the first in what is to be an annual ASM Materials Teacher Camp. The weeklong camp highlighted ways to incorporate materials science and engineering into high school and middle school classrooms. The workshop hosted 19 Wisconsin teachers at the Wisconsin Institutes for Discovery. Support for the workshop came from industry partner Thermal Spray Technologies of Sun Prairie.



Research Experience for Undergraduates (REU)

ICE continued to host Research Experience for Undergraduates (REU) last summer. REU students participated in the Summer Research Opportunities Program, a consortium of 13 summer research programs on the UW-Madison campus with the common goal of increasing diversity of the graduate student pool that is supported by the Graduate School.

Together the three programs attracted 37 students from the U.S. and Puerto Rico who spent 10 weeks conducting individual research projects under the guidance of faculty and postdocs in labs on the UW-Madison campus. Fourteen students were hosted in Chemistry Department labs through the REU programs.



Chem Camps

Over the summer, ICE continued hosting summer camps for middle school children. To accommodate as many campers as possible, ICE has always waived camp fees for those who are not able to afford them. A new Scholarship Fund now allows individuals to help fund a camper's experience. Please contact John Moore (jwmoore@chem.wisc.edu) for more information about contributing to the Scholarship Fund.

ICE offered four different sessions of Chem Camps: Fun with Chemistry, Fun with Forensics Science, The Science Behind the Superhero, and Fun with Food Chemistry. More than 160 students from Madison and surrounding communities participated in ChemCamps this summer.

Students Participating in Chemical Education (SPICE)

SPICE continued its outreach efforts as a registered undergraduate-run organization, visiting schools, museums, and libraries, and performing demonstration shows for groups of prospective students on campus visits. SPICE participated in 20 events over the course of the year, including hands-on activities at science fairs in schools. Over the summer SPICE actively participated in Explorando las Ciencias by organizing and overseeing an exploration station.

Adding to their repertoire of demonstrations and hands-on activities, SPICE continued their collaboration with the Fusion Science Theater, a group of chemists and theater artists who have developed an innovative method for science outreach—mini-plays with science concepts as

the themes. Last year most SPICE members attended a training workshop and performed several Fusion Science Theater programs around Madison.

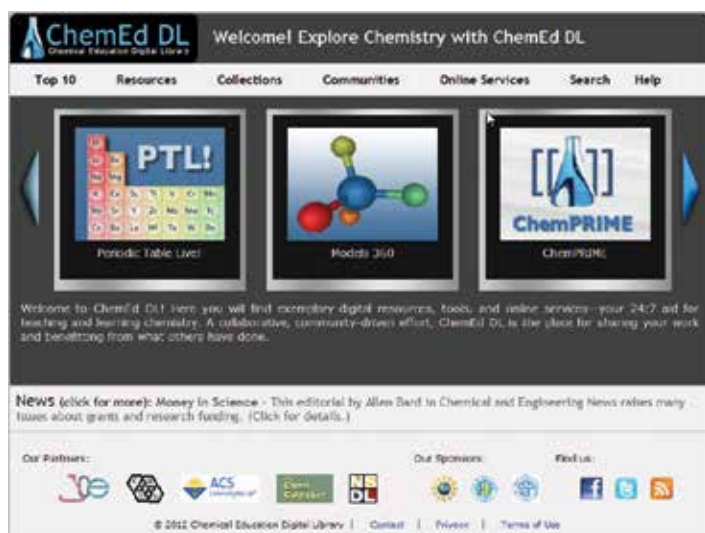
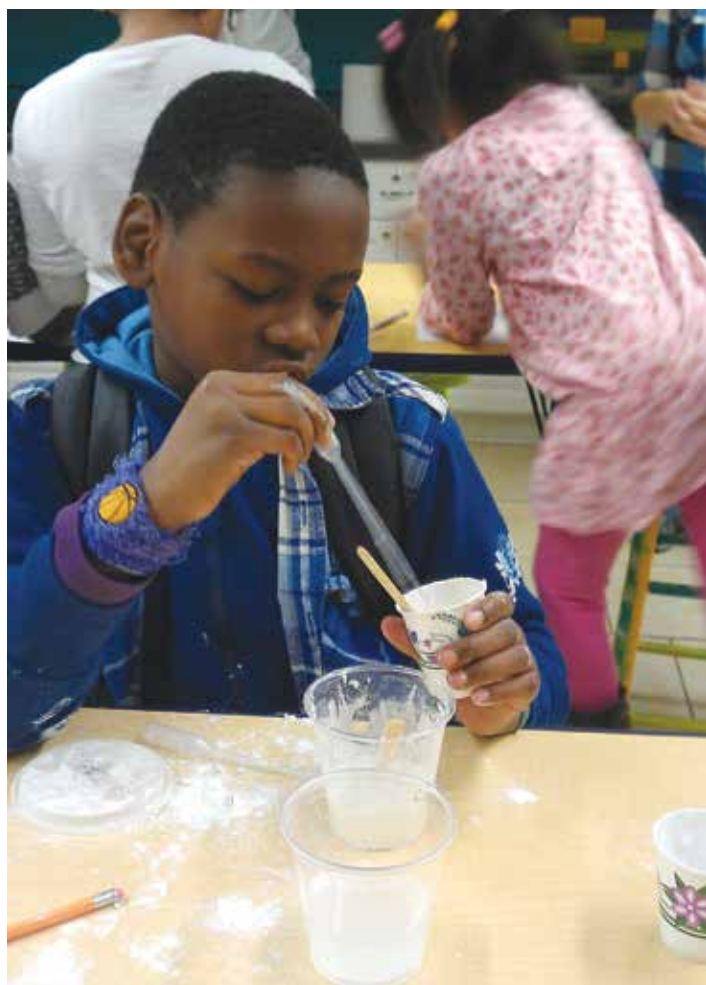
SCI ENCountErs

SCI ENCountErs, an after-school science outreach program, thrived during the 2011-12 academic year thanks to the continued support from NSEC and the two Boys and Girls Clubs of Dane County. More than 65 children from Dane County Boys and Girls Clubs participated in the program and more than 15 UW-Madison undergraduate and graduate students volunteered to work and guide the children through inquiry-based activities. SCI ENCountErs aims to inspire and excite students about science by providing weekly hands-on science experiments and activities for students.

ICE is working to expand SCI ENCountErs beyond Madison. A new program, initiated by Professor Scott Hartsell at UW-Eau Claire, began collaborating with the Boys and Girls Club of the Greater Chippewa Valley in 2012. If you would like to collaborate with us in this effort, please contact Professor John Moore (jwmoore@chem.wisc.edu).

Chemical Education Digital Library

The Chemical Education Digital Library (ChemEd DL) is an online outlet for great chemistry resources. ChemEd DL is now being maintained by the American Chemical Society. During the past year ICE worked on categorizing the ChemEd DL collections under a new subcontract from the National Science Digital Library. Nearly 2,300 online resources from the ChemEd DL were assigned keywords and aligned with National Science Education Standards and the AAAS Project 2061 Benchmarks. Because there will be a new set of national science education standards coming out in 2013, our staff also developed a new set of keywords that are aligned with the current drafts of the new NextGen standards and assigned these to the resources. This should allow the NSDL to align ChemEd DL resources to the new standards when they are finalized. High school chemistry teachers who are looking for chemistry learning materials that are aligned with the new NextGen Science Standards should find this work really helpful.



Top: A student completes an experiment at the SCI ENCountErs after-school program. Bottom: The ChemEd DL website

Wisconsin Initiative for Science Literacy



Shkhashiri with Philadelphia Mayor Michael Nutter at the Kavli Lecture, ACS National Meeting. Photo by Linda Wang, C&E News



Rodney Schreiner at the Watrous Gallery, demonstrating that a mixture of red light and green light is perceived as yellow.

Shkhashiri Oversees Initiatives as ACS President

Wisconsin Initiative for Science Literacy (WISL) Director Bassam Shkhashiri spent much of the year traveling the world, serving as president of the American Chemical Society. In addition to responsibilities at the ACS national meetings and several regional and local section meetings, Shkhashiri spoke at George Washington University's Teaching and Learning Collaborative, Research Corporation for Science Advancement's Centennial Gala Celebration, the Presidential Green Chemistry Challenge Awards, the International Chemistry Olympiad at the University of Maryland, and the Biennial Conference on Chemical Education at Penn State. He also continued his service on the Association of American Universities STEM Technical Advisory Committee. Internationally, he traveled to the Kavli Prize Award Ceremony in Oslo, Norway, the International Conference on Chemical Education in Rome, and the Royal Society of Chemistry in London. He also enlisted the help of his ACS colleagues in implementing the presidential initiatives he had set as goals upon his election. As a result, commissions were created to explore the advancement of graduate education in the chemical sciences and to help the public understand the science of climate change. You can view the work of these commissions at acs.org/graduatecommission and acs.org/climatescience.

Schreiner Explores Connection Between Science and Sight

WISL Associate Director Dr. Rodney Schreiner (Ph.D. '81) continued to explore the ties between chemistry and the way we see the world. In April, he was invited to present at a UW

Eye Research Institute Seminar; his presentation was titled "Color: It's All in Your Head." And as part of the Wisconsin Science Festival in September, he participated in an "About Seeing" exhibition at the Watrous Gallery of the Wisconsin Academy of Sciences, Arts, and Letters. For the exhibition, he created several images that simulate the color perception in various forms of color blindness, as well as an image that produces an illusion of motion.

WISL Continues Tradition of Excellent Outreach Events and Efforts

WISL once again put on a variety of educational public engagement events for science fans of all ages. In June, a Science is Fun Summer Extravaganza featured percussionist Todd Hammes. And for the second year in a row, WISL was part of the Wisconsin Science Festival, with another Science is Fun Extravaganza show. In summer 2012, WISL contributed to another successful installment of the PEOPLE program, which serves economically disadvantaged students from several Wisconsin communities. Returning instructors Pat Meloy and Lori Schacht-Dethorne once again ran the chemistry portion of the PEOPLE program for WISL. The year of outreach activities culminated in the 43rd annual "Once Upon a Christmas Cheery, In the Lab of Shkhashiri" the first weekend in December, featuring appearances by Schreiner, Santa Claus (C. Marvin Lang, M.S. '64, West) and Lauren Buchanan, a Ph.D. graduate student working with Prof. Martin Zanni. WISL's Cayce Osborne and Patti Puccio also collaborated on an archive project, gathering every recorded Christmas Lecture since 1970 and assembling them into a set of DVDs and accompanying

materials. Copies were donated to the Chemistry Library, the UW Archives, the Chemical Heritage Foundation, ACS, and other organizations.

Encouraging Public Dialogue About Science

Shakhashiri was invited back to make several more appearances on Wisconsin Public Radio's Larry Meiller Show, chatting with Larry and his callers about subjects ranging from the interactions between science and politics, to the legacy of Don Herbert. These radio appearances are one way WISL encourages a public dialogue about science; another way is the WISL Award for Communicating Graduate Chemistry Research to the Public. The initiative offers a \$500 award to graduate students who include a chapter in their Ph.D. theses that communicate the research to a general audience. They must explain their research in a way that anyone can understand. To date, 20 students have earned the award. You can view their chapters at scifun.org/Thesis_Awards/thesis_awards.html.

Chemical Demonstrations, Volume 5 Released

The research group that collaborated on Volume 5 of *Chemical Demonstrations: A Handbook for Teachers of Chemistry* continues to work toward future volumes that will feature demonstrations that help connect chemistry with what we perceive via our senses. Volume 5 dealt with vision, the next volume will deal with hearing; touch, taste, and smell will follow. Group members Shakhashiri, Schreiner, Dr. Jerry Bell and Ron Perkins also enjoyed positive reviews for Volume 5, most notably from *Education in Chemistry* (May 2012) and the *Journal of Chemical Education* (April 2012). Another WISL research group, including Professor Emeritus Laurens Anderson and Stacy Wittkopp (B.S. '08), published "What Is Happening When the Blue Bottle Bleaches: An Investigation of the Methylene Blue-Catalyzed Air Oxidation of Glucose" in the *Journal of Chemical Education*. It is the definitive work on the chemistry behind the popular lecture demonstration known as the Blue Bottle Experiment.

From top to bottom: Guest Lauren Buchanan displays a conductivity tester at the 43rd annual "Once Upon a Christmas Cheery, In the Lab of Shakhashiri." Photo by John Powell

Shakhashiri with the U.S. team at the International Chemistry Olympiad. Photo by Linda Wang, C&E News

WISL Honorary Fellow Ron Perkins receives the Helen M. Free Award for Public Outreach from Cheryl Frech, Free, and Shakhashiri. Photo by Peter Cutts

Shakhashiri presents Royal Society of Chemistry President Lesley Yellowlees a complete set of "Once Upon a Christmas Cheery, In the Lab of Shakhashiri, 1970-2011" and a copy of Volume 5. Photo courtesy of the RSC



In Memoriam

Ray S. Bender, Jr. (B.A. '71)

Ray S. Bender, Jr., 63, died May 7, 2012. He was born in Appleton, Wis. in 1948 and was the beloved husband of Christina C. Keppel, M.D. Bender earned a B.A. in chemistry from the University of Wisconsin-Madison. He studied biochemistry, published in the area of gene transcription, and worked as an instructor at Colorado State University in Fort Collins, Colo. after which he received his M.S. in 1974. He then pursued a teaching certificate and began his career in Appleton Area School District as a science teacher. In 1998 he decided, again, to make a big change and was accepted to the Medical College of Wisconsin. After a year as a family practice resident, he began his psychiatric training and then joined, his wife, Christina, in private practice.

Edward Walton Berndt (B.S. '51)

Edward Walton Berndt, 83, died Oct. 21, 2012. He received a degree in chemistry from the University of Wisconsin-Madison. After serving honorably in the U.S. Army, Berndt worked as a chemist at the S.C. Johnson and Son Company in Racine, Wis. He then attended the University of Minnesota and earned a Ph.D. in organic chemistry in 1959. Berndt later worked at Dr. Salsbury's Laboratories, Corning Laboratories, and Lakeway/Bofors Nobel Chemicals. He was an avid gardener, and he was married to his wife, Bertha, for 43 years.

Lewis J. Bodi (Ph.D. '55, Curtiss)

Lewis J. Bodi, 87, died Nov. 4, 2012. Bodi served with the U.S. Marine Corps in the South Pacific during World War II. He later worked at York College (CUNY) as dean of natural sciences, dean of faculty, provost, and vice president of academic affairs.

John Baptist Capuano (B.S. '41)

John Baptist Capuano, 95, died June 11, 2011. He earned a degree in chemical engineering from the UW-Madison and joined the U.S. Army during World War II. Capuano was stationed at the Fort Belvoir, Va., Army Research Center. He later joined the Occidental Petroleum Corporation and became general manager of research and development at the Udylyte Research Laboratory and vice president of the chemical manufacturing unit of Udylyte-Puerto Rico.

Arthur J. Dick, Jr. (B.S. '49)

Arthur J. Dick, 89, died Nov. 12, 2012. He attended Milwaukee State Teachers College until he enlisted in the Army in 1943. Under the G.I. Bill, Dick resumed his studies at the University of Wisconsin-Madison, where he received a B.S. in chemistry. He worked as a chemist in both Rockford,

Ill. and Milwaukee, Wis. before moving to Madison in 1961 to work as technical director of Lindsay Finishes, Inc.

James Edwin Dowd (M.S. '63)

James Edwin Dowd, 72, died December 19, 2011. He was married to his wife, Carolyn, for 49 years. Music was Jim's passion and he was involved in a variety of musical activities throughout his life. Dowd received a B.S. from Penn State in 1961, an M.S. at the University of Wisconsin-Madison, and his Ph.D. at the University of Colorado in organic chemistry. He worked for DuPont his entire career, from 1967-2001, as a senior research chemist.

Charles F. Huebner (B.S. '39)

Charles F. Huebner, 95, died Oct. 19, 2012. He received a B.S. in chemistry, and later a Ph.D. in biochemistry, from UW-Madison. While in school, he was a chemist on the team that developed Coumadin. Huebner was a distinguished research chemist for more than 40 years at Novartis (formerly Ciba-Geigy) from 1941-86. There he developed a drug for tuberculosis, which was also used to treat leprosy.

Margaret Jane Imm (B.S. '47)

Margaret Jane Imm, 92, died May 19, 2012. She attended the University of Wisconsin-Madison and received a B.S. in chemistry. After she graduated, she worked in the laboratory of the State of Wisconsin Health Department. She married Ruben Imm in 1948. She loved music and played the piano and organ frequently.

Benjamin Kastein, Jr. (B.S. '38)

Benjamin Kastein, Jr., 95, died May 11, 2012. A 1938 graduate of the University of Wisconsin-Madison with a B.S. in chemistry, he moved to Ohio in 1940 to work for Firestone as a senior compounder in the company's tire development department. One of his greatest accomplishments was being part of the team that developed synthetic rubber during World War II. He was married to his wife, Helen, for 69 years. He was an avid photographer and gardener.

Gary Lee Kratz (B.S. '70)

Gary Lee Kratz, 64, died Sept. 1, 2012. In 1970, Kratz graduated from the University of Wisconsin-Madison with a B.S. in chemistry. After more than 40 years, he retired from his plant manager position with BASF in Texas. Kratz enjoyed woodworking, making furniture, traveling, reading, debating with his children, and his great dane.

Robert Marion Lindquist (B.S. '44)

Robert Marion Lindquist, 88, died Aug. 21, 2012. In 1944, he graduated from the University of Wisconsin-Madison with a B.S. in chemistry. He then joined the U.S. Navy. He returned to the U.S. and earned a Ph.D. from the University of Minnesota in 1950. He married his wife Wilda Nov. 25, 1950. He worked for General Aniline in Pennsylvania and later joined IBM in California. Lindquist was a fellow in the American Chemical Society, a Monsanto Fellow, and in 1975 was honored as an outstanding contributor for IBM.

Samuel Loshack (Ph.D. '50, Hirschfelder)

Samuel Loshack, 88, died Nov. 7, 2012. He earned his Ph.D. at the University of Wisconsin-Madison. He was a brilliant inventor and held 40+ patents; he led R&D teams at Borden Chemical and Wesley-Jessen, where he invented a soft, colored contact lens that changed the wearer's eye color. A lifelong tennis player, he was once described as "a famous tennis player masquerading as the vice president of R&D." He was married to his wife, Risé, for 32 years.

John Jacob Mortvedt (Ph.D. '62)

John Jacob Mortvedt, 80, died March 13, 2012. He earned a B.S. in agronomy from South Dakota State University in 1953 and married his wife Marlene in 1955. After serving as an aviator with the U.S. Army for three years and farming for one year, Mortvedt earned an M.S. in soil science from SDSU in 1959 and a Ph.D. in chemistry from the University of Wisconsin-Madison in 1962. He worked with the Tennessee Valley Authority as a soil chemist and senior scientist until 1992. He was then a regional manager in the TVA Field Programs Department and retired in 1993. He served as an extension specialist at Colorado State University until 1996 and became a professor emeritus. Mortvedt published more than 100 papers and book chapters and held two patents. He was president of the Soil Science Society of America.

Richard A. Myren (B.S. '48)

Richard A. Myren, 88, died Sept. 20, 2012. He married his wife, Patricia, in 1948. He received a B.S. in chemistry from the University of Wisconsin-Madison in 1948 and a LL.B. (J.D.) from Harvard Law School in 1952. He was a Fulbright Scholar in Córdoba, Argentina. He was admitted to the North Carolina Bar in 1953. He served in the U.S. Infantry in Europe during World War II and in the U.S. Naval Reserve from 1954-68. Myren was recognized nationally and internationally as a pioneering leader in the field of criminal justice education. He began his career at the Institute of Government, University of North Carolina (Chapel Hill) as assistant director and assistant research professor in criminal law. He was then an associate professor of police administration at Indiana University. Myren later became the

foundling dean of the first graduate school of criminal justice in the U.S., at SUNY-Albany. He became dean of the School of Justice at American University in 1976. He retired as a professor emeritus in 1986.

George Neuman, Jr. (B.S. '51)

George Neuman Jr. earned a B.S. in chemistry from UW-Madison in 1951. During the Korean War, he served in counter-intelligence with the U.S. Army in Germany. He lived in New Jersey and worked for more than 30 years at DuPont. He retired as employee relations supervisor and later obtained his realtor license. Neuman was interested in computing, current affairs, and genealogy.

Elizabeth Olleman (M.S. '47)

Elizabeth "Betty" Olleman, 88, died Aug. 18, 2012. She attended the University of Washington and earned a degree in chemistry in 1945. She earned an M.S. in quantitative chemistry from the University of Wisconsin-Madison in 1946. She married her husband, Roger, in 1941, and they were married for 65 years. She worked as a research chemist, first at Tech and then at the Coppers Corp. She later worked with her husband at their business, Accident and Failure Investigations.

Douglas Dean Radtke (Ph.D. '66, Fenske)

Douglas Dean Radtke, 73, died July 24, 2012. He received a B.S. in chemistry from the University of Wisconsin-Stevens Point in 1961. He then earned a Ph.D. in physical chemistry from UW-Madison in 1966. Radtke also served in the U.S. Air Force. He married his wife, Marcy, in 1987. Radtke was a chemistry professor at the University of Wisconsin-Stevens Point for 38 years and retired in 1995. While teaching chemistry at UWSP, he also worked as assistant vice chancellor for business affairs.

Kurt J. Rorig (Ph.D. '47, McElvain)

Kurt J. Rorig, 91, died March 27, 2012. He was born in Germany and came to the U.S. with his parents at the age of 4. He earned a B.S. in chemistry from the University of Chicago, a master's in chemistry from Carleton College, and a Ph.D. in organic chemistry from the University of Wisconsin-Madison in 1947. Later that year, he began his 39-year career with G.D. Searle & Co. He began as a research chemist and became an assistant director and later associate director of chemical research. For 17 years he was involved in medicinal chemistry, working on cardiovascular and renal research as section head and, for a time, as acting director of medicinal chemistry. After his retirement, Rorig lectured in chemistry at Loyola University Chicago and was an adjunct professor of chemistry at the University of Illinois at Chicago. He held 82 U.S. patents and wrote and lectured widely on organic chemistry, toxicology, and pharmacology.

William Arthur Rowe (B.S. '48, M.S. '49)

William Arthur Rowe, 89, died Sept. 14, 2012. He graduated from the University of Wisconsin-Madison in 1948 and received a master's in chemistry in 1949. He served in the U.S. Air Force from 1943-46, during World War II. He was employed by the Pure Oil Company and Union Oil Co. for 16 years. He then worked for Gould Inc. for 19 years. He then worked for the Illinois Racing Board Laboratory for five years and retired in 1990. Rowe married his wife, Elda, in 1955.

James Spensley Ruhoff (B.S. '39)

James "Jim" Spensley Ruhoff, 96, died Oct. 3, 2012. The youngest of three brothers, he followed his older brothers into the field of chemistry, graduating from the University of Wisconsin-Madison. He worked for the Monsanto Company for nearly 30 years. Ruhoff married his wife, Nancy, in 1945.

Myran Charles Sauer, Jr. (Ph.D. '59, Willard)

Myran Charles Sauer, Jr., died Dec. 24, 2011. He graduated from Carnegie Institute of Technology with a B.S. in chemistry. In 1958, he earned a Ph.D. from the University of Wisconsin-Madison, where he met his wife of 52 years, Mary (Benedict), who was also a chemistry graduate student. He did basic research in radiation chemistry at Argonne National Laboratory from 1959-2005 and won an award for his work in helping to solve the problem of disposing of radioactive waste. His hobbies were bridge and bluegrass music.

Richard S. Schiefelbein (B.S. '43)

Richard S. Schiefelbein, 90, died Sept. 24, 2012. After graduating from the University of Wisconsin-Madison with a B.S. in chemistry, he was employed by the Shell Development Co. In 1949, he earned a Ph.D. in organic chemistry from Northwestern University and then worked for the Jefferson Chemical Co. until moving to the DuPont Company in 1953. Schiefelbein retired from DuPont in 1985 after 32 years of service. He was married to his wife, Gene, for 61 years.

Benedetto Anthony Soldano (Ph.D. '49, Hall)

Benedetto "Benny" Soldano, 89, died Jan. 8, 2011. He received his B.S. in engineering from Alfred University before serving in the U.S. Navy during World War II. He then earned a Ph.D. in chemistry from the University of Wisconsin-Madison in 1949. Soldano began his career at Oak Ridge National Laboratory, where he worked until 1971. He then worked as a professor of chemistry and physics at Furman University until his retirement. During his tenure at Furman, Soldano was twice invited as a research fellow to the prestigious Goddard Research Institute to assist NASA with its physics research program. He was married to his wife, Fay, for 64 years.

Lawrence Stein (Ph.D. '52, Murphy)

Lawrence Stein, 89, died May 10, 2012. He was born in Washington D.C. in 1922. He served in the U.S. Army during World War II and earned a Ph.D. in chemistry and physics from the University of Wisconsin-Madison in 1952.

Donald Loren Stevenson (Ph.D. '67, Dahl)

Donald "Don" Stevenson, 71, died Jan. 10, 2012. He attended Monmouth College and UW-Madison, where he earned a Ph.D. in physical chemistry in 1967. Stevenson began his career at DuPont de Nemours in R&D prior to moving into technical sales and marketing. He retired after 25 years and decided to change paths by obtaining a master of divinity from Lancaster Theological Seminary. In 1996, Stevenson was called to Christ's Community Church, where he served as pastor until his death.

Robert Brent Stevenson (M.S. '63)

Robert Brent Stevenson, 72, died Sept. 19, 2011. After receiving a bachelor's from Augustana College in 1961, he earned a master's from the University of Wisconsin-Madison in 1963, his doctorate in chemistry from the University of Iowa in 1967, and his J.D. from DePaul University in 1972. A patent attorney by profession, he was employed by Amoco for 14 years and later worked for DuPont; he retired after 15 years. He was married to his wife, Martha, for 50 years.

Paul Elmer Strege (Ph.D. '76, Trost)

Paul Elmer Strege, 61, died April 18, 2012. He was a graduate of the University of Wisconsin-River Falls and earned a Ph.D. in organic chemistry from UW-Madison. He married his wife, Maxine, in 1977. He began his career at Dow Chemical and was later employed by Johnson Polymer, Johnson Diversey, and S.C. Johnson Wax. He retired from Johnson Diversey in 2006 as director of global regulatory affairs.

Roberta Anne Svacha (B.S. '49)

Roberta "Bobbie" Svacha, 84, died Nov. 9, 2011. She earned a B.S. in chemistry from the University of Wisconsin-Madison. After graduating, she was employed by Universal Oil Products, where she was a librarian, technical writer, and assistant personnel manager. She ended her career in the Patent Department after 37 years. She married her husband, Roy, in 1951. She was an active volunteer with the police department and government of the Village of North Barrington from 1976-2009.

Richard Jerome Timmons (Ph.D. '62, Van Tamelen)

Richard Jerome "Jerry" Timmons, 77, died Dec. 14, 2012. Timmons enjoyed a 40-year career as a research chemist with the Scotts Company. He served as national chairman of the Agricultural Section of the ACS. He enjoyed sailing and traveling. He was married to Barbara, his wife, for 55 years.

Louise C. Tortorelli (M.S. '69)

Louise C. Tortorelli, 66, died Jan. 31, 2012. Tortorelli received a degree in chemistry from Loyola University in 1967. She then attended the University of Wisconsin-Madison, where she received a master's in physical chemistry and later a B.A. in art history. She married her husband, Jim, in 1971. She was a career chemist: she was employed by the Wisconsin State Lab of Hygiene as a heavy metals chemist, worked in the lab at the Metropolitan Sewage Plant, and ended her career with the Water Science and Engineering Laboratory at UW-Madison.

Donald Nicol Willett (B.Ph. '42)

Donald Nicol Willett, 93, died Oct. 19, 2012. He attended UW-Madison, where he earned a B.Ph. in chemistry and was a member of the marching band. From 1943-45, as a member of the Manhattan District in Oak Ridge, Tenn., Willett participated in work essential to the production of the atomic bomb. In 1946, he began working with a joint project of the Wisconsin Department of Agriculture and University of Wisconsin School of Agriculture. He later became director of the Laboratory Services and Analytical Testing Department for the Wisconsin Department of Agriculture.

Layton J. Wittenberg (Ph.D. '53, Larsen)

Layton J. Wittenberg, 85, died Oct. 8, 2012. He attended The Ohio State University, where he earned a B.S. in chemistry in 1949. He then began his graduate studies at UW-Madison, where he not only earned his Ph.D. in Chemistry, but also met and later married Melsean (Hauck), his wife of 59 years. Wittenberg was a research chemist with Monsanto for more than 30 years, and he specialized in nuclear chemistry, pioneering solar energy research, and fuels for space exploration. Upon his retirement, he returned to UW-Madison, where he was a senior research scientist at the Fusion Technology Institute for 17 years.

Howard E. Zimmerman

Howard E. Zimmerman, 85, died Feb. 12, 2012. He was a professor emeritus of chemistry at the University of Wisconsin-Madison. During World War II, Zimmerman served as a tank gunner for the U.S. Army. He earned a B.S. from Yale University in chemistry in 1950 and was first in his class. He received a Ph.D. from Yale University in 1953 and completed a postdoctoral fellowship at Harvard University. He taught for seven years at Northwestern University prior to coming to UW-Madison in 1960. He earned numerous awards, including: ACS James Flack Norris Award in Physical Organic Chemistry ('76); election to the National Academy of Sciences ('80); ACS Arthur C. Cope Scholar Award ('91); and the IUPAC Porter Medal for Photochemical Research ('06).

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

Floyd Anderson (B.S. '39)
 Robert Athey (Ph.D. '54, McElvain)
 Sanford Bloom (B.S. '47)
 Gary Alan Bormett (B.S. '89)
 Ray Brumblay (Ph.D. '38, Kahlenberg)
 Theodore La Chapelle, Jr. (B.S. '43)
 Marcella Chretien (B.S. '29)
 Yao-Ying Chien (M.S. '91)
 Edward Christensen (B.S. '62, Ph.D. '68, Blaedel)
 Harvey Eder (B.S. '37)
 Marjorie Fuller (B.A. '48)
 Frederick Guenther (B.S. '42)
 Steven Hanke (B.S. '65)
 Paul Hohenfeldt (B.S. '65)
 Robert Iverson (B.S. '41)
 John Johnson (Ph.D. '42, Hall)
 C. Warren Lalk (B.S. '39)
 John Parks (Ph.D. '73, Fenske)
 Mary Smith (B.A. '42)
 Harold Tarkow (B.S. '34, Ph.D. '39, Williams)
 Beatrice Touton-Fritz (B.S. '41)
 Howard Tyner (Ph.D. '34, Williams)
 Carl Umland II (B.S. '52)
 Donald Vissers (Ph.D. '60, Larsen)
 Winston Wayne (Ph.D. '40, Adkins)
 Martin Wesolowski (B.S. '57)
 Ray Wilcox (Ph.D. '41)

Legendary Instructor Ieva Reich Retires

A stack of notecards was always present on Ieva Reich's desk in the Daniels Chemistry Building.

The cards do not contain equations or formulas. There are no diagrams or talking points on the cards either.

Reich, a newly retired instructor, used the notecards to learn the names of students in her chemistry lectures — all 300 of them.

“I usually remember most names, but that is getting harder, which is why I am retiring,” Reich says. “Everybody responds to a personal connection. It's the most important thing you can do as an instructor. I did that by calling on students by name.”

Reich spent 42 years at UW-Madison starting as a researcher and then teaching organic chemistry for the past 17 years. She estimates that 1,500 sophomores take Organic Chemistry 343 and 345 each year, most of whom plan to go into health-related fields after graduation.

As Reich transitions into retirement, students say they will remember her for the rigorous nature of her courses and her interactive teaching style.

Despite the difficult subject matter, Mark Kraemer, a former student who is now enrolled at UW-Madison's School of Medicine and Public Health, found organic chemistry to be “challenging yet incredibly interesting and fun,” thanks to Reich's engaging lectures.

Coming from a research background, Reich says she was not a natural instructor and that perfecting her teaching style took years of practice. The work has not gone unnoticed: she has received many awards, including the Chemistry Department's James W. Taylor Excellence in Teaching Award, the Chancellor's Hilldale Award for Excellence in Teaching and the Alliant Energy Underkofler Excellence in Teaching Award.

Most recently, Reich was honored by former students and colleagues, whose gifts established an undergraduate scholarship in her name.

“Dr. Reich's lectures transcend the size of the class, and I feel that she is speaking directly to me,” student James Luo says.

Although both Luo and Kraemer admitted that it can be frightening to have a professor call your name at random in front of hundreds of other students, they say it kept them engaged in the subject matter.

Although Reich has left her teaching role, she remains active in the UW-Madison community, and her husband, Professor Hans Reich, continues to teach in the department.

— Holly Hartung, *College of Letters & Science*



A Mind for Scientific Exploration

Professor Stephen Nelsen Complemented His 47-Year Career as an Organic Chemist with Extracurricular Science

Among Professor Stephen Nelsen's more than 290 academic publications, one article is not like the others. This article, found in the journal *Mycologia* and titled "Pluteus aurantipes sp. nov. from Wisconsin, United States," details the discovery of a rare yellow, orange, and brown mushroom collected on one of Nelsen's foraging trips, near Belmont Mound Woods State Natural Area in Belmont, Wis.

Nelsen has long been interested in Wisconsin's nature, and this interest eventually morphed into an intensive study of the mushrooms and other fungi native to Wisconsin. His efforts include a collection of thousands of stunning photographs of the many species of mushrooms he has found and identified during his numerous mushroom forays into Wisconsin's parks and nature preserves.

Nelsen's mycology-related achievements do not, however, outshine his many chemistry-related accomplishments. He has been a professor in the Department of Chemistry for the last 47 years. In 1965, he joined the faculty at the University of Wisconsin-Madison, having completed his doctoral program at Harvard University earlier that year. He became a full professor in 1975, and since 1989, Nelsen has been the P.D. Bartlett Professor of Chemistry. His professorship was named in honor of his advisor at Harvard University.

Nelsen is a noted scholar and has remained a leader in mechanistic organic chemistry throughout his career. He has taught a variety of undergraduate and graduate classes and has served as an advisor for 33 Ph.D. students, who have valued his mentoring abilities and high standards.

His research has focused on conformation, structure, spectroscopy, reactivity, and/or theory of both the neutral precursors and the radical cations of alkenes, amines, sulfenamides, peroxides, hydroxylamines, haloamines and especially the finely tunable hydrazines, in many cases using Bredt's rule kinetic protection to stabilize radical species.

His important discoveries have been the result of careful design of molecular frameworks suitable for accurate and meaningful measurements of physical properties. Nelsen's major scientific contributions in recent years have been in the areas of intramolecular and intermolecular electron-transfer.



Top: Professor Stephen Nelsen displays a mushroom on a trip to Door County, Wis. in 1982. **Bottom:** Nelsen talks to Nick Hill, organic lab director, and Matt Bowman (Ph.D. '06), lecturer, at a poster session for students in Intermediate Organic Chemistry.



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