



COLLEGE OF
Science & Engineering

UNIVERSITY OF MINNESOTA

CHEM news

DEPARTMENT OF CHEMISTRY NEWSLETTER

Inside this issue...

3 Diversity Committee

4 Safety initiative

6 Outstanding alumni

14 Student honors

16 Promotions

18 New professors

22 Regents Professor

26 Donors

Graduate students laud their research, collaboration, and leadership opportunities

Opportunities to conduct research, work in collaborative environments, work with some of the top scientists in their fields, and participate in a variety of outreach and leadership activities are some of the recurring themes that arise from the Department of Chemistry's outstanding graduate students.

"In my experience, graduate school is designed to make you aware of how much you don't know," said Katherine "Katie" Hurley, a fourth-year graduate student working with Professor Christy Haynes. "I have definitely experienced this through learning by immersion, and although it is sometimes painful, I am academically much better prepared because of it. In five years, I may not remember much of what I learned in my first year classes, but I will remember how to approach problems efficiently and where to look for the specific knowledge I need."

The graduate students laud the Department of Chemistry for the opportunities to participate in collaborative research in outstanding facilities. "My favorite part of the graduate school experience has been working together with colleagues in my research group and in other close collaborations," said Hurley. "The people make my hard work worthwhile with the creativity, intellectual stimulation, and encouragement they provide."



Maria Miranda safely examines some chemicals needed for her research in an inert atmosphere glove box.

The collaborative environment that the department fosters, both within the department and outside of it, is truly invaluable, said Maria

[continued on page 9](#)

CHEM_{news}

DECEMBER 2013

DEPARTMENT OF CHEMISTRY CHAIR
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The Department of Chemistry is dedicated to providing a world-class education through its classroom and laboratory teaching; and creating new scientific knowledge through research aimed at solving some of society's most important human health, energy, and environmental problems.

This publication is available in alternative formats upon request. Direct requests to Eileen Harvala at 612-624-0831 or harva015@umn.edu.

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Top-notch student researchers, new faculty, new initiatives



Chair William Tolman

The continual sense of excitement and renewal on campus as new students and new faculty begin their work every fall is one of the most inspiring aspects of life in academia. The youthful enthusiasm they bring to their work is contagious!

We feature their contributions in this newsletter in a number of articles. The top-notch research we do is performed largely by students within our interdisciplinary research groups. Their stories are fascinating, and reflect both the tremendous opportunities to tackle exciting scientific problems we provide as well as the diverse backgrounds and insights they bring to their work. It's clear that what they learn by creating knowledge at the forefront of science through independent research has immeasurable impact.

On top of the extraordinary work of our current faculty, highlighted most recently by the selection of Professor Timothy Lodge as a Regents Professor (the highest honor for faculty in the university, and the third in our department!), I'm thrilled that we've succeeded in hiring four new faculty members this past year. Three are tenure-track assistant professors just beginning their faculty careers this past summer: Renee Frontiera, James Johns, and Ian Tonks. A fourth, Erin Carlson, whom we attracted to the Twin Cities from the University of Indiana, joins us in July 2014, as a tenured associate professor. Take a few minutes to survey their profiles in these pages. James' research combines atomic and molecular resolution imaging techniques such as scanning tunneling microscopy and atomic force microscopy with ultrafast spectroscopy to determine how the structure of material interfaces can facilitate or hinder charge transfer in photovoltaic and photocatalytic systems. Renee focuses on the development of new spectroscopic techniques to probe fundamental and applied issues in membrane protein biophysics,

alternative energy sources, and nanotechnology. Ian works in the area of organometallic chemistry with the aim of developing new catalysts for sustainable materials, atom-economic processes, and chemical fuels. Erin's research focuses on the problem of antibiotic resistance through the use of chemical biology and systems biology technologies to understand bacterial pathogenesis and identify potential therapeutic agents. Together, these new faculty bring an infusion of new energy and enthusiasm to our efforts to push our field forward.

I'm also proud that with the hires of Renee and Erin, more than a quarter of our faculty are women, which is well above the national average of approximately 16 percent. Excellence requires diversity; we cannot afford to neglect any fraction of the population in our efforts to attract the best faculty and students to our program. Toward this end, we have initiated a new effort aimed at making our program more effective at supporting and recruiting people from all backgrounds and orientations. A new Diversity Committee, composed of faculty, staff, and both undergraduate and graduate students, is leading the way. Keeping our workplace safer also remains a critical objective, and the continued leadership of students and postdoctoral associates in improving our culture of safety through their work on our Joint Safety Team (JST) is garnering national attention. I am excited to work with the JST and the Diversity Committee to make our department the most welcoming and openly supportive environment for all.

New Diversity Committee works on enhancing culture of openness, acceptance and support

The Department of Chemistry is committed to being an open and welcoming space for all of its students, postdoctorates, faculty, and staff. But what does that mean? How is that practiced? How can a culture of openness, acceptance, and support be enhanced?

Those are just some of the questions being considered by the department's new Diversity Committee, which was formed in June 2013. Professor Lee Penn chairs the committee, which includes Professors Philippe Buhlmann, Connie Lu and Aaron Massari, Graduate Student Rebecca Lindsey, Undergraduate Student Kadir Hussein, and Communications Coordinator Eileen Harvala.

Department of Chemistry Chair William Tolman hopes that the Diversity Committee will evaluate and assess diversity at all levels in the department. He would then like the committee to develop proposals for additional activities and initiatives aimed at improving the department's diversity, and enhancing the experiences and mentoring of people who are in underrepresented groups, are lesbian, gay, bisexual, transgender, or queer, or otherwise contribute to the diversity of the department.



Department of Chemistry Diversity Committee members are, front row, from left, Graduate Student Rebecca Lindsey, Professor Connie Lu, and Communications Coordinator Eileen Harvala. Back row, from left, Professor Aaron Massari, Undergraduate Student Kadir Hussein, Professor Philippe Buhlmann, and Professor Lee Penn.

**“... to attain excellence,
we must actively pursue
inclusiveness.”**

*—William Tolman, chair of the
Department of Chemistry*

“The drive for diversity is driven to a large extent by the simple fact that recruiting the best people requires that the pool of available candidates be as large as possible,” said Tolman. “If we are to be outstanding in all that we do, then we must be openly accepting of all the diverse people in our community; to attain excellence, we must actively pursue inclusiveness.”

Currently, committee members are asking a lot of questions by conducting research on the

diversity of the department and experiences; evaluating current activities and training that address diversity and their effectiveness; and considering possible activities and initiatives that might address some of the identified needs. This evaluation also encompasses looking at recruitment for the chemistry's educational, research, and outreach programs.

Committee members are developing a cadre of resources and possible initiatives such as looking at the need for note takers for students with limited English; conducting meet-and-greet gatherings; hosting training sessions for all members of the department; enhancing outreach activities, particularly research opportunities for high school and undergraduate students; and hosting seminars or speakers who understand the needs and hurdles facing diverse populations. Committee members

also want to serve as confidential advisers or adjudicators for people who might have concerns, conflicts, issues, or questions.

A website, www.chem.umn.edu/diversity, clearly outlines the department's commitment to excellence through diversity. That commitment is, “The Department of Chemistry is united in the belief that diversity in all of its forms is valued. Collaboration among people of all cultures and backgrounds enhances our experience as scientists and contributes to excellence in teaching, learning, and research. We strive to promote a climate that celebrates our differences and strengthens our department by embracing and working to increase our diversity.” That website also has links to resources, and outlines of the department's efforts.

Safety initiative attracts national attention due to focus on student, postdoctorate leadership

What began as a first-of-its-kind pilot safety initiative less than two years ago is now an embedded part of the culture of two departments in the College of Science & Engineering.

The Joint Safety Team (JST), which is led by graduate students and postdoctoral researchers in the departments of Chemistry and Chemical Engineering and Materials Science, continues to work hard on its efforts to improve and sustain the culture of safety in laboratories, including building safety awareness and improving safety practices. Its efforts are paying off with growing awareness, acceptance, compliance, and support. The success of this student-led initiative has gleaned university and national attention.

“It is going really well,” said Katherine “Katie” Hurley, a fourth-year graduate student in the Department of Chemistry and chair of the JST Administrative Committee. “Some of the barriers to safety have been removed. Safety is in the process of being adopted as a standard part of our culture,” she said.

The Joint Safety Team was formed more than a year and a half ago through a unique partnership with the Dow Chemical Company. The Dow Chemical Company is sharing its best-in-class laboratory safety practices, examples, advice, and resources with U of M students and postdoctorates.

Last fall, the JST launched a safety campaign focused on four key areas—CARE:

- **C**ompliance: improve compliance with lab standards on hazardous waste handling, sample and chemical storage, lab cleanliness, and the wearing of personal protective equipment (PPE);
- **A**wareness: improve awareness of safety hazards, best practices, and available resources around the theme of Safety Starts with U!;
- **R**esources: improve the quality of and access to safety resources, including the standardization of laboratory signs, development of a safety website, and PPE such as goggles, lab coats, and gloves; and

- **E**ducation: improve the training and ongoing education of laboratory safety officers and researchers.

Hurley said that this safety campaign is making a difference. “People are really conscious about

“Safety is in the process of being adopted as a standard part of our culture.”

—Katie Hurley, chair of the Joint Safety Team Administrative Committee

wearing the appropriate protective equipment in the labs; Safety Moments before all of our meetings are becoming routine; laboratory safety officers (LSOs) are more confident in their responsibilities; our laboratory inspections are now expected and accepted; and people are asking questions about safety,” she said.

One of the JST’s priority goals for 2014 is to develop and implement an incentive program designed to honor individuals and laboratories for their safety compliance and efforts. Dow Chemical Company also provided funds for new and additional safety posters that are strategically displayed in the hallways of the departments’ buildings.

Since its creation, it was hoped that what was learned from this pilot program would be shared with others at the University of Minnesota and other universities as well. Recently, the JST has been concentrating on such outreach at a variety of levels. Teams members have made presentations at the university and college levels and for other departments. They developed a comprehensive video about the JST and its work for Ohio State University. In January, Hurley will make a presentation



Members of the Joint Safety Team Administrative Committee are, from left, Katie Peterson, Ryan Knutson, Committee Chair Katherine "Katie" Hurley, Chris Smith, Alyssa McKenna (from the Department of Chemical Engineering and Materials Science), Research Safety Specialist Anna Sitek from the Department of Environmental Health and Safety, and Melissa Baudhuin.

about the JST and its initiatives at Duquesne University in Pennsylvania. In April, the JST will tell its story at a Materials Research Society meeting. Team members have also made presentations and demonstrations at schools, including the Chisago County Middle School Safety Camp.

The JST's work could serve as a blueprint to help universities across the country change their safety cultures. Department of Chemistry Chair William Tolman testified about the composition and work of the Joint Safety Team at a National Research Council meeting. The National Research Council, through its Board on Chemical Science and Technology and Board on Human Systems Integration, is examining safety in academic research laboratories. It will publish and distribute its findings, conclusions, and recommendations for improving safety in the spring of 2014.

An article about this safety initiative was published in the *Journal of Chemical Education* (DOI:10.1021/ed400305e). The abstract for

the article, "Student Involvement in Improving the Culture of Safety in Academic Laboratories," reads: "An effective way of addressing the need for an improved culture of safety in research-intensive science departments is described, which involves enabling leadership by graduate student and postdoctoral associate laboratory safety officers (LSOs). In partnership with The Dow Chemical Company, LSOs from the Departments of Chemistry and Chemical Engineering and Materials Science at the University of Minnesota formed a Joint Safety Team. With helpful input from Dow, the team has played a key role in improving the culture and practice of safety in both departments, providing support for use of this model for inculcating safety as a core value and an integral part of academic life."

"The unique approach we are taking is really catching the attention of other departments in the U.S.," said Tolman. "We are changing the culture of safety, led by the very students and postdoctorates who spend the most time working in the laboratories."

"We are changing the culture of safety, led by the very students and postdoctorates who spend the most time working in the laboratories."

—William Tolman, chair of the Department of Chemistry

This safety initiative is hard work, but the approximately 65 members of the JST are highly committed. The JST is developing a new set of safety posters with financial support from the Dow Chemical Company; its leadership team continues to streamline its work; it continues to let students know, including incoming first-year graduate students, about expectations for safety; it provides safety information to everyone in both departments through its website at <http://www.jst.umn.edu>; and it invites students and post doctorates who are interested to attend its meetings and become involved.

Other members of the JST Administrative Committee are Katie Peterson, treasurer, Ryan Knutson, website manager, Kelly Volp and Melissa Baudhuin, education and resources; and Chris Smith, public relations, who are all from the Department of Chemistry, and Alyssa McKenna, analysis and compliance, who is from the Department of Chemical Engineering and Materials Science. For additional information, send the JST an email at jst@umn.edu.

The University of Minnesota Board of Regents honored alumni Arthur J. Coury, Ph.D., and Darrel F Untereker, Ph.D., as 2013 recipients of the Outstanding Achievement Award (OAA). The OAA honors graduates who have attained unusual and noted distinction in their chosen fields, professions, and public service, and who have demonstrated outstanding achievement and leadership.

Arthur J. Coury, Ph.D.

Arthur J. Coury was honored for his outstanding contributions to biomedical device and biomaterials research and development. His prolific scientific work, extensive service to the academic and industrial scientific communities, and selfless mentoring has had a positive impact on innumerable lives.

Coury earned a doctorate in inorganic chemistry and a Master of Business Administration from the University of Minnesota. He obtained a bachelor's degree in chemistry from the University of Delaware.

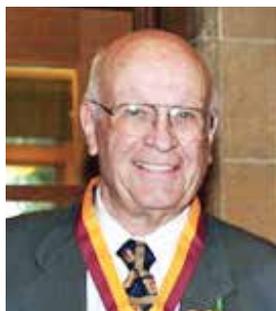
Coury's career focus has been on polymeric biomaterials for medical products such as implantable electronic devices, hydrogel-based devices, and drug delivery systems. He has held a number of senior-level biomedical positions, including senior research chemist at General Mills, Inc.; director, polymer technology and research fellow at Medtronic, Inc.; vice president, research and chief scientific officer at Focal, Incorporated; and vice president, biomaterials research at Genzyme Corporation. He holds more than 50 patents and has widely published in the field of polymeric biomaterials for medical products. Currently, he is a biomedical consultant.



Arthur J. Coury

His teaching positions have included adjunct appointments at the University of Minnesota and the Harvard-MIT Graduate Program in Health Sciences and Technology. His professional service has included: chair, Minnesota Section, American Chemical Society (1989-1990); president, Society for Biomaterials, USA (1999-2000); president, American Institute for Medical and Biological Engineering (2003-2004); and membership on several university, society, and corporate advisory boards.

Coury has received many honors for his contributions to science and biomaterials research. His recent recognitions include being inducted into the National Academy of Engineering in 2009, and being inducted as a Fellow of the American Chemical Society in 2011. He received the 2012 Pierre Galletti Award of the American Institute for Medical and Biological Engineering, the 2012 Founders Award of the Society for Biomaterials, and the 2007 Innovation and Technology Development Award of the Society for Biomaterials. In 2007, he was named one of the "100 Notable People in the Medical Device Industry" by the Medical Device & Diagnostic Industry magazine.



Lester C. Krogh, Ph.D.

Lester C. Krogh, Ph.D., 1925-2013

Lester Christensen Krogh, Ph.D., a chemical engineer, chemist, and long-time 3M employee who shared his passion for chemistry by endowing two chemistry fellowships, died on Friday, January 25. He was 87.

Krogh earned his doctorate in chemistry at the University of Minnesota in 1952. He earned his engineering degree from the University of Nebras-

ka at Lincoln. For 38 years, he was a leader and senior vice president of research and development at 3M.

In 1984, the University of Minnesota Board of Regents honored Krogh with an Outstanding Achievement Award. This award honors graduates who have attained unusual and noted distinction in their chosen fields, professions, and

ing Achievement Awards

Darrel F. Untereker, Ph.D.

Darrel F. Untereker was honored for his outstanding contributions to and leadership of efforts to develop medical devices that improve the health of millions of people, his service to the University of Minnesota and its Department of Chemistry, and his expertise, problem-solving skills and management effectiveness that has been instrumental to the growth of Minnesota-based Medtronic, Inc.

Untereker received his undergraduate chemistry degree from the University of Minnesota in 1967, which was followed by two years of post-graduate work in analytical chemistry at the university. He received a doctorate in chemistry from the University of New York at Buffalo in 1973, under the tutelage of Professor Stanley Bruckenstein, who was a professor in the Department of Chemistry at the University of Minnesota from 1955 to 1968. Untereker followed that with post-doctoral work in

surface science at the University of North Carolina. He also earned a CER in Business Administration from Stanford University.

In 1976, Untereker joined Medtronic, Inc., where he is the vice president of Corporate Research and Technology, and a Senior Technical Fellow. In his 37 years as a scientist and technical leader at Medtronic, Inc., he has played key roles in the development of a myriad of technologies critical for medical devices. He has worked on lithium batteries, electrochemical sensors, and iontophoretic drug delivery systems. He has led polymer, electrochemical and metallurgical science groups that use materials science and biomedical engineering to design implantable medical devices. Since 1995, he has been involved in and, ultimately, has led a corporate engineering sciences group that focuses on troubleshooting, problem solving and problem prevention in all Medtronic businesses



Darrel F. Untereker

Untereker has more than 60 publications in several fields as well as 40 patents. He has received many honors, awards, and accolades for his contributions to the scientific community, for his service on industrial advisory boards, for his engineering achievements and service, and for his mentoring of younger scientists and engineers. His awards include the Medtronic Star of Excellence, the Medtronic Out-

standing Initiative Award, and election to the Bakken Society, the highest technical honor in Medtronic (named for Earl Bakken, the founder of Medtronic). He is a Fellow in both the Electrochemical Society (ECS) and the American Institute for Medical and Biological Engineering (AIMBE). He is a 2006 winner of the Charles W. Britzius Distinguished Engineer Award for lifetime achievement in and service to the profession of engineering.

Untereker also gives generously of his time to the University of Minnesota, serving on the IPRIME Advisory Board, presenting numerous lectures and workshops, and mentoring young scientists and engineers. He also has served as a judge for the Department of Chemistry's Third-Year Graduate Student Research Symposium.

“Darrel has a career filled with major accomplishments in science, engineering, and business along with major services to those communities.”

*—Professor Stanley Bruckenstein,
University of Buffalo*

public service, and who have demonstrated outstanding achievement and leadership. The University also honored him with an Honorary Doctor of Science Degree.

Krogh was active in many science organizations, including being a member of the American Chemical Society for more than 50 years. He served on many advisory boards with the University of Minnesota and University of Nebraska. He was a trustee of Mendeleev Institute of

Chemical Technology, Moscow Russia; active in technology transfer, serving on many small company boards; elected to the National Academy of Engineering, and received Earle B. Barnes and Senior Chemists Awards from the American Chemist Society.

Because of his passion for chemistry and his commitment to the University of Minnesota, he and his wife Joan established the Lester C. and Joan M. Krogh Endowed Fellowships—two

fellowships that give financial support to chemistry students in the College of Science and Engineering's Department of Chemistry.

Krogh was preceded in death by his first wife Rosa C. Krogh and parents Clarence and Clara Krogh. He is survived by wife Joan, daughter Christine L. Brown (Baird), and son Charles J. Krogh (Beth Hudson); four grandchildren; and two great-grandchildren.

Ertem receives Award for Doctoral Thesis Excellence

Mehmed Zahid Ertem, Ph.D., received the Department of Chemistry's Award for Doctoral Thesis Excellence for a thesis completed in 2012.

Ertem received his doctorate in chemistry from the University of Minnesota in 2012, working with his adviser Professor Christopher Cramer. Currently, Ertem is a post-doctoral research associate at the Department of Chemistry at Yale University, and the Department of Chemistry at the Brookhaven National Laboratory under the guidance of Professors Victor Batista and John Tully.

"I am thrilled to be the recipient of the Award for Doctoral Thesis Excellence," said Ertem.

"I still can not believe that five years passed so quickly. Overall, my experiences here at University of Minnesota were really amazing and I need to thank my adviser Professor Cramer, my fellow graduate students, post-doctorates, friends, and family for everything," he said.

Before coming to the University of Minnesota, Ertem earned his bachelor's degree with a double major in chemistry, and molecular biology and genetics from Bogazici University, and a master's degree in chemistry from Bogazici University. He also earned a master's degree in chemistry from the University of Minnesota.

"The Department of Chemistry offers a very strong graduate program and I found it to be both intellectually and personally rewarding," said Ertem. "During my graduate work at Minnesota, I studied the computational modeling of small molecule activation by transition metal based catalysts, and especially focused on catalysts involved in oxygen activation and water oxidation. In future, I am planning to work on developing computational methods and applying them for modeling several components of

artificial photosynthetic systems. I am also willing to pursue a tenure-track faculty position, hopefully, in the United States," he said.

The Award for Doctoral Thesis Excellence is designed to honor outstanding Department of Chemistry graduate students for their doctoral thesis research. A committee of faculty members evaluated all of this year's award candidates. Ertem's thesis research stood out as the very best in the group of outstanding thesis packages. Committee members also awarded an honorable mention to Melissa Maurer-Jones, Ph.D., from the Christy Haynes research group. The best thesis award includes a \$500 honorarium and an invitation to present post-doctoral research results at a future Department of Chemistry seminar.

Malcolm MacKenzie Renfrew, 1910-2013

Alumnus **Malcolm MacKenzie Renfrew** died on Saturday, October 12, 2013, his 103rd birthday, in Moscow, Idaho. He earned his doctorate



Malcolm Renfrew, Ph.D.

in chemistry from the University of Minnesota in 1938. In 1977, he received an Outstanding Achievement Award—the university's highest alumni honor.

Renfrew was born, October 12, 1910, in Spokane, Washington. He grew up in Colfax, Washington, and Poflatch, Idaho. He earned his bachelor's and master's degrees in chemistry from the University of Idaho. While at the University of Idaho, he met and married Carol Campbell. In 1938, they moved to New Jersey, where DuPont employed him in research on new plastics. He was involved in the development of Teflon

and made its first public presentation at the national meeting of the American Chemical Society (ACS) in 1946. He later became director of chemical research and development for General Mills, Inc. in Minneapolis and for Spencer Kellogg and Sons in Buffalo, New York.

In 1959, the Renfrews returned to Moscow, where Malcolm headed the physical sciences department of the University of Idaho. He later chaired the chemistry department and officially retired as professor emeritus of chemistry in 1976. In semi-retirement, he served the university as patent director and executive vice president of the Idaho Research Foundation.

Renfrew was professionally active in the ACS (Fellow), holding offices in three different divisions, and representing the Washington-Idaho Border Section in the national council. During a sabbatical leave in 1967, he was a staff member of the National Science Foundation-sup-

in MEMORIUM

ported Advisory Council on College Chemistry at Stanford University, and for some years continued responsibilities as director of the College Chemistry Consultants Service. He also served as safety editor of the *Journal of Chemical Education* and for four years was a member of the National Research Council's Materials Advisory Board. Malcolm was a member of the American Association for the Advancement of Science (Fellow), the American Institute of Chemical Engineers, the Society of Chemical Industry (Brit), Sigma Xi, and Phi Beta Kappa.

His many honors included awards for teaching by the ACS Northeastern Section and the Manufacturing Chemists Association, and the ACS Santa Clara Valley Section Award honored his service to the Society. Upon his retirement, the University of Idaho awarded him an honorary Doctor of Science degree. The ACS Chemical

[continued on page 27](#)

Graduate students *continued from page 1*

Miranda, a fifth-year graduate student, working under the tutelage of Professors Marc Hillmyer and William Tolman. It provides opportunities to interact with other researchers with varying skill sets as well as instills the importance of communication and networking for success,” she said.

Rudisill said that his research projects have been highly collaborative, enabling him to work with mechanical, electrical, and biomedical engineers. “It has been quite eye-opening to see how differences in expertise cause people to approach problems from completely different angles,” he said. “The number one lesson I’ll take away from graduate school is how important cross-disciplinary collaboration and effective team management is for solving problems efficiently.”

Graduate students also have access to state-of-the-art research equipment and technology. It is a dividend that they hope will pay off when searching for positions in industry or academia.



Paul "Alex" Rudd checks an experiment he is working on.

acterization work for them, or simply suggesting methods to get particular information out of a sample. Having a broad background in characterization also means I’ve been able to learn about the many different research projects my colleagues work on. “

“The number one lesson I’ll take away from graduate school is how important cross-disciplinary collaboration and effective team management is for solving problems efficiently.”

—Stephen Rudisill

“I’ve really enjoyed the opportunity to learn the variety of materials characterization techniques we have available at the university,” said Rudisill. “Not only has this made me a more versatile researcher, but it has also allowed me to help out my fellow graduate students, whether by undertaking some char-

Not surprising, the graduate students appreciate the opportunities to share their research with others including as authors of papers published in prestigious scientific journals and to present their research at conferences or at poster sessions; to participate in outreach programs, and to be engaged in a variety of leadership activities.



Katherine "Katie" Hurley

**Katherine
"Katie" Hurley**

Fourth-year graduate student

*Adviser: Professor
Christy Haynes*

*Bachelor's degree:
Carthage College,
Kenosha, WI*

Fellowships/Honors/Awards: National Science Foundation Graduate Research Fellowship Program fellowship; Agnes Hansen Travel Award, Xi Chapter of Graduate Women in Science; Beaker and Bunsen Award, Third Year Graduate Student Research Symposium; Mary Haga Travel Award, Xi Chapter of Graduate Women in Science; American Chemical Society Travel Award for the fourth EuCheMS Chemistry Congress in Prague, Czech Republic; and invited talk for Cancer Nanotechnology Conference at Dartmouth College, “Effects of Mesoporous Silica Coating on the Transverse Relaxivity of Iron Oxide Nanoparticles.”

Future plans: During my time in graduate school, I have learned that my favorite part of the scientific process is communicating my results, particularly to those without expertise in my field. Therefore, I want my career to be heavy on communication and teaching, but the specifics are still coming together. I would love to be a professor at a liberal arts college, especially because I want to reach out to students who will not major in chemistry. I want to make their required science classes as useful as possible and help them to develop into scientifically literate members of the public. I could also see myself working in a job as an editor for a scientific journal, a science writer for a magazine, or a scientific adviser for policy-makers.



Maria Miranda

Maria Miranda

Fifth-year graduate student

Advisers: Professors Marc Hillmyer and William Tolman

Bachelor's degree: Boston University, 2009, working with Professor Linda Doerrer

Fellowships/Honors/Awards: Department of Chemistry Krogh/Block Grant Fellowship, National Science Foundation Graduate Research Fellowship, and Louise T. Dossdall Fellowship for women in underrepresented departments across the University of Minnesota. Recipient of two travel grants: one for outstanding research and exemplary presentation at the 2012 Graduate Student Research Symposium and another from the Xi Chapter of Graduate Women in Science.

Future plans: Currently looking for jobs in industry.



Paul "Alex" Rudd

Paul "Alex" Rudd

Fifth-year graduate student

Adviser: Professor Connie Lu

Bachelor's degree: Emory University in Atlanta, GA

Fellowships/Honors/Awards: Won the competitive travel grant from the American Chemical Society (ACS) Division of Inorganic Chemistry for travel to the 2013 spring American Chemical Society conference in New Orleans, and the university's Doctoral Dissertation Fellowship. I've also published several first author papers in the *Journal of the American Chemical Society* (2011), *Angewandte Chemie* (2013), and the *European Journal of Inorganic Chemistry* (2013).

Future plans: I'm primarily applying for industrial research and development, although, I'm also on the lookout for interesting postdoctoral positions at national laboratories.



Stephen Rudisill

Stephen Rudisill

Fifth-year graduate student

Adviser: Professor Andreas Stein

Bachelor's degree: Beloit College (first came to the University of Minnesota as an Research Experience for Under-

graduates student in 2008 in the Department of Electrical & Computer Engineering

Fellowships/Honors/Awards: 2013 Doctoral Dissertation Fellowship, and presenting a winning talk at the 2012 Third Year Graduate Student Research Symposium.

Future plans: After graduation, I plan on working in industrial research and development. I'd like to find work on developing alternative/sustainable energy production solutions, as I feel that's the most pressing technical problem on the planet right now. The main project I worked on for my first four years was on solar production of chemical fuels, which has given me both a broad understanding of the field, and some nitty-gritty details about catalysis, efficiency, and scale-up.



Rebecca Lindsey

Rebecca Lindsey

Fourth-year graduate student

Adviser: Professor Ilja Siepmann

Bachelor degree: Wayne State University

Fellowships/Honors/Awards: National Science Foundation travel grant to attend the PASI-3MS workshop on multiscale molecular modeling in Montevideo, Uruguay; awarded third place at the annual American Institute of Chemical Engineers (AIChE) Student Conference for poster presentation on energetic materials remediation research; and scholarships and research grants at Wayne State University.

Future plans: Although I'm still in the process of "figuring out" precisely what I want to do upon graduation, the ultimate goal is to obtain a teaching position in which I can also conduct research.

“Volunteering at outreach events provides an excellent avenue to both share my excitement for science and to get involved in the local community.”

—Rebecca Lindsey

Miranda is active with outreach activities through the Women in Science & Engineering (WISE) group and through her research with the Center for Sustainable Polymers. She also is active with a number of outreach projects ranging from helping middle school girls perform science experiments to developing exhibits for the EcoExhibit at the Minnesota State Fair.

For Rebecca Lindsey, a fourth-year graduate student working with Professor Ilja Siepmann, outreach and volunteering is one of her priorities, including serving on the department's new Diversity Committee (see story on page 3). “Outside of the typical graduate student activities, I have really enjoyed all of the opportunities for outreach through organizations like WISE and AMS (Association of Multicultural Scientists), just to name a few,” she said. “Volunteering at outreach events provides an excellent avenue to both share my excitement for science and to get involved in the local community.”

Hurley and Rudd have been active in leadership roles with the Joint Safety Team, a hard-working group of graduate students and post-doctorates dedicated to improving the department's culture of safety (see story on page 4).

“Probably the most formative experience I've had here was the start of the Joint Safety Team last year, after a personal, near-miss incident,” said Rudd. “It was really gratifying

that people from two departments and incredibly diverse backgrounds were willing to spend the time and make the effort to make our labs a better place to work. Improving lab safety is a never-ending process that takes sustained effort, but I was impressed at how people immediately stepped up and devoted much of their scant free time toward the grueling process of developing a new system from scratch.”

Hurley has added to her leadership skills because of her experiences with the JST. “I have learned how to guide a group of very busy volunteers to make big cultural changes,” she said. “In particular, I have learned the importance of delegating tasks to raise up new leaders and of implementing change at a measured pace to avoid burnout.”



Katherine “Katie” Hurley conducts research in the laboratory.

addition to understanding what needs to be done in order to accomplish my goals,” said Lindsey. Other resources and opportunities that have been helpful to her are the career workshops conducted by organizations such as the Graduate Student Workshop Committee and AMS, and the frequent opportunities to meet with seminar speakers.

“While here, I have learned the specifics of my research project, but I have also been trained on grant writing, research publication, and mentoring,” said Hurley. “My adviser is particularly good at making sure that her students have these skills before they leave, ensuring that they will be able to enter the workforce with both scientific knowledge and leadership potential.”

This support, advice and tutelage are invaluable to those about to receive their doctorates. “I’ve received invaluable support from both my advisers as well as the department, which has boosted my confidence when entering the job market,” said Miranda. “The industrial recruiting effort in the department is unique and provides graduates from the department an ‘in’ that otherwise would be very difficult to obtain. I think the collaborative spirit and reputation of the department also is a huge help to finding jobs. Because of the collaborations I’ve participated in, I can clearly illustrate my ability to work on teams and work with others, which I hope to be helpful in landing a job in industry.”

“I’ve received invaluable support from both my advisers as well as the department, which has boosted my confidence when entering the job market.”

—Marie Miranda

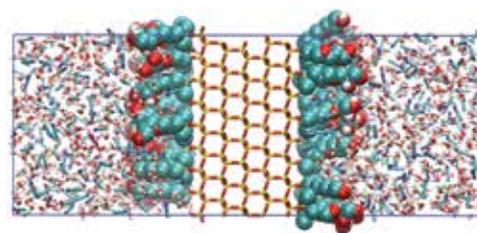
Do the graduate students think that the department has prepared them well for whatever the future holds? Yes, was the typical response. In a large part, this is due to the tutelage of their advisers, which goes beyond the ability to conduct meaningful research and convey that research in papers and poster sessions.

“Candid discussions with my adviser and other faculty in the department have been very helpful in deciding on a career path in

Their Research

Rebecca Lindsey

Broadly speaking, my research interests are in the area of chemical separations and algorithm development in molecular simulation methods. Chromatography has been a ubiquitous method for chemical separations for several decades; however, due to the complex nature of these systems, relatively little is known about the molecular mechanisms behind solute retention events. Most of my research efforts are focused on describing the retention mechanisms in these systems. Specifically, my research focuses on Hydrophilic Interaction Liquid Chromatography (HILIC), a method geared toward the separation of polar molecules such as those found in pharmaceuticals. To do so, I leverage molecular simulation in order to provide a virtual window into these complex chemical systems. From these simulations information pertaining to the structures, dynamics, and thermodynamics governing retention can be obtained, which is particularly valuable for the design of new column technologies.



The figure shows the simulation system, which uses a slit pore model. This system consists of a silica support with a diol stationary phase grafted to the surface as well as freely floating water and acetonitrile molecules, which act as the mobile phase. The colors yellow, red, teal, white, and blue correspond to silicon, oxygen, carbon, hydrogen, and nitrogen molecules respectively.

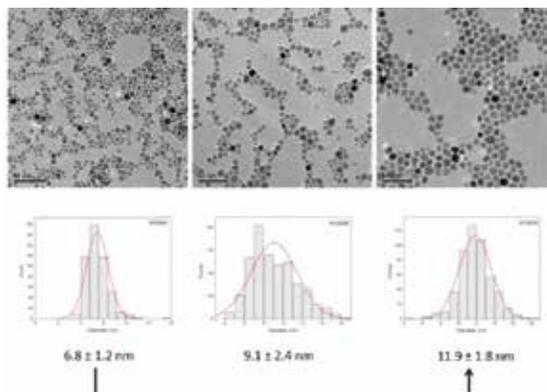
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Research *continued from page 12*

Katherine "Katie" Hurley

In Professor Christy Haynes group, I work with various types of nanoparticles for biomedical applications. Primarily, I work with iron oxide nanoparticles, which are magnetic and can therefore be used as MRI contrast agents or as heating agents for heat therapy. I also work with mesoporous silica nanoparticles, which have extremely high surface areas and pore volumes, making them promising candidates for drug delivery vehicles.

My work involves the synthesis, characterization, and application of these materials. My favorite part is the characterization. I love being able to investigate a sample in detail and know as much as possible about it.



In one of my research projects, I am using my synthesis and characterization skills to help develop a more fundamental understanding of how iron oxide nanoparticles can produce heat. When placed in an alternating magnetic field, magnetic nanoparticles like iron oxide will generate heat. The amount of heat generated seems to be related to specific material properties, but thus far there is no consensus regarding what parameters are the most important. All we know now is that particle anisotropy (shape, size, orientation of magnetic axis, etc.) plays a role. I am synthesizing monodisperse iron oxide nanoparticles of varying diameters with the same crystalline structure and coating, then working with a collaborator to determine their heating effectiveness. We hope to experimentally supplement a theory that claims there will be a large increase in heating ability at a certain diameter.

Maria Miranda

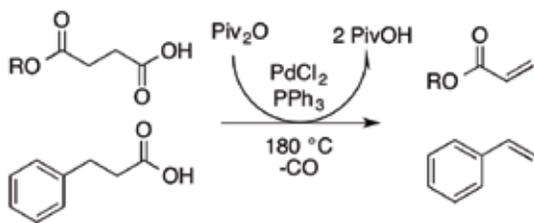


Figure 1. Reaction scheme for the synthesis of bio-derived alkene monomers.

chemistry to synthesize high volume commodity monomers from renewable resources. For the second project, we utilized Pd precursors and phosphine ligands to decarbonylate (CO loss) plant-derived carboxylic acids to terminal alkene monomers like styrene, alkyl acrylates and acrylonitrile. Synthesizing these alkene monomers from renewable resources is of key interest because traditionally these monomers are derived from petrochemicals. Our method has the advantage of being catalytic, neat (no solvent), high-yielding (>80% yield), scalable (up to 50 g per batch) and robust (air, moisture, functional group tolerant).

My research interests are focused on developing renewable materials using catalytic chemistry, and studying the mechanisms by which these catalysts operate. I have two major projects under this umbrella; one aims to understand the mechanism by which renewable cyclic ester monomers are polymerized into degradable polyesters using metal alkoxide catalysts, and the other is focused on using catalytic

Professor Andreas Stein

Supercapacitors are charge storage devices that typically have higher power densities but lower energy densities than rechargeable batteries. To increase the energy density, one can enlarge the interfacial area between electrodes and electrolyte through the introduction of nanopores and employ electrolytes that are stable over wider voltage ranges, such as ionic liquids. However, due to the relatively high viscosity of ionic liquids and large ion sizes, these measures can result in diminished power performance. Our team developed carbon electrodes that overcome these limitations and simultaneously provide high specific energies and high specific powers in EDLCs using the ionic liquid EMI-TFSI as an electrolyte. A colloidal crystal templating method was optimized to synthesize three-dimensionally ordered mesoporous carbons with well-defined geometry, three-dimensionally interconnected pore structure, and tunable pore size in the range from 8 to 40 nm, suitable for supercapacitors with high power and energy densities. Vu, A.; Li, X.; Phillips, J.; Han, A.; Smyrl, W. H.; Buhmann, P.; Stein, A. "Three-Dimensionally Ordered Mesoporous (3DOm) Carbon Materials as Electrodes for Electrical Double-Layer Capacitors with Ionic Liquid Electrolytes", *Chem. Mater.* **2013**, in press. dx.doi.org/10.1021/cm300915p

Professor Christopher Cramer

Professor Christopher Cramer and student Mehmed Zahid Ertem (Ph.D. 2012) worked with University of Wisconsin collaborator Shannon Stahl and his student Alison Suess to explain a remarkable change in mechanism, depending on acidic or basic reaction conditions, observed for green C-H bond oxidations accomplished by copper-mediated activation of molecular oxygen. Suess, A., Ertem, M.Z., Cramer, C., Stahl, S., Divergence between Organometallic and Single-Electron-Transfer Mechanisms in Copper(II)-Mediated Aerobic C-H Oxidation, *J. Am. Chem. Soc.* **2013**, 135, 9797-9804. dx.doi.org/10.1021/ja4026424

continued on page 14

research being conducted by our student, postdoctoral, and faculty researchers.

Professor Christy Haynes

The interaction of TiO₂ nanoparticles with a bacterial cell model was characterized in an effort to gauge the potential environmental impact of these materials. Minimal acute toxicity was observed, but cell functions relevant to the cooperative function of these bacteria in natural environments were altered. This work shows that acute toxicity assessment alone is insufficient to determine the impact of nanomaterial exposure on biological systems, and suggests the need for more sensitive measures of nanomaterial toxicology. Impact of TiO₂ Nanoparticles on Growth, Biofilm Formation, and Flavin Secretion in *Shewanella oneidensis*, Maurer-Jones, M.A., Gunsolus, I., Meyer, B., Christenson, C., and Haynes, C.L. *Analytical Chemistry*, 85(12) 5810-5818 (2013).

Professor Marc Hillmyer

Using a simultaneous block polymerization/in situ cross-linking from a heterofunctional initiator approach, Myungeon Seo, Ph.D., and Christopher Murphy working with Professor Marc Hillmyer produced a nanostructured and cross-linked block polymer in a single step from a ternary mixture of monomers and used it as a precursor for a cross-linked nanoporous material. *ACS Macro Letters* 2013, v2, p617.

Professor Thomas Hoye

A team of researchers in Professor Thomas Hoye's laboratories, composed of Dawen Niu, Pat Willoughby, Brian Woods and Beeru Baire, has uncovered a new type of transformation. They reported in *Nature* (doi:10.1038/nature12492) that reactive benzyne derivatives, formed by the hexadehydro-Diels-Alder (HDDA) reaction (doi:10.1038/nature11518), will abstract two hydrogen atoms from a saturated alkane to produce the corresponding alkene (via oxidation) and benzenoid (via reduction) disproportionation products. Mechanistic and computational studies all point to the involvement of a concerted dihydrogen transfer event via a planar transition structure geometry. The investigators comment, "We are not aware of any single-step, bimolecular reaction in which two hydrogen

atoms are simultaneously transferred from a saturated alkane." Alkane desaturation by concerted double hydrogen atom transfer to benzyne, Niu, D.; Willoughby, P.H.; Baire, B.; Woods, B. P.; Hoye, T. R. *Nature* 2013, 501, 531-534. (doi:10.1038/nature12492)

Professor Steven Kass

Hydrogen bond networks in conjunction with electron withdrawing groups were to lead to strong acids, effective hydrogen bond catalysts, and anion molecular receptors. Shokri, A.; Wang, X. B.; Kass, S. R. "Electron-Withdrawing Trifluoromethyl Groups in Combination with Hydrogen Bonds in Polyols: Brønsted Acids, Hydrogen-Bond Catalysts, and Anion Receptors", *J. Am. Chem. Soc.* 2013, 135, 9525-9530.

Oops! All chemists for the past 50 years have been taught that cyclopropenyl anion is antiaromatic, but this turns out be wrong! 121. Kass, S. R. "Cyclopropenyl Anion: An Energetically Nonaromatic Ion", *J. Org. Chem.* 2013, 78, 7370-7372.

An invited review in a special issue on reactive intermediates was written by Professor Kass on carbanions in the gas phase. 122. Tian, Z.; Kass, S. R. "Carbanions in the Gas Phase", *Chem. Rev.* 2013, 113, 6986-7010.

Regents Professor Timothy Lodge

Here we show how to prepare ion gels, which are polymer networks swollen with ionic liquids, that combine the advantages of "physical gels" and "chemical gels". The former can be easily processed, and recycled, but at a cost in terms of mechanical strength. The subsequent introduction of covalent crosslinks reinforces the material once it has been fabricated into a device, such as an organic transistor or a gas separation membrane. "High Toughness, High Conductivity Ion Gels by Sequential Triblock Copolymer Self-Assembly and Chemical Crosslinking", Y. Gu, S. Zhang, L. Martinetti, K. H. Lee, L. D. McIntosh, C. D. Frisbie, and T. P. Lodge, *J. Am. Chem. Soc.*, 135, 9652-9655, (2013). <http://dx.doi.org/10.1021/ja4051394>

Regents Professor Lawrence Que Jr.

In our project to design bio-inspired iron catalysts for olefin oxidation using environmentally hydrogen peroxide as the oxidant, we have for a long time been interested in determining the key intermediate in these reactions. Toward this end, we finally obtained convincing kinetic data demonstrating that the rate determining step involves the water-assisted heterolytic cleavage of the O-O bond of an Fe(III)-OOH intermediate. Oloo, W. N.; Fielding, A. J.; Que, L. Jr., *J. Am. Chem. Soc.* 2013, 135, 6438-6441 (<http://dx.doi.org/10.1021/ja402759c>)

In our high-valent diiron project, we demonstrated that a high-potential diiron(IV) complex can oxidize water by a proton-coupled electron transfer mechanism. The water oxidation rate was found to be second order in water concentration and exhibit a kinetic isotope effect of 2.4. Unlike for other water oxidation results, the water oxidation product in this reaction is the hydroxyl radical, so only one-electron oxidation occurs. The factors that make this system different from the others will help in the design of efficient water oxidation catalysts. Wang, D.; Que, L., Jr., *Chem. Commun.* 2013, online (<http://dx.doi.org/10.1039/C3CC46391E>)

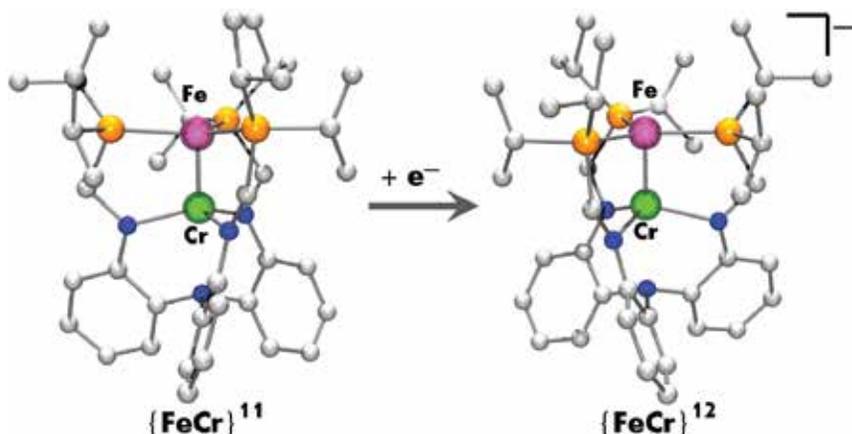
Professor Theresa Reineke

The Reineke Group has developed a new "sugar-coating" for nanomedicines (poly(trehalose)), which facilitates stable encapsulation of siRNA and promotes highly effective cellular delivery. This is currently being researched as an alternative to polyethylene glycol, the conventional stealth coating. *J. Am. Chem. Soc.*, 2013, 135, 15417-15424.

Researchers in the Reineke Group have also recently discovered that nanomedicines consisting of DNA encapsulated into nanoparticles by polymers are taken into mammalian cells and actively trafficked within the cellular environment in a similar manner to viruses. *ACS Nano*, 2013, 7, 347-364.

Research *continued from page 12*

Paul "Alex" Rudd



My research interests have centered on the modular synthesis of metal-metal bonds, including electronic structure and reactivity. In addition to my current research projects, I'm also quite interested in chemistry of f-block elements, especially uranium. William "Bill" Evans gave a seminar here a few years ago regarding how to blaze a new trail in science, and new f-block chemistry of the last few years has vindicated his belief that new, unexpected, and useful chemistry would come out of these elements. If I could start a new project tomorrow, it would involve the coordination of chemistry and reactivity of uranium complexes!

My research projects all involve the systematic synthesis and study of metal-metal bonds: our fundamental goal is to be able to predict the properties of a metal-metal bond before we make it. With that knowledge in hand, we hope to be able to predict what types of chemical reactions different metal-metal bonds can facilitate, ultimately offering a rational tool to help guide the study of reactive transition metal complexes. In this vein, one of my current projects involves the reduction of dinitrogen at an iron center. Biological nitrogen fixation occurs at a multi-iron site at room temperature, but homogenous chemistry has been largely unable to replicate this impressive feat, which requires a six-electron reduction of dinitrogen to generate two ammonia molecules. We have previously demonstrated the partial reduction of dinitrogen with an iron-aluminum complex, which is capable of breaking the strong double and triple bonds of the typically inert dinitrogen triple bond with only a single iron center. Current research efforts are focused on the final two-electron step, which we believe is accessible, that is required to cleave the remaining single bond in this complex. Complementary efforts are underway to synthesize iron complexes with other group thirteen elements (i.e., B, Ga, In) to quantitatively determine the influence of the second metal center.

continued on page 20

Fellowships

Robert and Jill DeMaster Fellowship—Gary Bondarevsky and Emily Keller

Wayland E. Noland Outstanding Graduate Teaching Fellowship—Sarah Wegwerth

Graham N. Gleysteen Fellowship in Chemistry—Laura Clouston and Haoyu Yu

Lester C. and Joan M. Krogh Endowed Fellowship—Rebecca "Becca" Mackenzie

Graham N. Gleysteen Fellowship in Chemistry—Seyedeh Moloud "Maral" Mousavi and Haoyu Yu

John Wertz Fellowship in Chemistry—Jennifer "Jen" Strehlau

Phillips 66 Fellowship—Pragya Verma

Wayland E. Noland Fellowship—Tao Wang and Evan Weitz

American Heart Association Fellowship—Kailey Soller

2013-14 Interdisciplinary Doctoral Fellowship—Amanda Stemig

Torske Klubben Fellowship—Ian Gunsolus

Robert C. Brasted Memorial Fellowship—Mariana Haj

Heisig/Gleysteen Chemistry Summer Research Program fellowships—Daniel Bakke, Vincent Brinker, RiAnna Butler, Meijie Cheng, Michael Cibuzar, Maya Cutkosky, Jacob Edwards, Mariana Haj, Matt Hauwiller, Lindsay Hegner, Shyam Rajan Iyer, Michelle Johnson, Jacob Kautzky, Lingxun Kong, Quang Luu Nguyen, Maximilian Margherio, Adam Matula, Drew Maurine, Kelsey McCoy, Kara Meyers, Matthew Miller, Frances Morris, Michael Neaton, William Ogden, Kyle Pribyl, Srijay Rajan, Advait Rau, Alexander Reath, Kyle Senger, Hannah Skopec, Dylan Walsh, and Haini Zhang

Doctoral Dissertation Fellowships—Makenzie Provorse, Gregory Rohde, Paul “Alex” Rudd, Stephen Rudisill, Stephen Tereniak, Kelly Volp, Yen-Chih Wang, and Xu Zou

2013 National Science Foundation (NSF) Graduate Research Fellowship Program honors—Joseph Buchman, Laura Clouston, Heidi Nelson, Ivan Spector, and Bridget Ulrich

2013-14 Louis T. Dosdall Fellowships—Maria Miranda and Katie Peterson

Scholarships

David A. and Merece H. Johnson Scholarship—Jacob Edwards, Matt Hauwiler, and Dylan Walsh

George T. Walker Scholarship—Shyam Rajan Iyer, Lingxun Kong, Adam Matula, and Kyle Senger

Lloyd W. Goerke Scholarship—Quang Luu Nguyen

Auzns Scholarship—Kara Meyers and Matthew Styles

Andrews Scholarship—Erin Hill, Megan Magee, and Maximillian Margherio

M. Cannon Sneed Scholarship—Katherine Ziebarth

Thomas DuBruil Memorial Award—Daniel Bakke and Vignesh Palani

Betty A. Lewis Scholarship—Tenley Brown, Kelsey McCoy, and Megan Magee

Sally Herz Memorial Scholarship—Matthew Hunt

Jane B. Spence Scholarship—Sammy Shaker



The Heisig/Gleysteen Chemistry Summer Research Program participants were front row, from left: Hannah Skopec, Jacob Kautzky, Kara Meyers, Vincent Brinker, Moriana Haj, Maya Cutkosky, Michelle Johnson, Matthew Miller, Drew Maurine, Adam Matula, Kelsey McCoy, Lindsay Hegner, and Meijie Cheng. Back row, from left: Michael Neaton, Advait Rau, Jacob Edwards, Dylan Walsh, Matt Hauwiler, Lingxun Kong, Maximilian Margherio, Quang Luu Nguyen, Kyle Senger, and William Ogden. Not pictured: Daniel Bakke, RiAnna Butler, Michael Cibuzar, Shyam Rajan Iyer, Frances Morris, Kyle Pribyl, Sryjay Rajan, Alexander Reath, and Haini Zhang.

Individual Awards

Robert C. Brasted Outstanding Undergraduate Teaching Assistant Award—Nathan “Nate” Bodette

Robert L. Ferm Outstanding Graduate Teaching Assistant Award—Laura Fox

4.0 Grade Point Averages—Tiannan Chen, Suyue Chen, and Shaohong Li

Beaker and Bunsen Third Year Graduate Student Research Symposium honors—Katherine “Katie” Hurley, Mayank Puri, Amanda Stemig, and Ellis Warner

Undergraduate Award in Analytical Chemistry sponsored by the Division of Analytical Chemistry of the American Chemical Society—Francis Morris

J. Lewis Maynard Memorial Prize in Advanced Inorganic Chemistry Award—Jacob Edwards and Yue Wu

2012 Overend Award for Graduate Research in Physical Chemistry—Alireza Shokri and Bess Vlavisvljevich

2013 Overend Award for Graduate Research in Physical Chemistry—Peng Bai and Daniel O’Brien

Procter & Gamble Best Poster Award (arranged by Ravi Ranatunga)—Philippe Buhlmann research group

Department of Chemistry Award for Doctoral Thesis Excellence—Mehmed Zahid Ertem, Ph.D.

We are grateful to the generosity of these donors who are supporting talented and deserving chemistry students through scholarships, fellowships, and awards.

Two chemistry professors promoted

Two Department of Chemistry professors were promoted in 2013. Philippe Buhlmann was promoted to full professor, and Aaron Massari was promoted to associate professor with tenure.

Philippe Buhlmann

Philippe Buhlmann joined the Department of Chemistry faculty at the University of Minnesota as an assistant professor in September 2000. He received tenure in 2006 and was promoted to associate professor. He was promoted to full professor in May 2013. He currently is the Director of Graduate Studies for the Department of Chemistry.

Buhlmann completed his undergraduate and graduate studies in Professor Wilhelm Simon's group at the Swiss Federal Institute of Technology Zurich in Switzerland. He earned his doctorate in 1993. Subsequently, he did postdoctoral studies at the University of Tokyo with Professor Yoshio Umezawa, as a postdoctoral fellow of the Japanese Society for the Promotion of Science. From 1994 to 2000, Buhlmann was an assistant professor in the Department of Chemistry, School of Science, at the University of Tokyo. Since 1993, he has published more than 100 scientific articles.

The common theme of the research activities in the Buhlmann group is the application of

molecular recognition and, in particular, the use of synthetic receptors for chemical sensing in complex real-life environments. One goal of his research is the development of chemical sensors that put receptors to their most effective use, permitting the selectivities and detection limits required for real applications, and providing maximum input for the rational development of new receptors. A second goal is the development of new strategies that permit the use of robust chemical sensors that excel not only in the laboratory but withstand the harsh conditions of long term monitoring, e.g., in the environment, in industrial process control, or upon implantation into the human body. In pursuit of these goals, the Buhlmann group has been pushing the limits of fluoros chemistry, explored new applications of carbon nanomaterials, developed plasticized perfluoropolymer membranes, and demonstrated the application of novel receptors that provide for unprecedented selectivities, detection limits, and long term signal stability.



Philippe Buhlmann

In addition to his teaching and research responsibilities, Buhlmann also coordinates the Chemists-in-the-Library outreach program for the Minnesota Local Section of the American Chemical Society.



Aaron Massari

Aaron Massari

Aaron Massari joined the Department of Chemistry faculty at the University of Minnesota as a non-tenured assistant professor in the fall of 2006. He was promoted to associate professor with tenure, effective July 1, 2013. Starting this fall, he is the Director of Graduate Studies for the Chemical Physics Program.

Massari attended Arizona State University, where he majored in chemistry and worked for several years as an undergraduate researcher in Professor Devens Gust's research group. After graduation, he moved to Northwestern University, where he worked under the direction of Professor Joseph Hupp on projects focusing on the electrochemistry and solar

energy conversion of self-assembled thin films. He continued his education by joining Professor Michael Fayer's research group at Stanford University, where, as a National Institute of Health postdoctoral fellow, he learned the ins and outs of two-dimensional spectroscopy.

Massari's research concentration is in ultrafast infrared spectroscopy with an emphasis on organic electronic materials.

Massari is engaged in the number of outreach activities, including University on the Prairie, and Energy and U.

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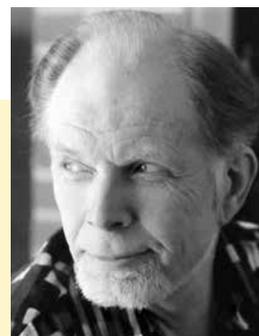
Professor Rufus Lumry

Rufus Worth Lumry II, 92, Minneapolis, MN, died March 23, 2013, after a four month illness. Rufus was born November 3, 1920 in Bismarck, ND, to Rufus Worth Lumry and Mabel Will Lumry. He received his Bachelor of Science degree in chemistry from Harvard College in 1942. During World War II, he was associated with the National Defense Research Committee. Following the war, he returned to Harvard and, working with George Kistiakowsky, received his doctorate in chemical physics in 1948, it was at this time that his interest in enzymes developed. In 1948, he moved to the University of Utah, joining Henry Eyring and Emil Smith among others. He moved to the University of Minnesota as assistant professor of chemistry in 1954, and quickly rose in rank becoming a full professor in 1956. Rufus taught at the University of Minnesota until his retirement in 1990. He was the author of more than 130 publications in the field of protein biophysical chemistry.

In the 1960s and 1970s, he spent time in leading laboratories in the field of protein chemistry in Denmark, Italy, Germany, and Japan. Lumry was also involved in organizing major scientific conferences, including a Gordon Conference. He was an influential participant and organizer of the Red Cell and Hemoglobin Program Project Grant awarded to the University of Minnesota in the 1970s and 1980s. He was recipient of numerous grants from National Science Foundation, the National Institutes of Health and the U.S. Navy.

A remarkable aspect of his career is that it extended well beyond his retirement in 1990. Thus, his 1995 chapter about new paradigms of protein research and his 2003 paper on protein substructures were significant contributions to the field.

Rufus presided, until late 2012, over the Lumry Lunch Group of former students and colleagues who met monthly for more than



Rufus Worth Lumry II

15 years. Rufus was renowned for his humor, intelligence, and passion for science—truly one of a kind.

Rufus is survived by his children, Rufus Worth Lumry III (Patricia), Bellevue, WA, Ann Lumry (Bo Hedlund), St. Paul, MN and Stephen Lumry (Shirley), Bellevue, WA, his grandchildren Amanda Wengerd (Loren), Kirkland, WA, Rufus Lumry IV (Amy) Atlanta, GA, Christopher Lumry, Cambridge, MA, Erik Hedlund (Julianne), Minneapolis, MN, and Emilie Hedlund, Minneapolis, MN and his six great-grandchildren.

He was preceded in death by his parents, his former wife Gayle Kelly Comfort, and his life partner Bernice (Maria) Meyer.

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Professor Paul O'Connor



Paul O'Connor

Paul O'Connor, 92, died at Abbott Northwestern Hospital after a brief illness. He was born in Milwaukee, WI, on February 3, 1921, to Arthur and Helen (Radell) O'Connor. He attended Haverford College where he majored in chemistry and mathematics (with, he liked to add, a minor in Bridge). During graduate school,

he participated in a program in the Manhattan Project isolating isotopes of plutonium.

He signed the Szilárd petition in 1945, urging President Harry Truman not to use the atomic bomb against people without first offering an observed demonstration.

In 1947, he became a professor at the University of Minnesota. The focus of his work changed after Russia put the Sputnik into orbit prompting a national effort to upgrade science and math education in the United States. He helped to develop and promote CHEM study, a new curriculum for high school chemistry. Because of this work, he was invited to introduce the curriculum in India, and he spent about 5 years there between 1964 and 1973. He retired after

26 years for medical reasons and took up his second career as a weaver. He applied his mathematical mind to complex double weave and continued to experiment, teach and publish for the next 40 years until the time of his death, which occurred shortly after putting a new warp on his loom.

He is survived by his children Mike (Marcie Archer) O'Connor, Maggie (Linda Ridlehuber) O'Connor and his grandchildren Elliot, Dan, Robert and Richard O'Connor. He was preceded in death by his wife Pat O'Connor, parents Arthur (Helen Radell) O'Connor, brothers John, Bob, Gary and Neal, and sister Jean Kelley.

Four new professors join the department

The Department of Chemistry has hired four new professors, including three assistant professors—Renee Frontiera, James Johns and Ian Tonks—and one associate professor—Erin Carlson.

Renee Frontiera

Renee Frontiera, Ph.D., joined the Department of Chemistry as an assistant professor. Since 2010, Frontiera was a postdoctoral researcher at Northwestern University, working with Professor Richard P. Van Duyne. She earned her doctorate in chemistry from the University of California, Berkeley, under the tutelage of Professor Richard Mathies. She received her bachelor's degree in chemistry and Chinese at Carleton College in Northfield, MN.



Assistant Professor Renee Frontiera

As a graduate student with Mathies, Frontiera examined chemical structural changes on the femtosecond timescale in systems including dye-sensitized solar cells and proteins such as green fluorescent protein and phytochrome, using an ultrafast spectroscopic technique known as Femtosecond Stimulated Raman Spectroscopy. As a post-doctoral scholar with Van Duyne, she developed methods to couple surface enhancement and ultrafast spectroscopy, in order to follow chemical reactions near plasmonic surfaces as well as to follow single molecule dynamics on the femtosecond timescale.

At the University of Minnesota, Frontiera is interested in determining the effect of local environments on chemical reaction dynamics, from cellular membranes to proteins to plasmonic materials. Her research involves the development of new imaging and spectroscopic techniques to examine reaction dynamics on the nanometer length scale with femtosecond time resolution. In particular, she is interested in label-free super-resolution imaging, the role of vibrations in driving electron transfer reactions, and the use of plasmons to drive chemical reactions.

James Johns

James Johns, Ph.D., joined the Department of Chemistry as an assistant professor. Since 2011, Johns was a postdoctoral researcher at Northwestern University, working with Professor Mark Hersam. He



Assistant Professor James Johns

earned his doctorate in physical chemistry from the University of California, Berkeley, under the tutelage of Professor Charles Harris. He received his bachelor's degree in chemistry and physical chemistry from the University of Virginia.

As a graduate student with Harris, Johns probed the ultrafast dynamics and charge trapping of ultrathin organic semiconductors used in photovoltaics in response to photo-excited charges at metals surfaces using two photon photoemission. Since joining the Hersam

group, Johns has used scanning tunneling microscopy and optical spectroscopy to characterize and develop new ways of chemically functionalizing 2D materials such as graphene and molybdenum disulfide.

At the University of Minnesota, Johns will focus on the structure and optical properties of surfaces, interfaces, and 2D materials. His research will develop new experimental techniques that will facilitate a better understanding and subsequent control over charge and exciton transfer at surfaces and interfaces related to energy, photovoltaics, and photocatalysis at unprecedented length and time scales. He will also be studying the chemistry and physics of new 2D materials for electronics, and developing experiments, which exploit their 2D nature to elucidate the electronic structure of interfaces commonly used in electronic devices.

Ian Tonks



Assistant Professor Ian A. Tonks

Ian A. Tonks, Ph.D., joined the Department of Chemistry as an assistant professor. Since 2012, Tonks was a postdoctoral scholar at the University of Wisconsin-Madison, working with Professor Clark Landis. In 2011, he earned his doctorate in organometallic chemistry at the California Institute of Technology under the tutelage of Professor John Bercaw. He received his bachelor's degree in chemistry from Columbia University while working with Professor Gerard (Ged) Parkin.

As a graduate student with Bercaw, Tonks studied the structure-electronics relationship of "post-metallocene" alpha olefin polymerization catalysts and explored the photophysics of early transition metal hydrazide complexes. More recently as a postdoctoral scholar with Landis, Tonks has developed safer alternative methodologies for the synthesis of primary phosphines, investigated the kinetics and mechanism of asymmetric olefin hydroformylation under extremely low pressures and developed new ligands for asymmetric hydroformylation.

At the University of Minnesota, Tonks is interested in designing inorganic and organometallic catalysts to carry out new and efficient transformations. His research utilizes inorganic, organometallic and organic synthesis to generate novel catalysts that are studied in depth through kinetic, mechanistic and computational techniques. A large focus of his research is not only on synthesis, but also on reaction discovery. In particular, he is interested in developing catalysts for the copolymerization of carbon dioxide with olefins to generate new biodegradable polymers, practical and green routes to heterocycles that could be utilized in novel drug design, and electrocatalytic nitrogen reduction.

Erin Carlson

Erin E. Carlson will join the Department of Chemistry as an associate professor with tenure on July 1, 2014. She is coming to the University of Minnesota from Indiana University, where she has been an assistant professor since 2008.

Carlson received her bachelor's degree from St. Olaf College in 2000. She went on to graduate studies funded by the National Institutes of Health (NIH) Predoctoral Biotechnology Training Program at the University of Wisconsin-Madison. She earned a doctorate in organic chemistry in 2005 under the direction of Professor Laura L. Kiessling. Her graduate career focused on the design and synthesis of mechanistic probes and inhibitors for carbohydrate-binding proteins, concentrating on the study of UDP-galactopyranose mutase (UGM), an enzyme involved in cell wall biosynthesis of *Mycobacterium tuberculosis*.

Carlson was awarded an American Cancer Society Postdoctoral Fellowship for studies at The Scripps Research Institute with Professor Benjamin F. Cravatt. Carlson and Cravatt developed a global metabolite profiling strategy that utilizes chemoselective probes to enable enrichment and profiling of metabolites from complex biological systems. This technology, referred to as Metabolite Enrichment by Tagging and Proteolytic Release (METPR), facilitates the rigorous characterization of biochemical pathways through their most sensitive reporter, endogenous small molecules. In 2007, she received an NIH Pathway to Independence Award. She joined the faculty at Indiana University in the summer of 2008.

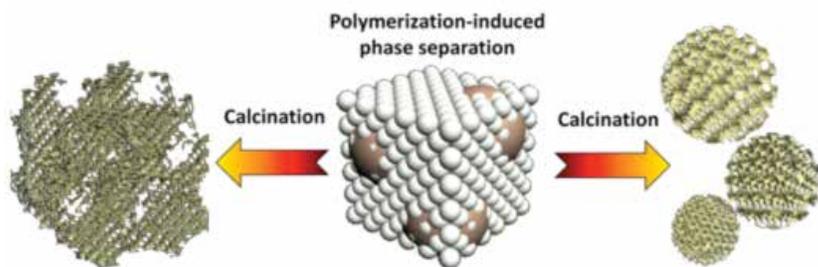
Carlson's research program centers on the development and application of advanced chemical biology and systems biology technologies to both define the mechanisms of bacterial pathogenesis and identify potential therapeutic agents. She is pursuing the development of technologies for natural product discovery including innovative methods for compound isolation, screening, and diversification. Carlson also is utilizing state-of-the-art metabolomic and proteomic methods to map the biochemical pathways associated with bacterial pathogenesis and antibiotic resistance.

Since the start of her independent career, Carlson has won numerous awards including being named a Pew Biomedical Scholar, the NIH Director's New Innovator Award, the Indiana University Outstanding Junior Faculty Award, the National Science Foundation CAREER Award, and the Cottrell Scholar Award. She also was named a Sloan Research Fellow and an Indiana University Dean's Fellow. She has been highlighted in several videos, including one produced by NBC in their Science Behind The News series supported by the NSF, and a "Brilliant Minds" video produced by Indiana University. Carlson was also named one of "Tomorrow's PIs" in the sixth annual issue of *Genome Technology*.



Erin E. Carlson

Stephen Rudisill

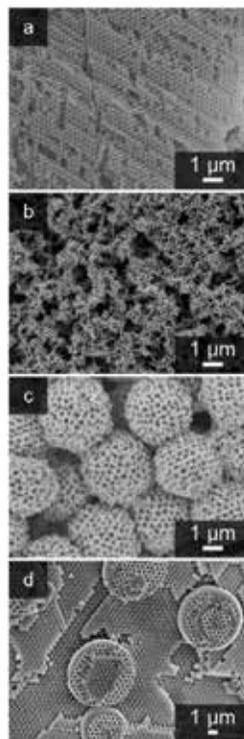


The research I'm interested in uses clever, simple chemistry to add controlled shapes to the nanoscience toolbox. From a technical perspective, I'm interested in the self-assembly of complex, nano-to-micrometer sized shaped materials through templating, modifying colloidal electrostatics, and directing crystal growth, among other methods. I'm also invested in finding uses for these shaped materials, particularly in the alternative energy and catalysis fields.

My main research project now is on self-assembly of three-dimensionally ordered macroporous (3DOM) microspheres and bicontinuous networks from metal-polyester precursors. 3DOM materials are a staple of Professor Andreas Stein's research, these are produced by forming an ordered array or "colloidal crystal" of 300-500 nm poly(methyl methacrylate) spheres, filling the spaces between the spheres with a precursor, and then burning the spheres and crystallizing the precursor at high temperature.

Formation of spheres with the 3DOM structure can be a bit tricky. The technique relies on the phase separation that occurs between a growing polymer in solution and the solvent (in this case, water), as a result of the growing polarity difference between the two phases. The extent of that polarity difference changes the amount of interfacial area between the polymer and the water, which results in different shapes—either microspheres, or a bicontinuous network. The polarity difference is almost solely dependent on the molecular weight of the polymer; the higher molecular weight, the more non-polar the polymer phase will be. So, by controlling the extent of polymerization, we can change the morphology of the material, as well as the size of the features. We primarily control this polymerization by changing the reagent imbalance between the ethylene glycol and citric acid, which make up the polymer.

In the March 12 cover article of *Chemistry of Materials*, we demonstrated the effectiveness of this technique for a common catalytic oxide, CeO_2 . Before this discovery, polymerization-induced phase separation could be performed with a limited set of materials (silica, zirconia, titania), and required specialty precursors known as alkoxides. The technique here utilizes cheap, widely available reagents and, in theory, can be used with any element on the periodic table which forms a nitrate salt. Future goals in this project are to demonstrate exactly that, and provide a roadmap for generalizing the technique. In the process, we have whole new batch of technical issues to overcome, given the substantial differences between size, charge, and reactivity of the ions we're investigating.



Video features the department's research



Department Chair William Tolman working with Chuck Olsen

This fall, the department worked with Chuck Olsen from Minneapolis-based Vidtiger on the creation of a video focused on research. The video features faculty and graduate-student researchers, highlighting the department's collaborative and interdisciplinary research opportunities. When completed, the video will be posted on the department's website, and will be used to highlight the research excellence of the department to draw the interest of graduate students, alumni, and friends.

Peter Carr

Professor Peter Carr was honored with the 2013 American Chemical Society of Analytical Chemistry J. Calvin Giddings Award for Excellence in Education at the ACS National Meeting. This award honors Carr for his contributions to analytical chemistry and for enhancing the personal and professional development of students who are studying analytical chemistry. Throughout his years as a faculty member at University of Georgia and, since 1977, at University of Minnesota, Carr has made many contributions benefiting students in the classroom and in the laboratory, including writing influential books and articles for analytical courses, training and mentorship, and laboratory equipment design and use.

Carr also received the 2013 LCGC Lifetime Achievement Award for his contributions to the field of liquid chromatography and surface chemistry. LCGC stands for liquid chromatography, gas chromatography.

Carr's contributions to the field of chromatography are many. His research interests, scientific contributions to, and promotion of separation science have resulted in many new pivotal approaches to liquid chromatography. In addition to his work on the fundamental theory of high-performance liquid chromatography, his research has focused on understanding the nature of solute-solvent interactions as they pertain to the prediction of retention, selectivity and optimization in chromatography; the theory of nonlinear chromatography; the development of stable chromatographic column media such as zirconia and hyper-crosslinked silica phases to replace the standard silica packing materials; and two-dimensional liquid chromatographic separations of biomolecules as a novel approach that achieves chemical separation of complex mixtures in a fraction of the time of conventional liquid chromatography.

Christopher Cramer

Professor Christopher Cramer was awarded the 2013 George W. Taylor Award of Distinguished Service by the College of Science and Engineering. This award recognizes outstand-

ing service to the University of Minnesota and voluntary public service.

Cramer's service has included key leadership roles with the Department of Chemistry, College of Science & Engineering, and University of Minnesota as well as national and international science organizations.

For the Department of Chemistry, Cramer served three years each as Director of Graduate Studies and Director of Undergraduate Studies. During that time, he developed and implemented a comprehensive strategy for graduate student recruitment, which has increased faculty participation and positive responses from prospective students. He chaired the department's Faculty Search Committee for two years at a time of expansion for the department, resulting in the hiring of two new faculty members. He also is a long-time member and supporter of the Minnesota Supercomputing Institute.

At the college level, Cramer served on two of the college's most important committees—Promotion and Tenure, and Blue Ribbon Strategic Planning. Since July 2013, he has been serving as the College of Science & Engineering's associate dean for Academic Affairs.

At the university level, Cramer served on the Senate Research Committee, Senate Subcommittee on Research Openness, and a number of task forces and working groups addressing important university-wide issues. In 2009, he was elected to the Faculty Consultative Committee (FCC), which is the executive body for the Faculty Senate, and served as its vice chair and chair.

Cramer has committed a number of years of service to the science community, currently serving as editor-in-chief of *Theoretical Chemistry Accounts*, as North American associate editor for the *Journal of Physical Organic Chemistry*, and on the advisory boards of other publications. His national and international service has included leadership positions on executive boards of scientific societies, organizing symposiums, and serving as a panelist or workshop presenter.

Edgar Arriaga

Professor Edgar Arriaga received a university grant to purchase a mass cytometer to be housed in the Department of Chemistry's Mass Spectrometry Laboratory. Arriaga's grant was awarded through the Research Infrastructure Program by the University of Minnesota's Office of the Vice President for Research.

Mass cytometry is becoming widely used in biotechnology and biomedical research at leading institutions across the nation. Mass cytometry provides the ability to analyze complex sets of proteins or genes in mixtures of cells or in cells as they change status during maturation, differentiation or degradation. Because it can be done at extremely high speeds (1000 cells/second), it provides a tool to monitor specific protein dynamics and cell populations in many tissues. Currently there are 12 installed mass cytometers in the United States, and other institutions are in the process of acquiring similar capabilities.

Arriaga's co-investigator is Dr. Dan Kaufman from Hematology, Oncology and Transplantation in the Department of Medicine. Matching funds for the mass cytometer is provided the College of Science & Engineering, the Department of Chemistry, and the Medical School.

The Research Infrastructure Investment Program awards are a one-time investment in university research infrastructure designed to facilitate strong partnerships and interdisciplinary alliances at the University of Minnesota, especially between the health sciences and other disciplines.

continued on page 24

Timothy Lodge named Regents Professor



*The University of Minnesota Board of Regents has named **Timothy P. Lodge** a Regents Professor. This designation is the highest level of recognition given to university faculty members. Lodge is a professor in the College of Science & Engineering's Department of Chemistry and the Department of Chemical Engineering and Materials Science. He is a renowned polymer scientist, whose scholarly reputation is far-reaching and international. He has served the University of Minnesota with distinction for three decades with an outstanding record of research, teaching, and service.*

“Tim is well-deserving of this high honor, which recognizes his extraordinary contributions to science, education, and service to the larger community. His record of accomplishment is simply amazing,” said William B. Tolman, chair of the Department of Chemistry.

Lodge earned his bachelor's degree in applied mathematics from Harvard College, and his doctorate in chemistry from the University of Wisconsin-Madison. He was a National Research Council post-doctoral research associate at the National Bureau of Standards, and joined the Department of Chemistry at the University of Minnesota in 1982. He also joined the Department of Chemical Engineering and Materials Science (CEMS) in 1995, and became director of the Materials Research Science and Engineering Center (MRSEC) in 2005.

He has received many accolades for his research and teaching, including some of the top honors at the University of Minnesota such as the Postbaccalaureate, Graduate, and Professional Education Award (2012), CSE Distinguished Professorship (2004), and Distinguished McKnight University Professorship (2001).

His contributions have also been recognized by external awards and invited lectureships, including the Minnesota Award-American Chemical Society Minnesota Section (2012), Turner Alfrey Visiting Professorship (2011), and International Scientist Award from the Society of Polymer Science Japan (2009). Lodge was recognized as a Fellow of the American Chemical Society (2010) and the Association for the Advancement of Science (2009). He has been awarded two of the most prestigious international awards in the demanding fields of both polymer physics and polymer chemistry—the American Physical Society Polymer Physics Prize (2004) and the American Chemical Society Award in Polymer Chemistry (2009). Few scientists in the world have claimed both of these prizes.

Lodge is one of the most productive, innovative, and influential polymer scientists in the world, focusing his research on the structure and dynamics of polymeric systems. He has published more than 300 papers on his innovative and groundbreaking research.



Frank Bates, head of the Department of Chemical Engineering & Materials Science, William Tolman, chair of the Department of Chemistry, and Eric Kaler, President of the University of Minnesota, congratulate Timothy Lodge for being named a Regents Professor.

Lodge's reputation is based both on careful and meticulous experiments to elucidate the universal physical laws that govern the behavior of polymers, and on the development of conceptual and theoretical models to understand these laws. His work is unusually broad in scope, and it encompasses the behavior of polymers in solution (for example as drug delivery vehicles) and in the bulk state (for example as mechanically robust composites). To this end, Lodge has developed a laboratory at the University of Minnesota containing a powerful and innovative array of experimental tools, which is truly second to none in scope and which has allowed him to be one of the most productive and influential polymer scientists in the world.

For example, a major and growing research focus of Lodge's research has been block copolymer systems: polymers with two (or more) subchains that spontaneously self-assemble into fascinating nanostructures. In a program extending over the last 20 years, Lodge and his students have delineated the fascinating mechanisms by which individual polymer molecules diffuse around and within these nanostructures. In another area, Lodge has developed a systematic route to "structured micelles," which are block copolymer nanostructures in which micellar cores are subdivided as in, for example, a double-yolked egg. The 2004 *Science* paper that first reported this discovery has been cited now more than 450 times. This is a fascinating demonstration of hierarchical self-assembly well known in biological systems, but built entirely through polymer architecture control in synthetic cases. The design flexibility offered by this approach has resulted in many exciting developments that are documented in the many publications since that original report that highlight the versatility and potential applications that include drug delivery, solution viscosity modification, and nanostructure templating.

A sought-after teacher and adviser, Lodge is an outstanding classroom teacher, and created the popular Polymer Physical Chemistry course. "Great class, great instructor, not the easiest class I've taken, but one of the most interesting and useful," wrote one student.



The Lodge family celebrates at a reception at President Kaler's house for the university's Regents Professors. Pictured are, from left, Sam, Susanna, Tim, and Hannah Lodge. Photo by Patrick O'Leary.

He is co-author of *Polymer Chemistry, Second Edition*, written with Paul Hiemenz, which is the leading polymer chemistry textbook, and which is the only textbook that covers the synthesis, characterization and properties of polymers, and derives all of the important equations in mathematically tractable and physically transparent ways.

Lodge has advised and trained more than 100 students and post-doctoral associates who are heavily recruited by industry or who have attained faculty positions at prestigious institutions.

Daniel Savin, an assistant professor at the School of Polymers and High Performance Materials at the University of Southern Mississippi, was a post doctorate in Lodge's laboratory. He writes, "He instilled the confidence in me to pursue projects that are important, yet, unexplored, and he constantly challenges me in ways that make me think critically about my independent research program and the way I am going. . . . My experience in the Lodge group has shaped my educational philosophy

and has served as a model for how I aspire to run my own research group."

Colleague Professor Marc Hillmyer writes, "Simply put, his contributions to teaching and advising have been at the highest level in all regards: brilliant scientist, caring adviser, outstanding educator."

Lodge's service to science does not end in the classroom or laboratory. He has served in many leadership roles for the Department of Chemistry and the College of Science & Engineering, including serving as director of MRSEC and leading one of its interdisciplinary research groups focused on polymer research, and coordinating the microstructures polymers group for the universities Industrial Partnership for Research in Interfacial and Materials Engineering (IPRIME). As editor-in-chief of *Macromolecules*, he oversees the processing of 3,000 manuscripts annually, and coordinates the efforts of 13 associate editors. He also launched a new journal, ACS (*American Chemical Society*) *Macro Letters*. He has chaired and organized many meetings and national

continued on page 25

Honors & awards *continued from page 21*

Cramer also is one of the University's top professors and researchers. He is a Distinguished McKnight University Professor, a University Teaching Professor, and the Elmore H. Northey Professor of Chemistry. Recently, he became the director of the Center for the Study of Charge Transfer and Charge Transport in Photoactivated Systems.

The George W. Taylor Award was established in 1982. In addition to Cramer, other chemistry professors who have received this award include Paul Barbara, Paul Gassman, Louis Pignolet, and Donald Truhlar.

Marc Hillmyer

Professor Marc Hillmyer was awarded the 2013 Medema Award from Polymer Technology Netherlands (PTN). This award is given to a prolific polymer scientist who also interacts and/or has close ties with the Dutch polymer community. Hillmyer gave his award address, *Nanoporous Materials from Block Polymers*, at Dutch Polymer Days in Lunteren, The Netherlands, and was presented with the award there.

Connie Lu

Professor Connie Lu was awarded a prestigious Alfred P. Sloan Research Fellowship for 2013. Lu was among 126 winners of this highly competitive award intended to enhance the careers of exceptional young faculty, including two other honorees from the University of Minnesota.

Sloan Fellowship winners are faculty members at 59 colleges and universities in the United States and Canada who are conducting pioneering research in physics, chemistry, computational and evolutionary molecular biology, computer science, economics, mathematics, and neuroscience. Each winner receives a grant of \$50,000 for a two-year period.

Sloan Research Fellows are free to pursue whatever lines of inquiry are of most interest to them, and they are permitted to employ fellowship funds in a variety of ways to further their research aims.

Lu also received a CAREER award from the National Science Foundation (NSF) for her research project, *Configuring New Bonds*

Between First-Row Transition Metals. The Faculty Early Career Development (CAREER) Program is one of the NSF's most prestigious awards. It supports junior faculty who exemplify the role of teacher-scholars through outstanding research, excellent education, and the integration of education and research within the context of the mission of their organizations.

Lu's research interests are to develop inexpensive bimetallic catalysts for small-molecule activation, specifically the reduction of carbon dioxide. Two complementary classes of first-row bimetallics will be targeted: the early-late transition metal pair (the simplest representative of a late metal particle adsorbed on an oxide support, which is typical of heterogeneous catalysts); and the mid-to-late transition metal pair, which is similar to the multimetallic sites found in metalloenzymes. By using a novel ligand platform, diverse metal pairs will be constructed in a modular fashion and compared systematically.

The five-year CAREER award support will allow Lu to better integrate research with her

Christy Haynes

Professor Christy Haynes was chosen by the University of Minnesota's Postdoctoral Association to receive the Outstanding Mentor of Postdoctoral Scholars award. The award recognizes extraordinary performance and achievement in mentoring postdoctoral fellows, postdoctoral associates, and research associates at the University of Minnesota who are within five years of obtaining their doctorate degrees.

Haynes also received a 2013 Minnesota Futures grant to conduct research on maximizing magnetic relaxation and heating in nanoparticle therapeutics. This year's winning projects focus on new cancer treatments. She will be working John Bischof and Chris Hogan from Mechanical Engineering, and Michael Garwood from Radiology.

There is currently a large effort worldwide to clinically translate alternating magnetic field (AMF) induced iron oxide nanoparticle (IONP) heating for cancer treatment. Modified IONPs are also used for magnetic resonance imaging (MRI), facilitate drug delivery and improve the speed and uniformity of thawing from a cryopreserved state.

For IONP thermal therapies to be successfully translated into a clinical environment, enhancements over the existing methods in image guidance, heating and therapeutic ratio are critically needed. The goal of this collaboration is to produce an IONP with superior heating and imaging properties that will provide a level of clinical planning for both heating and drug delivery that is not currently possible. The project will also

allow for further functionalization (drug loading and systemic targeting) and use in cryopreservation technology in the future.

The research team will work to optimize these nanoparticles to create a platform poised for clinical and commercial translation.

Modeled after the National Academies Keck Futures Initiative, the Minnesota Futures program supports extraordinary research by nurturing interdisciplinary ideas. The goal is to develop new ideas to a point where they are competitive for external funding. The award covers expenses of up to \$250,000 over two years and is supported by technology commercialization revenue.

teaching and outreach in new ways. For example, a student-created and community-edited online resource will provide public access to the results and relevant literature of this research field. Lu and members of the Women in Science and Engineering group will adapt the popular Solar Hydrogen Activity Research Kit (SHArK), an outreach program in several high schools and universities, to a solar energy workshop for middle school girls.

Valerie Pierre

Professor Valerie Pierre received a fall 2012 Translational Grant Award from the University of Minnesota's Clinical and Translational Science Institute (CTSI). Her research encompasses siderophore aptasensors for immediate point-of-care diagnosis of urinary tract infections.

This round of awards, designed to facilitate the highest quality translational research, was dedicated to junior investigators at the University of Minnesota. Pierre was one of four researchers to receive a grant.

In translational research, scientific discoveries are moved from the laboratory into real-world practice, leading to improved human health. Pierre will partner with a project development team from the CTSI Office of Discovery and Translation (ODAT), which will provide project mapping and translational research expertise to facilitate the achievement of specific metrics and endpoints.

William Pomerantz

Professor William Pomerantz and his researchers were awarded an American Cancer Society Institutional Research Grant to support their research designing a class of peptide mimetic, which they term polarity switch peptides. Molecular design rules are being developed as a general approach for inhibiting transcription factor-protein interactions involved in acute myeloid leukemia. In-cell ¹⁹F nuclear magnetic resonance methods are also being investigated to quantitate cellular uptake of these compounds. This one-year award will cover research expenditures.

Donald Truhlar

Regents Professor Donald Truhlar's 1,000th journal article was published in May. The article, *Adsorption on Fe-MOF-74 for C1-C3 Hydrocarbon Separation*, was co-written by Pragma Verma, graduate student research assistant, and Xuefei Xu, Ph.D., postdoctoral associate. It was published in the May 22 edition of *The Journal of Physical Chemistry C*, and can be found at <http://z.umn.edu/e4c>.

Truhlar has also written 84 book chapters for a total of 1,084 publications. According to the Web of Science, his index factor is 118, and his papers have been cited 64,294 times. Truhlar is one of the University of Minnesota Department of Chemistry's most distinguished professors and researchers, and is one of the top physical chemists in the world. He has received many prestigious awards and honors for his research and his seminal contributions that have advanced and transformed chemistry and chemical physics.

His contributions to the scientific community include serving as an associate editor for the *Journal of the American Chemical Society* and editor of *Computer Physics Communications*. Truhlar also is a member of the National Academy of Sciences of the United States of America, and the International Academy of Quantum Molecular Sciences. He is a fellow of the American Association for the Advancement of Science, the American Physical Society, the American Chemical Society, the Royal Society of Chemistry, and the Minnesota Supercomputing Institute.

Truhlar is a member of the Department of Chemistry's Chemical Theory Center, and a co-investigator in the Nanoporous Materials Genome Center collaborative based on the University of Minnesota.

Truhlar also received the Graduate and Professional Student Assembly 2013 Outstanding Adviser Award, honored for his exemplary role as a mentor and adviser. He was nominated by his students to receive this award. This award honors advisers who create a culture of mentorship by helping students set realistic expectations, providing opportunities for professional development and/or research, and overcoming personal and professional challenges.

Lodge *continued from page 23*

conferences, and has served as a leader on the executive committee for the American Physical Society Polymer Division.

C. Daniel Frisbie, a Distinguished McKnight University Professor with CEMS, has worked closely with Lodge both in MRSEC and on collaborative research initiatives. He writes, "The impact of MRSEC on the research enterprise at the university is far reaching—more than 50 graduate students and post doctorates are supported by MRSEC, and leveraged MRSEC funds for capital equipment has resulted in millions of dollars worth of new instrumentation for university facilities... I am convinced that Lodge's vision and steadfast stewardship of MRSEC is helping to propel the university to national prominence in materials research."

Frank S. Bates, head of CEMS, notes: "Tim is the quintessential leader, one who sets the highest standards and drives excellence by example. He has been a most valued friend and colleague for nearly 25 years, a brilliant scholar and a dedicated servant to the university and our profession. Simply put, Tim Lodge has inspired me, and innumerable others, to reach higher and further."

Lodge is the third current Regents Professor in the Department of Chemistry, joining honorees Lawrence Que Jr., and Donald Truhlar, and also the third current Regents Professor in the Department of Chemical Engineering and Materials Science along with Frank Bates and Lanny Schmidt. The Regents Professor position was established in 1965 by the Board of Regents to recognize the national and international prominence of faculty members. It serves as the highest recognition for faculty members who have made unique contributions to the quality of the University of Minnesota through exceptional accomplishments in teaching, research and scholarship or creative work, and contributions to the public good.

2012-2013 Donors

The Department of Chemistry thanks the many generous alumni, faculty, and friends listed below for their donations to support the department year-to-date in 2013. These gifts are vitally important and they benefit our talented undergraduate and graduate students, support our distinguished faculty, and enhance our world-renowned research and incredible academic program. We are grateful for your support.

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For more information about making a gift or for assistance, please contact Kathy Peters-Martell, external relations officer for the Department of Chemistry, at kpeters@umn.edu or 612-626-8282. You can also make a gift through the department's website at <http://www.chem.umn.edu/giving/>.

Help us double scholarship/fellowship support for students

By Kathy Peters-Martell

Our country is facing an unprecedented need for more scientists (only 11 percent of all undergraduate degrees in science are awarded in the United States). Currently, the demand for admission into the College of Science and Engineering (CSE) is at an all-time high (there were 12 applicants for every opening in the freshman class this year). The competition for the best and brightest students will continue to increase. Currently, 36 percent of students receive scholarship support in their freshman year. Our goal is to double the scholarship and fellowship support available, and to continue producing exceptional graduates and keep pace with global innovation.

The average debt load for CSE undergraduates is 31,000, which is below the national average, but still too high. With decreasing state support and the increasing costs of technology and much-needed research and innovation to address global challenges in energy, the environ-

ment, health care, and the nation's infrastructure, tuition costs have continued to rise. While it is no longer feasible for students to work their way through college as previous generations have done, getting a chemistry degree is still a great investment. We have to find a way to help these talented and deserving students get an excellent education at the University of Minnesota.

We are fortunate to have several donor-funded awards in Department of Chemistry and departmental funds like the Chemistry Special Projects Fund to ease the financial burden of obtaining a degree for many students, but it is not enough to support everyone. These scholarship and fellowship funds are changing the lives of the lucky student recipients who will go on to shape the future of our world. I ask you to consider helping us help our students by supporting an existing fund or by establishing your own fund. I would be happy to discuss

the ways you can support the department and the college.

I am pleased to report that we have received notification of two significant future estate gifts to the Department of Chemistry—one to establish a chair in the department, and one to create an endowed fund to support faculty hires and retention and provide funding for opportunities to strengthen and enhance the department. While the donors wish to remain anonymous, we are grateful for these future transformative gifts.

To have an impact on our world tomorrow, we must invest in our college today.

If you have questions or need assistance in making a gift to the department, please contact Kathy Peters-Martell, external relations officer for the Department of Chemistry, at kpeters@umn.edu or 612-626-8282.

Renfrew *continued from page 8*

Health and Safety Division gave him its top award. He was co-editor of *Safe Laboratories: Principles and Practices for Design and Remodeling* (1990), and editor of *Safety in the Chemical Laboratory, Vol. IV* (1980). He was author of professional papers on plastics, chemical safety, and molecular spectroscopy. He was named to the University of Idaho Hall of Fame, the State of Idaho Hall of Fame and received the Distinguished Idahoan University of Idaho Alumni Award. He and his wife Carol received the Idaho Treasures Award from the University of Idaho Retirees Association.

In 1985, to mark Renfrew's 75th birthday, the physical sciences building at the University of Idaho was named Malcolm M. Renfrew Hall. The building was rededicated in 2010 on the occasion of his 100th birthday.

Malcolm was preceded in death by his parents, wife Carol, and brother Edgar.



Some of the Department of Chemistry's scholarship award recipients are, from left, Moriana Haj, Robert C. Brasted Memorial Fellowship a fellowship as well as a part-time apprenticeship in the department's General Chemistry Program awarded to an outstanding chemistry major who has expressed an interest in a teaching career in chemistry; Kara Meyers and Matthew Styles, Auzins Scholarship awarded to chemistry majors who have shown outstanding academic achievement; Katherine Ziebarth, M. Cannon Sneed Scholarship awarded to a chemistry major who has shown outstanding academic achievement; Megan Magee, Erin Hill, and Maximillian Margherio, Andrews Scholarship awarded to chemistry majors who have shown outstanding academic achievement; and Quang Luu Nguyen, Lloyd W. Goerke Scholarship awarded to a chemistry major who has shown outstanding academic achievement.

DEPARTMENT OF CHEMISTRY



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ALUMNI news

Alumnus Andrew Aspaas receives Educator of the Year award

*Alumnus **Andrew Aspaas**, who is a chemistry instructor at Anoka-Ramsey Community College, received an Educator of the Year Award for Excellence in Teaching from the Minnesota State Colleges and Universities (MnSCU). Aspaas did his master's thesis work in Professor Thomas Hoye's group in 2005.*

The MnSCU Board of Trustees bestows the award to acknowledge and reward exceptional professional accomplishment and to encourage ongoing excellence in teaching. The four winners of this year's were selected from 36 faculty members named Outstanding Educators by the presidents of their respective institutions based on nominations by students, faculty peers or staff. Evaluation criteria included: content expertise and professional growth; teaching

strategies and materials; assessment of student learning and performance; and service to students, the profession, the institution, and the system. This is the seventh year of the awards.

The following was written about Andrew: "Andrew Aspaas doesn't enter his classrooms and lab intending merely to walk students through the concepts and principles of his subject. Instead, he brings to his work a sense of vision

and responsibility, saying, "The job of teaching chemistry to the future nurses, scientists, doctors, and citizens in my community is not one I take lightly." He not only brings a formidable knowledge of chemistry to his college but also a scholar's understanding of student learning, and designs educational experiences for students that allow them to struggle with difficult ideas while they also enjoy the fun of discovery and developing new skills."