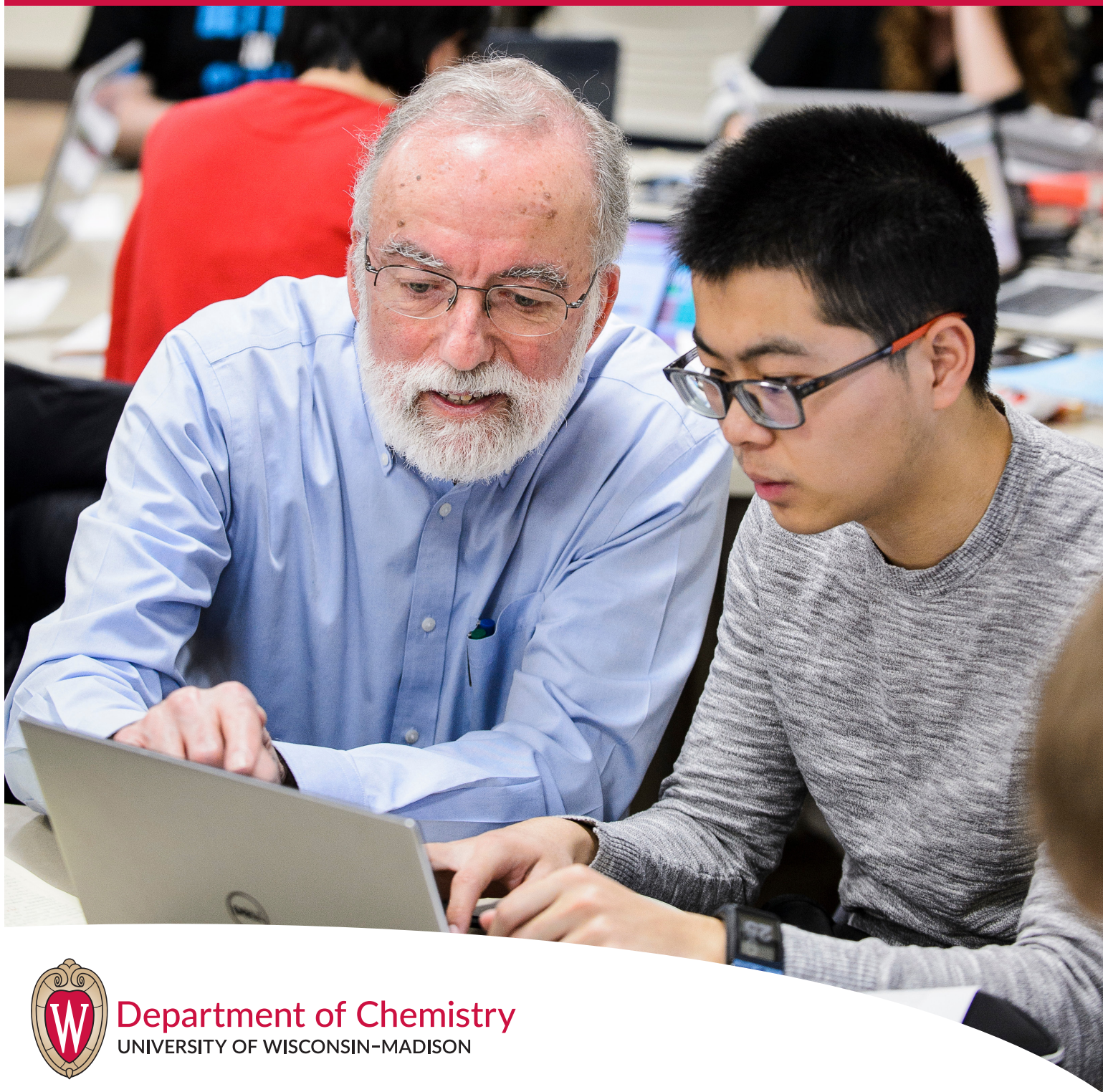


BADGER CHEMIST

University of Wisconsin-Madison Department of Chemistry

Established 1953, No. 60, 2017



Department of Chemistry
UNIVERSITY OF WISCONSIN-MADISON

New Faces, New Spaces

As the spring semester speeds along, I find myself making note of each final milestone I face in my service as department chair. I've now given my last department chair's welcome talk to visiting prospective chemistry graduate students and convened the last Chemistry Board of Advisers meeting of my tenure. As of July 1, Professor Judith Burstyn will take the reins and capably lead the Department into the next several years of its history. As I return to my former roles — professor, principal investigator, and Chemistry Building Project lead — I look forward to continuing to interact with alumni and friends of the Department of Chemistry as opportunities arise.



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

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Cover photo: Professor John Moore works with an undergraduate student in a pilot active learning version of Advanced General Chemistry 109. More on page 6.

We are pleased to report that each day brings us one step closer to the first phase of construction for the Chemistry Building Project. We expect to begin in early 2018, which means that parts of the new tower could be ready for students by 2020. Learn more about this project, as well as how we are preparing our undergraduate curriculum in anticipation of these new teaching spaces on pages 10-11.

Just as we are preparing to send this issue of the Badger Chemist to the printer, we have received word that three new professors will be joining the Department of Chemistry in the near future. In summer 2017, Daniel Weix joins us as a tenured professor from University of Rochester. His research program focuses on the development of conceptually new catalytic methods for organic synthesis. Dr. Andrew Buller also will join us in summer 2017. His research interest areas include protein engineering, biocatalysis, enzymology, and chemical biology. In summer 2018, Dr. Zachary Wickens will join the faculty. Wickens' organic chemistry research program will draw from his work in catalysis, organometallics, synthesis, and mechanistic analysis. We look forward to introducing you to these outstanding chemists in the next issue.

We hope to see you the next time you visit Madison or at our regular UW-Madison alumni receptions at the ACS National Meetings. In the meantime, please sign up to receive quarterly email updates from the Department of Chemistry at go.wisc.edu/alumnienews if you wish to hear from us more frequently.

With very best regards,

Robert J. McMahan

Irving Shain Chair in Chemistry and Department Chair
chair@chem.wisc.edu



Department of Chemistry
UNIVERSITY OF WISCONSIN-MADISON

New Badger Chemists

Ph.D.

DECEMBER 2015

Brent Amberger (McMahon/Woods)

Millimeter-wave spectroscopy of highly nitrogenous molecules of potential astrochemical interest

Matthew Aronoff (Raines)

New tools for chemical biology from main group elements

Natasha Bennett (Kiessling)

Polymer-derived multivalent antigens for modulating B and T cell activation

Heejun Choi (Weisshaar)

Elucidation of antimicrobial peptide action on live *E. coli* cells

Jennifer Faust (Nathanson)

Collisions and reactions with glycerol films and water microjets: exploring the chemistry of interfacial ions

Robert Guenette (Strieter)

Chemical tools to study branched ubiquitin chains

Judy Hines (Burstyn)

Probing the allosteric role of heme in hCBS, DGCR8 and CooA with biophysical and spectroscopic methods

Brett Marsh (Garand)

Cryogenic ion vibrational spectroscopy of metal complexes: solvation and reactions

Ivan Pallares (Brunold)

Characterization of enzyme-bound forms of cobalamin with spectroscopy and computations

Alicia Phelps (Schomaker)

Tunable reactivity in transition metal-catalyzed group transfer reactions and subsequent cyclization reactions

N. Rangarajan (Weisshaar)

Time-lapse fluorescence microscopy of the effects of antimicrobial peptides on single, live *E. coli* cells

Tracey Reitz (Zanni)

Advances in 2D IR spectroscopy and applications to sensitized thin films

Jaeyoon Shin (Crim)

Time-resolved spectroscopic studies of chlorine and bromine atom reactions in solution

Arne Ulbrich (Coon)

Methods for identification and quantification of small molecules and peptides in bioenergy, metabolism, and proteome research

Jamie Wheeler (Hamers)

Understanding the environmental chemistry and biological impacts of nanomaterials



Leili Zhang (Cui/Yethiraj)

Dancing on membranes: bravo for peripheral proteins

Linghong Zhang (Hamers)

Photo- and electrochemical reduction of CO₂ at diamond surfaces

MAY 2016

Travis Blum (Yoon)

Photocatalytic electron transfer and energy transfer cycloadditions of phenols

Amanda Corcos (Berry)

Bimetallic reactive intermediates containing late transition metals

Brian Dolinar (Berry)

Expanding the scope of heterotrimetallic MMO₂ complexes through hard-soft acid-base chemistry

Erin Gemperline (Li)

Method development and application of mass spectrometry imaging to study symbiotic relationships between bacteria and host organisms

Viorel Iosub (Stahl)

Dehydrogenation of partially saturated compounds for the synthesis of substituted (hetero)aromatics

Jennifer Kaiser (Keutsch)

Abundance and speciation of volatile organic compound emissions determined through field measurements of formaldehyde

Donghyeon Kang (Choi)

Studies on electrochemically constructed n- and p-type photoelectrodes for use in solar energy conversion

Vanessa Kung (Gellman)

Peptide models of parallel beta sheet and amyloid (mis) folding

Qiyao Li (Smith)

Proteomic technologies for tissue engineering investigation and post-translational modification discovery

Christopher Lietz (Li)

Novel mass spectrometry-based method

development, and applications to signaling peptides and proteins

Randy Mehlenbacher (Zanni)

Development of broad bandwidth nonlinear spectroscopies for characterization of electronic states in materials systems

Robert Newberry (Raines)

Backbone carbonyl interactions in proteins

Gregory Potts (Coon)

Improved mass spectrometry methods for increasing depth and throughput in targeted and discovery proteomics experiments

Kate Skog (Keutsch)

Utilizing glyoxal and formaldehyde as tracers of tropospheric secondary pollutant formation

Marco Torelli (Hamers)

Studying the interface between nanomaterials and biomolecules

Kittikhun Wangkanont (Kiessling)

Structural analysis of galactofuranose-binding lectins and biosynthetic enzymes

Michael Welsh (Blackwell)

The application of chemical tools to study bacterial quorum sensing

AUGUST 2016

Shyamosree Bhattacharya (Forest)

Phytochrome fluorescence and folding

Hannah Bowman (Burstyn)

Structure-function relationships in the gas-sensing heme-dependent transcription factors RcoM and DNR

Matt Carter (Lynn)

Design, synthesis, and fabrication of soft materials surfaces and interfaces

Qi Ding (Jin)

The chemistry of MoS₂ and related compounds and their applications in electrocatalysis and photoelectrochemistry

Benjamin Dunnington (Schmidt)

Applying molecular banding concepts to the solid state

Kale Engelkemier (Fredrickson)

From structural complexity to structure-property relationship in intermetallics: development of density functional theory chemical pressure analysis

Bennett Fox (Kiessling)

Comparative analysis and characterization of ubiquitin proteins in ubiquitin signaling and neurodegenerative disease

Yiming Guo (Fredrickson)

Structural intergrowth in complex intermetallics: pathways towards stabilization from a theoretical viewpoint

Benjamin Haenni (McMahon)

Theoretical investigation of diradicals and carbenes

Kelly Hebert (Ediger)

Segmental dynamics of polymer glasses undergoing deformation: effect of temperature and reversing deformation protocols

Paul Hebert (Wright)

Femtosecond multidimensional electronic and Raman spectroscopy towards the study of Mn complexes and the oxygen evolving complex

Zachary Kann (Skinner)

Simulation studies of simple gas desorption and development and spectroscopic studies of charge-scaled ion models

Brandon Kilduff (Fredrickson)

Synthetic realizations of structural plasticity in intermetallics

Stephanie Knezz (McMahon)

Synthesis, spectroscopy, and photochemistry of reactive organic molecules

Michael Kratochvil (Lynn)

Non-wetting surfaces for the controlled release of active agents

Wenting Li (Weisshaar)

Single molecule study of RelA during the stringent response in live *E. coli* cells

Yicun Ni (Skinner)

Theoretical vibrational spectroscopy of the E3B water model and evidence for a liquid-liquid critical point in supercooled water within this model

Alicia Richards (Coon)

Towards comprehensive proteome sequencing through mass spectrometry

Matthew Rowley (Wright)

Spectroscopic studies on the photophysics of semiconductor materials for solar energy collection

John Roylance (Choi)

Electrochemical reduction of furfural-based biomass intermediates

Travis Sunderland (Berry)

Metal-rhodium bonded paddlewheel complexes: consequences of exchanging rhodium for bismuth

Daniel Tabor (Sibert)

Extracting structural information from the OH and CH stretch spectral regions with a local mode approach

M.S.

DECEMBER 2015

Shane Lies (Yoon)

MAY 2016

James Chambers (Schomaker)

Lin Hui Chang (Strieter)

James Jirak (Schomaker)

Alan Lee

Leland Martin (Fredrickson)

John O'Connor (Zanni)

Kelly Suralik (Ediger)

Nicholas Walters (McMahon)

AUGUST 2016

Nolan Blythe (Andrew)

Michael Croisant (Schomaker)

Gregory Eyer (Andrew)

Eli Miller (Burstyn)

B.S. / B.A.

DECEMBER 2015

Aldrich, Claudia

Au, Patrick

Boden, Jacob

Burlingham, Scott

Dahlgren, Nora

Daniel, Andrew

Firth, Connor

Kamp, William

Kautz, Erin

Kim, Hyun Jin

Klade, Emily

Koenig, Lea

O'Rourke, Libby

Osinski, Cassandra

Porchetta, Angelo

Whitehead, Taylor

Wu, Tianyao

MAY 2016

Adams, Kimberly

Bartuce, Allison

Bichler, Ali

Bruggeman, Chase

Caldwell, Nicholas

Cheng, Sherry Lixue

Desrochers, Kyle

Dohm, Randall

Dubey, Zachary

Dulli, Richard

Dundas, Alex

Fassbender, Joseph

Fox, Adam

Fraser, Douglas

Goetz, Mckenna

Hall, Mikayla

Hardcastle, Emily

Held, Karissa

Hong, Seong Ho

Jun, Brian

Kansariwala, Ina

Karls, Nicholas

Kim, Kyu Bum

Kim, Sangyun

Klosterman, Ellen

Lacrosse, Cody

Larson, Connor

Lenz, Natalie

Leroy, Louis

Logan, Phoenix

Mallek, Aaron

Murphy, Kelsey

Peterson, Alexander

Phillips, Brandon

Richter, Michael

Rowe, Mark

Salvati, Lawrence

Sibley, Zachariah

Smits, Angela

Stricker, Avi

Swannell, Melanie

Tamerius, Alexandra

Touney, Eric

Van Gilder, John

Van Lysel, Matthew

Warzecha, Evan

Yentz, Nicholas

Yusko, Larissa

Zarling, Lucas

Ziegler, Jacob

AUGUST 2016

Castonguay, Rachel

Christenson, Trevor

Eklund, Elliot

Gutkoska, Griffin

Kim, Jessica

Neumann, Luke

Rajaratnam, Vilashini

Rust, Clayton

Stevenson, Corey

Tang, Yukun

Alumni News



Robert Bergman (Ph.D. '66, Berson) has earned the Wolf Prize in Chemistry for his discovery of the activation of carbon-hydrogen bonds of hydrocarbons by soluble transition metal complexes. Bergman is Gerald E.K. Branch Distinguished Professor Emeritus of Chemistry at the University of California, Berkeley, and faculty senior scientist with Lawrence Berkeley National Laboratory. The Wolf Foundation, based in Israel, awards the \$100,000 Wolf Prize each year to a number of recipients in the areas of chemistry, mathematics, physics, medicine, and the arts. The prize is widely considered to be second in importance only to the Nobel Prize.

Peter Dorhout (Ph.D. '89, Ellis), has been elected the 2017 American Chemical Society president-elect by members of ACS. Dorhout will serve as president of the society in 2018 and immediate past-president in 2019. Since March 2016, he has served as vice president for research at Kansas State University. He filled this position on an interim basis beginning in December 2015. He joined the university in January 2012 as dean of the College of Arts and Sciences.

The 2016 class of ACS fellows included UW-Madison chemistry alumni Steven Corcelli (Postdoc '02-05, Skinner) of the University of Notre Dame, Christine Landry-Coltrain (Ph.D. '85, Schrag) of the Eastman Kodak Company, and Matthew Lynch (Ph.D. '91, Corn) of P&G.

John Tanner (Ph.D. '66, Stejskal) has been awarded honorary membership in the International Society for Magnetic Resonance in Medicine. This honor is in recognition of pioneering research in diffusion NMR, which stemmed from Tanner's doctoral thesis work with former Professor Edward Stejskal.

Megan Frisk (Ph.D. '09, Beebe) has been awarded an American Association for the Advancement of Science (AAAS) Science & Technology Policy Fellowship with a placement at the U.S. Department of State in the Office

of the Science & Technology Advisor to the Secretary (STAS). Frisk is one of 266 scientists and engineers who is spending a year serving professionally in federal agencies and congressional offices.

Kiu-Yuen Tse (Ph.D. '07, Hamers) has received the 2016 Carl Dahlquist Award from the Pressure Sensitive Tape Council (PSTC), a trade association for tape manufacturers and suppliers. Tse is an advanced research specialist at the 3M Corporate Research Laboratory in St. Paul, Minn. He works with pressure-sensitive adhesives for health care, electronics, industrial and consumer markets.

Eric Hansen (Ph.D. '06, Lee) is process chemistry team lead at Pfizer Inc. Recently, he was an invited speaker at the ACS Division of Organic Chemistry Young Investigators Symposium.

After 36 years, John Haberman (Ph.D. '75, Bernstein), retired from the Solar System Exploration Division of the Sciences and Exploration Directorate at the NASA Goddard Space Flight Center in early 2016. The GSFC granted Haberman emeritus status, allowing him to continue working with science and engineering data collected from missions on which he participated during his career. He continues to advise the organization in a variety of arenas, especially in chemistry.

Jung Ho Lee (Biophysics Ph.D. '13, Cavagnero) is an assistant professor of chemistry at Seoul National University (South Korea).

Almaz Jalilov (Ph.D. '11, Nelsen) is an assistant professor at The King Fahd University of Petroleum and Minerals (Saudi Arabia).

Margarita Santiago-Torres, a former Cavagnero group postdoctoral associate, is now an assistant professor at the University of New Mexico Comprehensive Cancer Center.

Chemistry News



Middle School Students Learn to Grow Crystals

Led by Dr. Iliia Guzei, the Molecular Structure Laboratory organized its third annual statewide contest for students to grow large, high-quality crystals. In addition to high school students, middle school students also participated in the Wisconsin Crystal Growing Competition this year for the first time. Learn more at wicgc.chem.wisc.edu.

Berry Appointed Lester R. McNall Professor in Chemistry

In 2016, Professor John Berry became the inaugural holder of the Lester R. McNall Professorship in Chemistry. Berry is an inorganic chemist whose research investigates structure and bonding in transition metal compounds. McNall received a bachelor's degree in chemistry from UW-Madison in 1950, working with Professor Samuel McElvain. He is the founder and former CEO of Nutrient Technologies, a manufacturing company dedicated to plant nutrition technologies.

Climate Task Force Work Begins

Department Chair Robert McMahan has established a special task force to recommend and implement actions to address issues related to department climate. In 2016-17, the Task Force, chaired by Professor Judith Burstyn, is working to survey current department structures, programs, and initiatives that intersect with workplace climate and help foster coordination among these efforts. In order to represent students, staff, and faculty and give voice to their workplace climate issues, members of the Graduate Student-Faculty Liaison Committee, Graduate Curriculum Committee, and Climate/Diversity Committee comprise the Task Force.

McCammon Wins 2016-17 Hirschfelder Prize

J. Andrew McCammon, a professor of chemistry, biochemistry, and pharmacology at the University of California, San Diego, received the 2016-17 Hirschfelder Prize in Theoretical Chemistry. The Department of Chemistry's Theoretical Chemistry Institute (TCI) presents the award annually. McCammon visited campus in September to deliver three



lectures (and is shown above with Professor Emeritus James Skinner). The Hirschfelder Prize was established in 1991 through a gift from Professor Joseph Hirschfelder, a noted theoretical chemist, and Dr. Elizabeth Hirschfelder.

WISL Launches Science in Motion Program

Beginning in 2017, a group of students, staff, and faculty from UW-Madison will offer Science is Fun public presentations at a variety of public venues throughout Wisconsin and neighboring states. The program is intended to help improve the connection between UW-Madison and citizens and to equip non-scientists. "By sharing the beauty of science and its importance in daily life we strive to elevate the level of appreciation and understanding of what science is capable of achieving and what science cannot accomplish," says Professor Bassam Shakhshiri, WISL director.

Retirements

In December, Fleming Crim and James Skinner became professors emeriti. Also in December, Rodney Schreiner, a senior scientist with Wisconsin Initiative for Science Literacy, retired after 35 years of service to UW-Madison. Dennis Reece, assistant to the chair, retired following 18 years of University service in February.

Staff Additions

The Department has welcomed several new staff members: Jessica Baran, undergraduate services specialist; Kayla Driscoll, assistant to the chair; Gery Essenmacher, senior outreach specialist; Char Horsfall, human resources specialist; Quinn Lorang, financial specialist; and Erynn Zweifel, undergraduate services specialist. Tim Kachel has transitioned into a new role as post-award grants specialist. Cheri Stephens has transitioned into a new role as physical chemistry path coordinator.

Faculty News

In August, Timothy Bertram was promoted to associate professor with tenure.



In April, Professor Robert McMahon presented a lecture at the 70th Fujihara Seminar, an international symposium dedicated to new developments in physical-organic chemistry. Professor Hiizu Iwamura of Nihon University (see photo above), who was a postdoc with Professor Howard Zimmerman, made the arrangements for this distinguished seminar. The meeting took place in Fukuoka, Japan, amid the aftershocks following the earthquake on Kyushu Island. Undergraduate students invited McMahon to present a plenary lecture at the Western Canadian Undergraduate Chemistry Conference in Winnipeg, Manitoba, Canada. He also spoke at the “Radicals in the Rockies” conference in Telluride, Colo., and enjoyed the opportunity to see many friends, including Igor Alabugin (Florida State University; postdoc Zimmerman), Luis Echegoyen (University of Texas-El Paso; postdoc Nelsen), Bob Sheridan (University of Nevada-Reno; faculty member 1980-87), and Dan Singleton (Texas A&M University; postdoc Trost).

Professor Mark Ediger presented named lectures at UCLA and University of Massachusetts-Amherst, as well as invited talks in Paris, Seoul, and less exotic places. Ediger is an associate editor of the *Journal of Chemical Physics* and just finished a four-year term as member of the Council of the American Physical Society.

Professor Ronald Raines was appointed to the Editorial Advisory Board of *Bioconjugate Chemistry*, an ACS journal. He also gave the Michael Laskowsky Lecture at Purdue University.

Professor Robert Hamers co-chaired a two-day National Science Foundation workshop, “Mid-scale Chemical Instrumentation.” The goal of the workshop was to assess the chemistry community’s needs for shared instrumentation facilities costing \$4-120 million. Hamers’ workshop focused on potential opportunities associated with regional instrumentation centers. Paul Bohn (Ph.D. ’81, Taylor), a professor at Notre Dame, organized a companion workshop on the topic of instrument development. Findings from both workshops will be reported to NSF for consideration. At UW-Madison, Hamers has been leading the charge for



improved family leave benefits for women and partners associated with the birth or adoption of a child. In 2015-2016, Hamers served as chair of a university committee looking at family leave benefits for faculty. In 2016, Provost Sarah Mangelsdorf appointed him to a new task force charged with developing recommendations for family leave benefits for faculty and staff.

In spring 2016, Professor John Moore taught a special section of Chemistry 109, Advanced General Chemistry, using a flipped-classroom, active-learning approach (see photo above). Students studied the textbook, did a pre-class worksheet, and came to class ready to complete in-class worksheets that presented challenging questions and problems. Moore collaborated with undergraduate students Kristopher Kennedy and Lucas Oxtoby to prepare course materials. Two of the four classes each week were in a collaborative learning classroom where students worked in interactive groups. The other two were in a lecture room but without traditional lectures. Instead, students learned about research from faculty guest lectures, were introduced to the principles and manipulations for laboratory work, and participated in interactive sessions based on the topics that students found most difficult each week. Department of Educational Psychology Professor Martina Rau evaluated student outcomes in the class. Rau identified significant improvement compared with the same course taught traditionally. Moore and collaborators reported their success at the Biennial Conference on Chemical Education in August. Because of the success of this approach, the Department purchased special seating to support active learning for one discussion classroom in the Chemistry Building and convinced the university to equip several other classrooms similarly. During the fall semester, Rau compared student performance in the modernized rooms with traditional classroom and discovered that students below the median of the class performed better in the active-learning rooms. These classroom experiments are informing furniture choices for the Chemistry Building Project, for which Moore is the principal liaison to the design and architecture team.

News from the Demo Lab

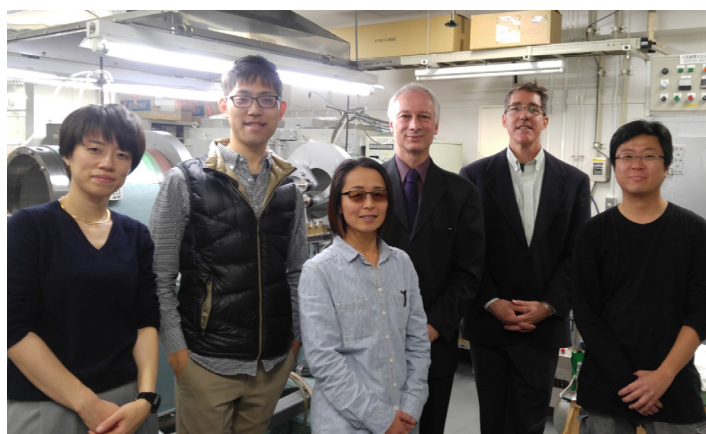
In 2014-15, Lecture Demonstrator Jim Maynard received a grant to convert lecture videos into short topical videos for two introductory general chemistry courses. This work continues, and the Demo Lab will likely begin working through this process with an organic chemistry lecture class next.

The Lab did a lot of demos in 2016. They partnered with the Wisconsin Initiative for Science Literacy to help with the 47th annual Christmas Lecture and the Fourth of July event, “Science is Fun at the Union Terrace.” They also conducted regular classroom lecture experiments, participated in UW-Madison’s College for Kids and PEOPLE programs, and worked with Alpha Chi Sigma, the professional chemistry fraternity. Maynard and colleagues

have been running new lecture experiments for classes participating in the REACH initiative in the Department, which seeks to more actively engage students in their own learning during lecture classes.

The Demo Lab also has helped implement technology changes from one learning management system to a new one and from one type of in-class response clicker system to a new system that makes use of students’ own mobile devices.

Thanks in large part to the hard work of undergraduate Tess Carlson, the Lab recently published a scientific paper about a protein-folding demo. What began as a pretty good demo is now a pretty good paper, Maynard says.



Tracy Drier demonstrates a quartz flat flange for Japanese glassblowers at the regional Tokyo glassblowers meeting (left). Drier also visited with colleagues at the Nagoya University Glass Shop (right).

Glassblower Tracy Drier Learns from Glassblowing Tradition in Japan

For Tracy Drier, master scientific glassblower, a trip to Japan to visit a number of scientific glassblowing shops was the highlight of the year. Because glassblowing traditions in Japan and the West developed independently, Drier learned a lot from observing the Japanese glassblowing processes. In total, he visited 15 factory/production facilities and university research glassblowing shops in Tokyo, Nagoya, Osaka, and Kyoto. In addition to touring glass factories, he attended a regional glassblowing symposium in Tokyo, where he did demonstrations for the Japanese glassblowers.

automated factories. Many of the shops had been handed down from generation to generation and specialized in one area (e.g., micro glassware).

Some of the tools used in Japan were unfamiliar. He received as a gift a tool called a *hashi*. Held like chopsticks, this metal tool is used to flare and constrict softened glass tubing. Since returning home, Drier has been working to become proficient with the new tool.

“The university glassblowing shops I visited were similar to those in the U.S. in that they were spacious, clean, and well equipped,” Drier says. “Their range of capabilities was wider than the typical university shop [in the U.S.]”

“Producing glassware for research is never routine; each project presents unique challenges and requires creative collaboration between the chemist and glassblower,” Drier says. “I call upon my experience and consult with other scientific glassblowers to brainstorm solutions. This trip has expanded my knowledge base and skill set.”

The production glassblowing facilities ranged from single-person shops using fairly primitive methods to large and highly



The Information Commons represents a new vision for the Chemistry Library. The space will be part of a new tower slated to open in 2020.

From Conventional to Commons: A Short History of the Chemistry Library

One of the oldest continually running libraries on campus, the Chemistry Library has been relocated or remodeled at least four times and has seen a number of staffing changes. As the library has grown and changed, space and staffing have always been the primary challenges of this facility. Through the years, the Chemistry Library has always remained a traditional library brimming with book stacks and familiar library services. However, as the 2016 fall semester came to a close, so too did the long-established Chemistry Library. When this space reopens in 2019 or 2020 as a newly envisioned and newly built Information Commons, it will have undergone its first true transformation in 120 years. Looking back at the history of this space helps to provide context for where its path will lead in the future as this evolution takes place.

UW-Madison's established its first library in 1850, shortly after the University's first classes began in 1849. John Lathrop came to campus in 1854, beginning chemistry instruction at UW-Madison. The Department of Chemistry was formally established in 1880. However, the Chemistry Library was not established until 1905. Two converging events spurred its creation: the appointment of Louis Kahlenberg to the chemistry faculty in 1895, and the dire need for additional lab and classroom spaces. Kahlenberg was a rising star in chemistry. After completing his bachelor's and master's degrees at UW-Madison, he left to pursue a doctorate in Leipzig, Germany. A voracious reader, he came back to his alma mater with not only a degree, but also a collection of German, French, and English science journals. At the same

time, the Department was becoming overcrowded. The State of Wisconsin eventually appropriated funds for a new building solely for chemistry. This building would later be named Chamberlain Hall. Kahlenberg was heavily involved in the planning of this building, and one of the new features he championed was the creation of a departmental library. Although journals and other texts previously had been available in offices and laboratories, this was the first time there was space in the department where chemical literature was systematically available to students. This building quickly became overcrowded as the Department continued to grow. In 1929, a new and expanded library space was included on the second floor of the East Addition. The Chemistry Library would remain in this location until 1967.

Upon opening in 1905, departmental secretaries maintained the Chemistry Library. When the Chemistry Library joined the University's General Library System (GLS), GLS hired a trained librarian to oversee the operation. GLS installed Reinhold "Ray" Schlueter as chemistry librarian. A recent library school graduate with a background in natural sciences, Schlueter was a natural fit.

Turnover among the chemistry librarians followed for some time. Schlueter left the library in 1949 to work as the librarian at the Oak Ridge Institute of Nuclear Studies. His replacement as chemistry librarian, Frederic Bassett, only stayed a short while, leaving in 1951 to become a librarian for the Upjohn Company. These losses frustrated the GLS and the Chemistry Department. The 1951 Annual Report from Libraries noted

that, “The competition put up by industrial corporations is too stiff for the salary scale established by law in Wisconsin! Twice we have found able young men, competent in both chemistry and librarianship, and each time they have left us after a year’s service to go to positions paying 50 percent or more in salary.” Higher paying opportunities in industry librarianship again caused Gerald Jahoda, a former chemist who became chemistry librarian in 1952, to leave the position after a single year in order to pursue his doctorate and serve as librarian for Colgate-Palmolive. The position became a revolving door, and librarians rarely stayed longer than two years.

In 1958, an alumna of the Chemistry Department returned to lead the Chemistry Library. During her time as chemistry librarian, Ann Ratcliff Bergen (B.S. ’57) focused primarily on the library’s physical space. Once again, the Department and the library were nearly at capacity. The Department began planning a new building, and Bergen was asked to provide a needs assessment for the library. She worked with Professor Aaron Ihde, chair of the Chemistry Library Committee, to determine what type of library space would be needed to support the Department for the next 50 years. They reported that significant space was needed to grow the collection and provide adequate seating for students and departmental users. Undergraduate students had taken to using the library as a study space between classes. Bergen and Ihde recommended the construction of a study hall for undergraduates. A new building was completed in 1962 and eventually was named for former department chair Professor J. Howard Mathews. However, its sole focus was research — it contained no classrooms or student spaces. When her husband graduated with his doctorate in 1960, he and Bergen moved to Idaho. The revolving door of librarians continued to spin.

Another Chemistry Department graduate eventually filled the post and helped to transition the Chemistry Library into its

new space. Kenneth Keller (B.S. ’51) became the chemistry librarian in 1966. While working towards his master’s in library sciences, Keller met Mildred Hunt North, who was also studying to become a librarian. The two married in 1967, and when Keller took another position in 1967, North was hired as the new chemistry librarian. She served in the position until 1969. During this time, a second building for the Chemistry Department had been approved, and this time the plans included mostly instructional and administrative spaces. During the Thanksgiving holiday in 1967, the couple moved the library into its location on the second floor of the new building (eventually named the Farrington Daniels Building), where it would remain. The new space was larger than any of the previous spaces, and the Department hoped it would be sufficient for many years to come. Although included in the initial plans for the building, Bergen and Ihde’s proposed study hall was scrapped in favor of additional classrooms.

When history and German scholar Kendall Rouse earned his master’s in library science from UW-Madison and served as a temporary project librarian for the Chemistry Library in 1974, he did not anticipate that he would be the first person to serve as chemistry librarian for longer than five years. Rouse found his knowledge of German to be an excellent complement to the collections in the Chemistry Library, particularly when using one of the seminal reference works in chemistry, *Beilsteins Handbuch der Organischen Chemie*.

Rouse noted in his 1980 Annual Report that the Chemistry Library would have been considered full by the GLS standards more than five years prior; book stacks were filled to the brim, and the top shelves had to be used, rendering much of the collection only accessible via step stools. Frustrated by the lack of space, Rouse began to pursue bringing ‘online searching’ to the Chemistry Library. This new technology allowed users to access and search the Chemical Abstracts, the most complete

Faces of the Chemistry Library



Schluter



Bergen



Rouse



Wixon



Mulvey



Andrea



The existing Chemistry Library will be demolished to make way for a new chemistry tower (left). The Chemistry Library will resume operation in 2019-20 as a newly envisioned Information Commons (right).

index of chemical literature, from a single computer station. He was able to offer this service in 1983 from a computer in his office, allowing the print version of the abstracts to eventually move to storage, freeing up an entire wall of shelving.

The eventual electronic accessibility of chemical literature completely changed the face of the library. In 1994, Rouse and GLS brought the newly digitized *Beilstein* to UW-Madison, making it the first university in the country to have this resource available online. UW-Madison hosted the *Beilstein*, making it available to all UW System and Big 10 institutions at a low cost. With the *Beilstein* seeing increasing usage on campus, GLS hired librarian Emily Wixson in 1997 to assist Rouse with designing learning materials and providing instruction on its usage. Also during this time, the library began systematically canceling print subscriptions to journals that were available online. A library once created for convenient access to print was quickly redefining itself a center for personalized reference services and expert information literacy instruction.

Space for books became less and less of a concern, but space for students remained a challenge. Some of the library space was repurposed toward this goal as fewer bookstacks were required. To maintain longer operating hours, Rouse hired student staff and eventually a library services assistant to manage them. Students filled every seat in the library. A Chemistry Library remodel was completed in 2001, bringing additional staff office space, student seating, and most importantly, natural light. After overseeing the project, Rouse retired in 2002.

After Rouse's retirement, Sharon Mulvey, who had been the library services assistant since 1992, became the director of the Chemistry Library. Emily Wixson was relocated from Steenbock Library to the Chemistry Library and was named co-director. Mulvey and Wixson ran the library for the next

nine years. Mulvey focused on operations and collections management and Wixson provided instruction and reference support to the department. Wixson retired in 2011. In 2012, Ariel Andrea came to the Chemistry Library as the chemistry instruction and reference librarian. She became the library administrator when Mulvey retired in 2013.

Unsurprisingly, the Chemistry Department was again in need of additional space for teaching. Classrooms were filled to capacity and teaching laboratories that had not seen many renovations since they were built in 1967 were falling into disrepair. After a very long planning process, the Chemistry Building Project was approved by the legislature in summer 2015. A new tower is scheduled to replace the two-story portion of the Daniels Building, a space that currently houses two large lecture halls and the Chemistry Library.

As Andrea worked with the Chemistry Building Project planning committee to design a new library space, it quickly became clear that space for people, not print, would be the focus of the new space. The existing library lacked sufficient student seating. Furthermore, as instructors redesign courses to support active learning, spaces for technology-aided group work have become a necessity. The new Information Commons will have all of these amenities, as well as the chemistry librarian's office and small collection of heavily used print materials that are not available electronically. Scheduled to open in 2020, the Information Commons will look significantly different than the Chemistry Library of the past, but it will continue to have the same common purpose — to support the faculty, staff, and students of the Chemistry Department by providing convenient access to and expert instruction on chemical information.

—Ariel Andrea, aandrea@library.wisc.edu



Each new and renovated teaching laboratory will be adjoined by write-up rooms for pre-lab instructions and post-lab group work. Movable seating will allow for flexible room arrangements.

First Phase of Construction Approaches for New Teaching Facilities

During spring break, one of the first visible changes associated with the Chemistry Building Project took place. As undergraduates traveled, analytical chemistry undergraduate teaching laboratory staff began moving materials and equipment to the Medical Sciences Center, located across University Ave. and one block west of the Chemistry Building. The analytical chemistry laboratory move will continue as soon as the semester ends in May, with undergraduate analytical chemistry classes beginning in the Medical Sciences Center during the summer term.

The analytical chemistry teaching laboratory move is just one of the many changes that will take place before the first shovel hits the ground in early 2018. By spring semester 2018, most large undergraduate chemistry lectures and analytical chemistry laboratory classes will have transitioned to the Medical Sciences Center swing space and to lecture halls across campus. The first step in the construction process — demolition of the two-story Chemistry Library and Room 1351/1361 lecture hall wing — is likely to begin in early 2018.

On Dec. 14, the State of Wisconsin Building Commission approved a key design report and granted the authority to construct the Chemistry Building Project. The approval of this report signifies that the project is ready to move to the final design and bid phases.

“This approval represents the most significant milestone in the project since it was enumerated in the state budget in July 2015,” says Robert McMahon, Irving Shain Chair of Chemistry and department chair.

Governor Scott Walker signed a contract for the final design work in March, allowing the architects to move forward with completing detailed architectural plans as the project moves toward the construction bid phase.

The initial phase of the project will include the construction of a new tower at the southwest corner of University Ave. and Mills Street, two fully outfitted floors for organic chemistry instructional laboratories in the new tower, mechanical rehabilitation of existing facilities, two new lecture halls, and a multipurpose learning studio. Other components of the project await additional funding commitments.

If construction begins in early 2018, the new tower would be in use beginning in 2020.

To learn more about the Chemistry Building Project, visit chem.wisc.edu/chemistry-building-project.

REACH Efforts Complement Vision for New Teaching Spaces

As the construction phase of the Chemistry Building Project approaches, Department of Chemistry instructors are working in parallel to prepare the undergraduate curriculum for the new types of teaching approaches the new facilities will enable.

When the new facilities open, the new lecture halls will be equipped to allow students to work in pairs or groups more easily. Write-up rooms adjacent to each teaching laboratory will allow teaching assistants a non-lab space in which to introduce students to each day's lab plans and safety notes and also will allow students to work together on lab reports following each class session. Informal interaction spaces throughout the new and remodeled teaching wings, as well as group workspaces in the Information Commons, will be ready for group study sessions outside of class.

To prepare the curriculum for these new flexible learning spaces, the Department has joined the campus-wide REACH initiative, which aims to transform large, introductory, lecture-based courses into sustainable, active learning environments that increase students' engagement in their own learning. Professors Clark Landis and Edwin "Ned" Sibert lead REACH efforts in the Department of Chemistry.

Beginning in spring 2016, instructors piloted an active learning unit as part of Chemistry 103, the first course in the two-part introductory general chemistry lecture series. All sections of Chemistry 103 moved to a fully transformed version of the course in fall 2016. Chemistry instructors launched a pilot unit for Chemistry 104 in fall 2016 and expanded the pilot effort throughout Chemistry 104 sections in spring 2017. The work will continue into the 2017-18 academic year with the full transformation of Chemistry 104.

In addition to the REACH initiative efforts, other chemistry instructors have begun working to incorporate active learning approaches into additional chemistry courses. Professor John Moore piloted an active-learning version of Chemistry 109, Advanced General Chemistry, in spring 2016. Dr. Brian Esselman piloted a 'flipped classroom' concept in his summer 2016 Introductory Organic Chemistry 343 course. Other instructors have piloted various active learning approaches dating back to the early 2010s.

To learn more about REACH, visit go.wisc.edu/reach.

Chemistry Building Project gifts and pledges made now will help determine the scope of the first phase of the project. For maximum impact, make your gift now at go.wisc.edu/ChemistryBuildingProject.



Professor Edwin "Ned" Sibert is teaching a fully transformed version of Chemistry 103 during the spring 2017 semester (top). Students learn much of the course material outside of lecture meetings. Class sessions focus on reviewing material and individual and group problem-solving. Sibert and the teaching assistants for the course circulate among the students, helping to guide group work and answer questions (middle, bottom).

Research and Innovation

COON GROUP

Building a Protein Atlas

The ability to confer nitrogen fixation into non-leguminous plants such as cereals is among the top challenges in agricultural biotechnology. The fact that two distinct and very distantly related organisms — a plant and a bacterium — can partner to draw life-sustaining nitrogen from the atmosphere is just one of the challenges plant engineers face as they seek to confer this quality on other important crops. The answer to this challenge now may be one step closer with the Coon group and collaborators' publication of a massive proteomic inventory, or atlas, of 23,000 plant and bacterial proteins at play as the symbiotic process plays out between plant and microbe.

>> [More at go.wisc.edu/protein-atlas](http://go.wisc.edu/protein-atlas)



D. JAYARAMAN / S. RAJASEKAR

STAHL GROUP

Finding New Efficiencies

The Stahl group and collaborators have laid out a highly efficient new method to convert abundant organic molecules into new medicines. Their 2016 publication describes a way to convert carbon-hydrogen bonds into nitriles, common components of bioactive molecules used in medicinal and agricultural applications. Carbon-hydrogen bonds are the most common feature of the molecular building blocks used to make valuable chemicals. The new method described by the Stahl group and their Chinese collaborators gives chemists prospecting for bioactive molecules a new tool in the search for novel drugs or chemicals for agriculture.

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



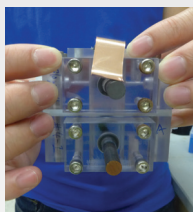
JAMIE GOLDEN

JIN GROUP

A Marriage Made in Sunlight

As solar cells produce a greater proportion of total electric power, a fundamental limitation remains: the dark of night when solar cells go to sleep. The Jin group and collaborators now have integrated a solar cell with a large-capacity battery. They made a single device that eliminates the usual intermediate step of making electricity and, instead, transfers the energy directly to the battery's electrolyte. Jin chose a "redox flow battery," which stores energy in a tank of liquid electrolyte. The researchers have demonstrated a single device that converts light energy into chemical energy by directly charging the liquid electrolyte.

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



DAVID TENENBAUM

YOON GROUP

Expanding the Photochemistry Toolbox

The Yoon group reports a new concept for synthesizing chiral molecules using light. If a molecule is chiral, it has two versions that are mirror images but otherwise identical. Chiral molecule synthesis is important for research in medicinal chemistry, materials chemistry, and biology. Researchers in the Yoon group selectively produced one of the two mirror image molecules in [2+2] photocycloadditions of hydroxychalcones by combining chiral Lewis acids with Ru-bpy as a photosensitizer. Mechanistic studies showed that the chiral Lewis acid catalyzes triplet energy transfer by coordinating to the substrate and decreasing its triplet energy to a degree that makes triplet energy transfer thermodynamically possible.

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



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BEHIND THE DISCOVERY

Methodical and Steady Wins the Race

Travis Blum (Ph.D. '16, Yoon), first author of this paper, worked on this project from fall 2014 to spring 2016. Along with several other Yoon group members, he started with proof-of-concept screening results for enantioselectivity. Those initial results gave him the confidence to push forward. Some of the group's initial mechanistic proposals failed, but computational investigations helped to expose the origins of these shortcomings. "The essential results of this manuscript were indeed discovered on accident," Blum says. "This paper taught me the value in both chasing down unexpected observations and in being able to identify a profoundly interesting result when one comes along." Writing the manuscript itself was one of the most difficult aspects of the project, because "the unique nature of the field and our solution made simultaneously contextualizing the discovery while maintaining a compelling scientific narrative difficult," Blum says. This work opens up new avenues for synthesizing stereochemically enriched molecules that are otherwise impossible to make. The Yoon group's new type of pathway opens the door for future work within the group and by other synthetic chemists.

—Daniel Hinton

HERMANS GROUP

Catalysts for More Sustainable Plastics and Chemical Building Blocks

The Hermans group recently discovered a new, highly selective and efficient heterogeneous catalyst for converting propane to propene. Metal-free hexagonal boron nitride and boron nitride nanotubes were shown to be useful for oxidative propane dehydrogenation. Chemists have searched for active and selective catalysts for this reaction, but one outstanding challenge has been over-oxidation of propene to carbon dioxide. Ethene, a useful and desired chemical, is the main byproduct of the reaction with boron nitride.



>> [More at go.wisc.edu/BN-catalyst](http://go.wisc.edu/BN-catalyst)



BEHIND THE DISCOVERY

Control Experiment Reveals a Surprise

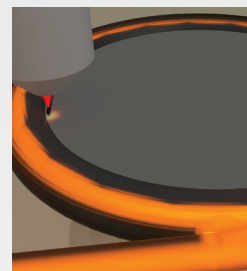
Recently, graduate student Joseph Grant's careful attention to detail led to a pleasant surprise in the lab. He ran a series of control experiments while studying what was then the most promising class of catalysts for the oxidative dehydrogenation of propane reaction as a method to produce propene. As he worked with boron nitride for the control experiments, he unexpectedly identified the boron nitride itself as a promising catalyst for one of the most important petrochemical reactions in the world. After repeating the results multiple times, Grant and Professor Ivo Hermans were convinced of the true catalytic qualities of boron nitride. Soon, others in the Hermans group joined in to help unravel the mechanism of this reaction. The group discovered that the catalysis was happening due to adsorbed oxygen on edge sites of the catalyst surface. Department of Chemistry staff members such as Robert McClain helped determine that the reaction was occurring solely due to boron nitride, not because of the presence of other contaminants. Time was on the Hermans group's side: very shortly after their Science paper was published, other research groups began reporting similar findings. The group is now testing the catalyst's behavior in other dehydrogenation reactions.

—Daniel Hinton

GOLDSMITH GROUP

The Ultimate in Sensitivity

Goldsmith group researchers made significant progress toward developing a single-molecule absorption spectrometer. The major thrust of this work is toward combining the power of spectral characterization with the fundamental principle of studying molecules one at a time and without the limitation of molecule's being emissive. The group achieved a major milestone by demonstrating that they can do this successfully with gold nanoparticles. They placed gold nanoparticles on the surface of toroidal optical microresonators behaving as microsized thermometers. The group was able to achieve unprecedented levels of resolution compared to similar techniques.



>> [More at go.wisc.edu/single-molecule-spectrometer](http://go.wisc.edu/single-molecule-spectrometer)



BEHIND THE DISCOVERY

Years of Groundwork Yield Speedy Data Collection

The Goldsmith group's latest finding is a result of both determination and serendipity. When they began working on the project in 2011, neither chemistry graduate student Kevin Heylman (Ph.D. '16, Goldsmith) nor Professor Randall Goldsmith had any experience with fiber optics microresonators, taper pulling, laser reflowing, or related computer simulations — all of which proved essential in creating this new absorption spectroscopy measurement method. The two researchers learned all of these techniques in just a few years. The group soon recruited two more graduate students to work on the project. In 2013, Kassandra Knapper began working on device fabrication, and in 2014, Erik Horak began digging into the spectroscopy side of the project. Developing all of the methods and tools for the project took several years. However, the actual data collection only took only about a month. "I was surprised that the gold nanorods yielded such interesting data since we chose them due to the fact that they are a well-known system fitting for proof-of-concept work," Horak says. Theoretical chemistry collaborators from the Masiello group at the University of Washington played an important role in helping to unravel the interesting data. Horak and Knapper say they see this project taking many exciting directions in the future.

—Daniel Hinton

Awards and Honors



New ACS fellow Professor Robert Hamers (left) is pictured with Diane Grob Schmidt, former ACS president.



Professor J.R. Schmidt, a 2017 Chancellor's Distinguished Teaching Award recipient, teaches physical chemistry students.

FACULTY

Professor Robert Hamers was named to the 2016 class of ACS fellows.

Professor Ronald Raines was elected as a fellow of the National Academy of Inventors and received the American Peptide Society's Vincent du Vigneaud Award.

Professor Catherine Middlecamp will receive the 2017 UW-Madison Emil Steiger Teaching Award, one of the top campus teaching awards.

Professor J.R. Schmidt will receive a 2017 Chancellor's Distinguished Teaching Award.

Professor Emeritus Daniel Rich will receive the 2017 Meienhofer Award for Excellence in Peptide Sciences at the Boulder Peptide Symposium.

Professor Shannon Stahl received the 2016 Mitsui Chemicals Catalysis Science Award at the November meeting of the Chemical Society of Japan.

Professor Laura Kiessling earned a 2016 UW-Madison Vilas Distinguished Achievement Professorship.

Professor John Berry was among the UW-Madison Vilas Faculty Mid-Career Investigator Awards recipients for 2016.

Professor Randall Goldsmith has been named the 2017 Journal of Physical Chemistry 'C' Lecturer.

Professor Silvia Cavagnero has become an honorary member of Phi Kappa Phi Honor Society.

Silatronix Inc., a start-up company founded by Professor Robert Hamers and Professor Emeritus Robert West, was among the Chemical & Engineering News' 2016 "Top 10 Startups to Watch." Also in 2016, the company received full patent protection on its core compounds, which improve the performance and safety of lithium-ion batteries. The company currently employs 21 people in Madison and at a subsidiary in Tokyo.

STAFF

Dr. Brian Esselman has received the annual College of Engineering Harvey Spangler Award for Technology Enhanced Instruction.

The American Chemical Society Wisconsin Local Section has named Master Glassblower Tracy Drier 2017 Local Section Outreach Volunteer of the Year.

Karen Stephens, organic chemistry path coordinator, will receive a 2016-17 College of Letters & Science University Staff Excellence Award.

STUDENTS

At a recent Biophysical Society Meeting, graduate student Rayna Addabbo (Cavagnero group) won a Student Research Achievement Award for her poster on the kinetics of protein folding.

Graduate student Andrew Fuchs (Cavagnero group) received a travel grant to present at a recent Biophysical Society Meeting.

Miranda Mecha (Cavagnero group) received a graduate fellowship from the Molecular Biophysics Training Program.

Yusuke Okuno (Cavagnero group) received a travel grant to attend and present a research talk at the 2016 Experimental Nuclear Magnetic Resonance Conference.

Tess Carlson, a Cavagnero group undergraduate researcher, is first author on a paper that has been selected for the cover of the Journal of Chemical Education. Read the paper at go.wisc.edu/carlson.

STUDENT DEPARTMENTAL AWARDS 2016-17

DEPARTMENTAL SUMMER UNDERGRADUATE RESEARCH AWARDS

- Margaret McLean Bender Scholarship / Karen M. Telander Award / Undergraduate Student Support in Chemistry Scholarship: Susanna Yaeger-Weiss
- Eugene & Patricia Kreger Herscher Scholarship: Katelyn Callies
- Edwin & Kathryn Larsen / Edward Panek Memorial Scholarships: Collin Goebel
- Wayland Noland Undergraduate Research Fellowship: Ryan Kladar
- Walter & Young-Ja Toy Scholarship: Yao Yao
- Undergraduate Student Support in Chemistry Scholarship: Zachary Konz, Lucas Oxtoby, Isaac Mades

ACADEMIC YEAR UNDERGRADUATE AWARDS

- Ackerman Scholarship: Alexander Chartier, Zachary Heim
- Ackerman Scholarship (East High School Graduate): Allison Elliott
- Don Brouse / Robert Franklin Taylor Scholarships: Efrey Noten, Adarsh Suresh
- Department of Chemistry Scholarships: Joshua Combs, Kunal Dani, Liam Eccles, Michael Foy, Wen Fu, Runyu Hong, Richard Jodts, Patric Sadecki, Hao Zhou
- Andrew Dorsey Memorial Scholarship: Efrey Noten
- Henry & Eleanor Firminhac Chemistry Scholarship: Victoria Cooley, Brandon Dobraska
- Richard Fischer Scholarship: Yao Yao
- Eugene & Patricia Kreger Herscher Scholarship:

Victoria Cooley, Anya Dillahunt, Hailey Thompson

- James Leddy Scholarship: Noah Johnson
- Lindsey Plank & Richard Putze Memorial Scholarship: Jake Ptaszynski
- Ieva Reich Undergraduate Scholarship: Wen Fu
- Mabel Duthey Reiner Scholarship: Ariana Saffold
- Saco Polymers Scholarship: Nicolas Padilla, Efrey Noten, Lucas Oxtoby
- Undergraduate Student Support in Chemistry Scholarship: Zachary Konz, Isaac Mades, Zachary Matusinec, Lucas Oxtoby, Jacob Redovich
- Martha Gunhild Week Scholarship: Karishma Bhawnani, Clare Kai Cimperman
- Alfred L. Wilds Scholarship: Johnny Yi Zhang
- George & Arleen Ziarnik Scholarship: Brian Ferrer

OTHER UNDERGRADUATE AWARDS

- Francis Craig Krauskopf Memorial Award Ryan Behm, Lauren Fahmy, Tristan Gunther, Zachary Leggon, Jimmy Soeherman, Marcus Voigt
- John & Elizabeth Moore Award for Excellence in General Chemistry: Jack Nuckles, Michael Palo, Jack Propson, Zachary Wesson
- ACS Undergraduate Award in Inorganic Chemistry: McKenna Goetz
- ACS Undergraduate Award in Organic Chemistry: Natalie Lenz
- ACS Hach Land Grant Scholarship: Tess Carlson, Michael Richter
- Alpha Chi Sigma Alumni Scholarship: Kunal Dani
- ACS Wisconsin Local Section Excellence in Analytical Chemistry: Lili Kim, Peter Hesse
- ACS Wisconsin Local Section Excellence in Inorganic Chemistry: Isaac Mades
- ACS Wisconsin Local Section Excellence in Organic Chemistry: Mark McCrary

- ACS Wisconsin Local Section Excellence in Physical Chemistry: Samuel Moskal, Tom Stadelman

UNDERGRADUATE/GRADUATE AWARDS

- Stephen Morton Research Award - Undergraduate Mentees: Lily Klapper, Riley Whitehead
- Stephen Morton Research Award - Graduate Mentors: Arielle Mensch (Hamers), Laura Slaymaker (Hamers)

GRADUATE AWARDS

- Leah Cohodas Berk Award for Excellence in Chemistry Research: Erin Gemperline (Li)
- Roger Carlson Award: Margaret Robinson (Hamers)
- Charles & Martha Casey Excellence in Research Award: Chemical Biology, Robert Newberry (Raines); Inorganic Chemistry, Amanda Corcos (Berry); Organic Chemistry, Kaz Skubi (Yoon)
- Farrington Daniels Ethical Leadership Award: Margaret Robinson (Hamers)
- Robert Doban Mentorship Award: Matthew Rush (Coon), Diane Walters (Ediger), Valerie Winton (Kiessling)
- Goering Organic Chemistry Fellowship: Eileen Burke (Schomaker), Jonathan Jaworski (Stahl), Scott McCann (Stahl), Ryan Scamp (Schomaker), Steven Schmid

(Schomaker), Spencer Scholz (Yoon)

- Richard & Joan Hartl Excellence in Research Award: Analytical Chemistry, Nick Kwiecien (Coon); Materials Chemistry, Ankit Gujral (Ediger); Physical Chemistry, Daniel Tabor (Sibert)
- Hirschfelder Prize Graduate Award: Vincent Yannello (Fredrickson)
- Hirschmann/Rich Graduate Award in Bioorganic Chemistry: Marlies Hager (Gellman), Heather Hodges (Kiessling), Dale Kreitler (Gellman)
- Eli Lilly Organic Fellowship: Adrian Amador (Yoon), Kelsey Miles (Stahl)
- Michael McCoy Memorial Award: Matthew Stolt (Jin)
- Gary Parr Memorial Award: Erin Gemperline (Li), Alicia Richards (Coon)
- PPG Industries Mentorship Award: Arielle Mensch (Hamers)
- K.V. Reddy Award in Physical Chemistry: Diane Walters (Ediger)

OTHER AWARDS

- GSFLC Mentor Awards: Amanda Buchberger (Li), Professor Judith Burstyn, Kevin Heylman (Goldsmith)

How do scholarships and fellowships impact chemistry students?

“By supporting this scholarship, you not only support me to conduct my research but also let me have more confidence in my future study and moving forward to my dream with even more determination.”

“It is extremely encouraging to know that my hard work within and outside of the classroom is being recognized.”

“With the funding provided by your scholarship, I will continue to live and work in Madison this summer, and I cannot thank you enough for this opportunity. This scholarship will allow me to dedicate myself to our project, and I believe we will make great progress.”

“I am so proud, thankful, and humbled to receive this scholarship. This will help me achieve all of my goals, both long-term and short-term.”



STUDENT AWARDS CEREMONY 2016

In total, 80+ students were honored at the April 2016 Student Awards Ceremony. Thanks to the generosity of alumni and friends of the department, students received more than \$250,000 in departmental scholarships and fellowships.



GRADUATION CELEBRATION 2016

The department recognized graduating chemistry majors and graduate students at a May 2016 graduation event. Family members, friends, colleagues, and research mentors gathered to honor the graduates.



Institute for Chemical Education



The Institute for Chemical Education (ICE) continues its extensive outreach program under the direction of Professor



Institute for Chemical Education

John Moore and with the contributions of Andrew Greenberg,

Francisca Jofre, Linda Craft, Elizabeth Moore and several undergraduate student workers. ICE gratefully acknowledges the UW-Madison Materials Science and Engineering Center (MRSEC), which supports distribution of ICE science kits, the American Chemical Society (ACS) Wisconsin Local Section, which supports science activities on Earth Day and National Chemistry Week, the Boys & Girls Clubs of Dane County (B&GC), and the MilliporeSigma Corporation, which provides scholarships for ChemCamps and whose employees volunteer with SCIENCECountErs.

SCIENCECountErs

For the first time, more than 200 B&GC members were able to participate in two full semesters of activities, a week of summer camps, Earth Day activities, and Chemistry Week. More than 50 UW-Madison undergraduate volunteers, all recruited from general chemistry lecture courses, helped to support these programs. In 2016, the ACS Wisconsin Local Section and the UW-Madison chapter of National Organization of Black Chemists and Chemical Engineers (NOBCChE) partnered with SCIENCECountErs to celebrate Earth Day and Chemistry Week at the B&GC with hands-on science activities. More than 80 members of the B&GC participated in each of the events.

Last summer, members of the B&GC also enjoyed a week of science camps. Each day, the students enjoyed a different

theme, such as forensic science, nanoparticles, or fun with chemistry. They explored chemistry and science through experiments, projects, and discussions.

To make SCIENCECountErs an even more successful outreach program, ICE has developed a training program for volunteers that helps volunteers develop a deeper understanding of different cultural backgrounds, facilitates handling of micro-aggressions, creates social awareness, and teaches volunteers how to communicate complex science topics to learners at all levels. ICE used this training with several groups of students and staff across campus.

SCIENCECountErs is a nationwide program with six centers in addition to UW-Madison. For more information, or to start your own SCIENCECountErs program with a local B&GC, visit sciencounters.chem.wisc.edu.

Chem Camps

Last summer, ICE collaborated with the College of Engineering to develop a new camp called Fun with Engineering. Students learned about different engineering disciplines, basic engineering principles, and the engineering design process. Campers worked on projects ranging from building a Morse telegraph to creating a water recycling system. Hundreds of middle-school-age students attended the camps last summer. Topics ranged from general chemistry to forensic science and chemical inventions.

Students Participating in Chemical Education (SPICE)

SPICE continued its traditional outreach efforts, visiting schools, museums, libraries, and performing demonstration shows for student groups visiting campus. The 35+ active

SPICE student volunteers participated in more than 40 events during the school year, including hands-on activities, science fairs, and family science nights.

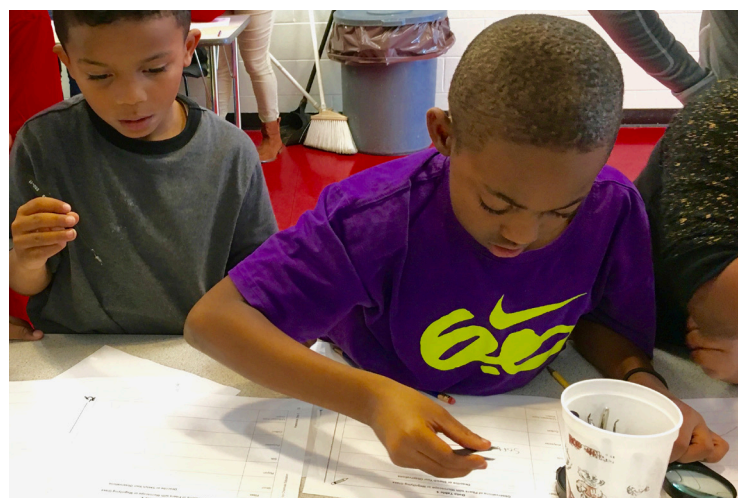
ICE Salt Model Kit

ICE has developed a new kit to help students learn about solid-state structures. Based on the ICE Polyhedral Model kit, the Salt Model kit comes in three layers that can be stacked to form a unit cell of sodium chloride. As the photos show, the kit allows for demonstrations of both the cubic unit cell (shown at right) and the closest-packed layers of ions that make up the structure. The Salt Model is an inexpensive aid for anyone teaching about unit cells and closest-packed structures.



Research Experience for Undergraduates

ICE again hosted four National Science Foundation-funded Research Experience for Undergraduates (REU) programs during summer 2016 and continued to organize the research exchange program with the University of Science and Technology of China (USTC). The REU programs participated in the Graduate School's Summer Research Opportunities Program, a consortium of 15 on-campus summer research programs with common goal of increasing diversity of the graduate student pool.



Together the programs attracted 48 students from the U.S., Puerto Rico, and China to spend 10 weeks doing research in labs on the UW-Madison campus. Through the REU and China programs the Department of Chemistry hosted 21 students in Department labs. Chemistry faculty whose research groups hosted students included: Timothy Bertram, Judith Burstyn, Silvia Cavagnero, Kyoung-Shin Choi, Ive Hermans, Randall Goldsmith, Padma Gopalan, Robert Hamers, Song Jin, Laura Kiessling, Clark Landis, Gilbert Nathanson, Jennifer Schomaker, Shannon Stahl, John Wright, and Tehshik Yoon. REU students worked on individual research projects under the guidance of graduate students and postdoctoral associates in their assigned laboratories.



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

Top, middle: SCIENCountErs students participate in Chemistry Week activities with NOBCChE volunteers; Bottom: The new ICE Salt Model kit, configured to demonstrate the cubic unit cell; Opposite: B&GC students participate in Earth Day activities.

In Memoriam

Grace E. Bowman (B.S. '54)

Grace E. Bowman worked as a chemist at McArdle Cancer Research Laboratory and at Wisconsin State Hygiene Lab before devoting herself to raising her family. She later worked as a chemist for Rayovac Corporation in Madison. Bowman loved the outdoors and spent many hours gardening at her house in the country. She loved baking and made Norwegian recipes, such as *sandbakkes*, that were passed down from her mother. Her religious faith was the cornerstone of her being.

Warren N. Brown (B.S. '85, Harriman)

Warren Brown enjoyed the challenges of working as a chemist and research scientist at Bell Laboratories, Wisconsin Department of Agriculture, Trade and Consumer Protection, and the Pharmaceutical Product Development Corp. He was passionate about his hobbies. He chased auroras. He took photographs. He enjoyed target shooting, discussing politics, and kayaking. Brown was a lifelong learner and reader. His Christian faith was his greatest passion of all.

Michael W. Chen (Ph.D. '79, Gaines)

Michael Chen received advanced degrees in chemistry from Michigan State University and UW-Madison. He worked for Union Carbide Corporation in the chemicals and plastics industry for more than 20 years. During this time, he was active in catalyst, process, and product technology research and development. Later in his career he transitioned into commercial management, focused on the development of international joint ventures, global process re-engineering, and organizational leadership development. Chen completed his career working with Roquette in commercial and technical food sales and in the business development of ecologically friendly products in the coatings and adhesives industry. One of his hobbies was aviation, and he was involved in the restoration of a B-17E "Flying Fortress" as part of a restoration group. He was married for 35 years to Monica Clarke Chen.

George S. Cripps (B.A. '47, Schuette)

George Cripps began his career at Merck Research Laboratories. He later worked at Climax Molybdenum and then Atlas Chemical. He retired from AstraZeneca in 1979. He served in both World War II and the Korean War as a Marine Corps aviator. He retired from the Marines following the Korean War, with the rank of major. He received the Distinguished Flying Cross for heroic actions in Korea. Cripps enjoyed racing his sailboat, traveling the world, and visiting his children and grandchildren.

Edward B. Dismukes (M.S. '51, Alberty)

Edward Dismukes' undergraduate studies at Birmingham-Southern College were interrupted by a year's service in the U.S. Army in 1946. He returned and completed his bachelor's in chemistry. In 1953, he began employment with Southern Research Institute, where he met his wife, Barbara. During his career with SRI, Dismukes conducted classified research on defensive measures for chemical warfare agents as head of the Physical Chemistry Section and the Chemical Defense Section. He later transferred to SRI's Environmental Sciences

Department. As senior research advisor, he became a national expert on flue gas conditioning processes and studied methods of removing sulfur and ammonia from power plant emissions.

Lloyd H. Dreger (Ph.D. '61, Margrave)

Lloyd Dreger received a bachelor's degree from UW-Oshkosh and two doctorates from UW-Madison, one in chemistry and one in philosophy. He worked at Allan Bradley and then at CSI Specialty Coatings in Milwaukee until his retirement. He served as a Milwaukee-area softball umpire for many years and also as an actor with a local theater.

Edmund J. Eisenbraun (B.S. '50, Ph.D. '55, McElvain)

As a member of the South Dakota National Guard 109th Engineer Regiment, Edmund "Pete" Eisenbraun's unit was called into active service in World War II. He was deployed to Northern Ireland, Algiers, Tunisia, and Italy. The GI Bill covered Eisenbraun's later undergraduate studies at UW-Madison. He completed his postdoctoral work at Wayne State University and Stanford University, working with Professor Carl Djerassi (Ph.D. '45, Wilds). In 1962, Eisenbraun joined the chemistry faculty at Oklahoma State University, where he worked until 1987. He married his wife, Joyce, in 1949.

Hillel H. Gershenson (B.A. '55)

Hillel Gershenson was professor emeritus of mathematics at the University of Minnesota, Twin Cities. For many years, he taught future teachers and worked to improve math education for women and minority students. Gershenson entered UW-Madison at age 16 on the Ford Scholars program. He received his doctorate from The University of Chicago and taught at Princeton University, Cornell University and the University of Aarhus before moving to Minnesota. He grew up in the Bronx, and he supported the Yankees until the Minnesota Twins won his heart. He was a keen birdwatcher and amateur historian. After switching to mathematics, he channeled his passion for chemistry into baking New York-style bagels and Kentucky bourbon cakes. His wife of 54 years, Celia, survives him.

Carl O. Hoeppepner (B.S. '45, Bender)

Following his graduation from UW-Madison, Carl Hoeppepner attended Harvard Law School. He worked for Western Condensing Co. as a control and production chemist. He also practiced law, but the greater share of his career was spent teaching. He coached debate at Tufts University. He taught chemistry, math, science, law, business, speech and debate at Lakeland College for 24 years. He taught debate and forensics at Plymouth High School for 12 years before retiring. Hoeppepner enjoyed being active, and he swam and ice-skated regularly until he was 78. He also enjoyed the arts.

Arthur G. Jelinek (B.S. '40, Ph.D. '44, McElvain)

Arthur Jelinek was an organic chemist at the DuPont Experimental Station for most of his 35-year career, retiring in 1979. He held 13 patents for compounds he developed, and he authored several scientific papers. In his spare time, Jelinek enjoyed gardening, painting, sculpting, and golfing.

Sheldon F. Kurath (Ph.D. '54, Daniels)

Sheldon Kurath worked as a professor of chemistry at UW-Oshkosh until his retirement in 1993. He was a member of the ACS, the American Institute of Chemical Engineers and the Technical Association for Pulp and Paper Industry. His hobbies included tracking the weather and watching the Green Bay Packers. His wife, Shirley, whom he married in 1954, survives him.

William B. McCormack (Ph.D. '48, Wilds)

During World War II, William "Bill" McCormack joined the Royal Canadian Air Force and trained as a bombardier. He met his wife, June, at a freshman mixer at the University of Alberta, and they married in 1945. Upon completing his doctorate, he worked for the DuPont Company. He spent his entire career working in Wilmington, Del. as a research scientist. He worked on a number of projects and holds patents for the first commercial application of reverse osmosis. He also invented the McCormack Reaction. He retired in 1985. He enjoyed traveling, gardening, woodworking, reading, learning, and his family.

Norman A. Nelson (Ph.D. '52, Wilds)

Norman Nelson was born in Edmonton, Alberta, Canada. He earned a bachelor's in chemistry from the University of Alberta in 1949. While working at the Massachusetts Institute of Technology from 1952-59, he served as research associate, instructor, and assistant professor of chemistry. Nelson then moved to Kalamazoo, Michigan to work for the Upjohn Company. There he held a number of positions in drug discovery research before accepting the position of associate director of cardiovascular diseases research. He published extensively and held 151 U.S. patents. He retired in 1990. His wife, Margery, died before him.

Robert W. Schmelzer

Robert "Bob" Schmelzer worked at Madison-Kipp Corporation until he was drafted into the Army, where he was assigned to the motor pool in Tokyo, Japan. After 25 years, he retired as a colonel. Schmelzer worked at the UW-Madison Department of Chemistry as the student machine shop machinist, retiring in 1984. He was an active community member and volunteer. His favorite accomplishment was transforming a pile of rusted parts into his Model T Ford. He was involved with a local Model T Ford Club. Schmelzer enjoyed traveling, tinkering in his garage, spending time with family and friends, playing cards, and fixing everything. His wife, Rosemary, survives him.

Ronald R. Schroeder (Ph.D. '67, Shain)

Ronald Schroeder joined the Wayne State University faculty in 1967. He retired in 2004 having mentored approximately 20 doctoral students. He was a prodigious collaborator on all things electrochemistry. He served as associate chair and chair of the graduate studies committee. He was active in the Federation of Analytical Chemistry and Spectroscopy Societies (FACSS) and in the Association of Analytical Chemists (ANACHEM). His wife, Eileen, survives him.

Charlene J. Steinberg (B.S. '47, M.S. '48, Idhe)

Charlene "Charlie" Steinberg began her teaching career in Green

Bay, Wis. at the UW Center in 1948. She moved to Sheboygan in 1951 to teach chemistry and coach tennis and golf at UW-Sheboygan until her retirement in 1987. Steinberg loved to travel and enjoyed listening to music and playing bridge and Mahjongg. She was an enthusiastic fan of the Chicago Bears football team, especially when they played against the Green Bay Packers.

Joseph G. Thresher (B.S. '68)

While studying at UW-Madison, Joseph Thresher met Joanne Seckar. They married just before he left for Vietnam, where he served as an Army officer and earned the Air Medal and two Bronze Stars. He later earned a law degree at UW-Madison. He was admitted to the Florida Bar in 1973. He truly loved the practice of law, specializing in construction litigation. He enjoyed spending time with his children and grandchildren. He danced the polka with them, taught them chess, and loved watching them play sports. His wife, Joanne, survives him.

Ignacio Tinoco Jr. (Ph.D. '54, Ferry)

Ignacio "Nacho" Tinoco Jr. made fundamental contributions to the understanding of RNA folding throughout his more than 60 years as a professor of chemistry at the University of California, Berkeley. In the early 1970s, Tinoco and colleagues published a pair of papers describing methods to predict the structure of an RNA molecule from its sequence. These two papers have been cited more than 2,600 times. Tinoco later turned to single-molecule studies of RNA with his former graduate student Carlos Bustamante, who had joined the faculty at Berkeley. In 2001, their team forcefully unfolded and folded an RNA molecule to measure its free energy. Tinoco mentored about 60 doctoral students and nearly as many postdocs.

Gerritt J. Van Wagenen Jr. (B.S. '89, Gaines)

Gerritt Van Wagenen worked as a chemist before switching careers and pursuing a master's in architecture from Boston Architecture College and working in the field. In 2012, he and his wife, Julie, felt called to become missionaries and moved to Port Au Prince, Haiti. He loved God and his family with all his being.

We also have been informed of the deaths of the following alumni who died from Jan. 1, 2016 to Dec. 31, 2016:

Loren W. Bannister (Ph.D. '53, McElvain)
 George D. Beaty (B.S. '50, Idhe)
 Herbert L. Benson (Ph.D. '61, Willard)
 Tek-Ling Chwang (Ph.D. '72, West)
 Harry Cohen (Ph.D. '41, McElvain)
 Dennis J. Daigle Jr. (B.S. '89)
 George P. Fitzgerald (B.S. '48, Link)
 John Jensen Jr. (B.S. '68, Fenske)
 Giffin D. Jones (B.S. '39, McElvain)
 Dale H. Klettke (B.S. '86, Cornwell)
 Paul T. Kwitowski (Ph.D. '67, West)
 John F. Langkau (B.S. '55, Daniels)
 Ian C. Mandel (B.S. '08)
 Donald L. Petitjean (B.S. '50, Blaedel)
 Carl Serres Jr. (B.S. '52)
 Donald J. Siehr (B.S. '51, Goering)
 Jane A. Wagner (B.S. '59)
 Austin H. Young (Ph.D. '59, Willard)



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