

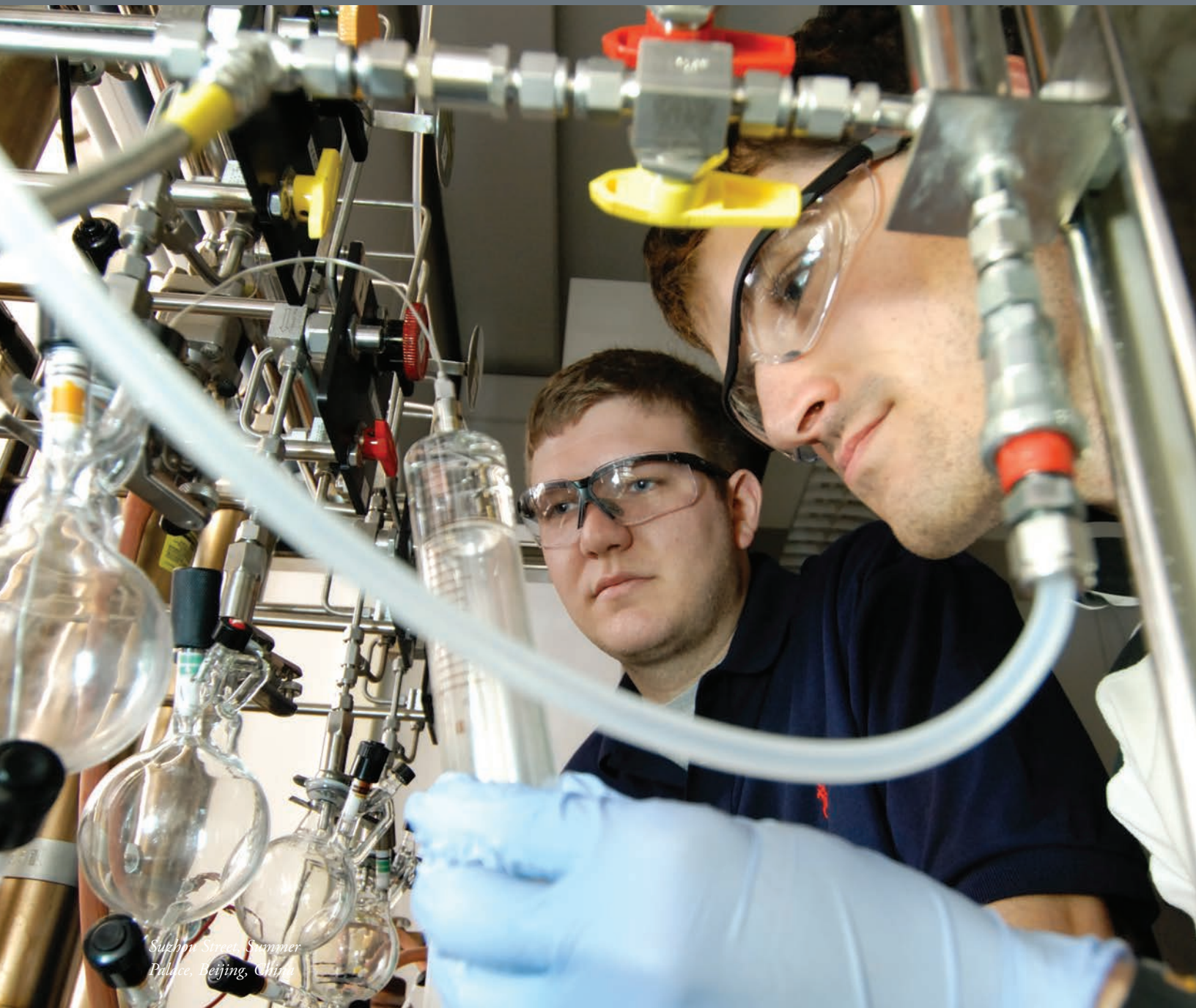
DEPARTMENT OF

# Chemistry News



FALL/WINTER 2013

UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN



*Suzhou Street, Summer  
Palace, Beijing, China*

A Tradition of Innovative Thinking Since 1868



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## Letter from the Head Constant Through the Change



**A QUICK GLANCE THROUGH THE PAGES OF THIS ISSUE OF CHEMISTRY NEWS, AND YOU ARE LIKELY TO SEE SEVERAL NEW FACES, AS WELL AS SEVERAL OLD FACES NOW OCCUPYING NEW ROLES.** And if you've been on our website lately, you will notice more of the same. Five new faculty have joined our ranks this fall, while the familiar names of Alex Scheeline and Pat Shapley retired this past year. Steve Zimmerman's term as Department Head has come to an end, and with it marks the close of a period in which our department made great strides forward and acquired exceptional stability at a time when most of our peers suffered through a sour economy that did not spare its wrath on the chemical industry. And if you follow the goings-on at the University, you've undoubtedly heard about our new administrators, new instructional models like the massive open online courses (or MOOCs) and a completely renovated mainstay on the quad – our beloved Lincoln Hall. Construction is afoot on our side of the quad as well, with Noyes Lab wrapping up an exterior refinishing project as the planning for the update of Chemistry Annex kicks into high gear.

Rest assured that through all the change, the chemistry department at the University of Illinois remains constant at our core. The chemistry department's foundation is built on the pursuit of mastery in teaching, research and service. For those of you who like to ask, "What's the evidence for that?" I can confidently back my praises with data from Academic Analytics - a provider of high-quality

data for research universities in the United States used to benchmark individual departments relative to their peers. Of the four categories that determine Academic Analytics "productivity radar" – articles, awards, grant dollars, and citations – our department finds itself positioned in the 98th, 97th, 96th, and 96th percentile, respectively.

But the best is never good enough. The faculty and staff – those who just arrived and those who have been around for a while – are dedicated to the professional development of next-generation scientists and educators who will impact the world with their skills and knowledge. We remain constant through the change. And for this reason, I am privileged to provide interim leadership to this great department.

With best wishes and Illini pride,

Jeffrey S. Moore  
Interim Head and Murchison-Mallory Professor



## Department News

**Murchison-Mallory Professor of Chemistry Jeffrey Moore is serving as 2012-13 Interim Department Head.** A University of Illinois alumnus and member of the department faculty since 1996, Professor Moore will lead the department until August 2013. During his time in office, he will be overseeing administrative changes within the department (see below) and leading the charge to find a permanent replacement for the headship for the 2013-14 academic year. He was preceded in the position by Roger Adams Professor Steven C. Zimmerman, who served a total of eight years as Head or Interim Head.

In addition to Professor Moore, leadership in the Department is now facilitated by two Associate Heads—Associate Head of Budget and Operations, Professor Scott Silverman, and Associate Head of Research Faculty, Professor Martin Gruebele. As Associate Heads, Professors Silverman and Gruebele will assist in the administration of the Department. Although the position of Associate Head has existed in various forms in the past, these appointments are expected to be an integral part of departmental leadership going forward.

**Eiszner Family Chair Jonathan Sweedler has been named Director of the School of Chemical Sciences** for the 2012-16 term. Professor Sweedler, a world-renowned analytical chemist, joined the Department of Chemistry in 1991 and previously served as Director of the Biotechnology Center of Campus. As Director of the School, Professor

Sweedler supervises the staff who help to run a variety of resources shared between the Departments of Chemistry and Chemical and Biomolecular Engineering. Professor Andrew Gewirth served as the previously Director of the School, from 2008-2012.

**Dr. Christian Ray is serving as Interim Director of General Chemistry.** Dr. Ray, a lecturer and adjunct associate professor in the Department, will lead the general chemistry section, which serves undergraduates across campus for the 2012-13 academic year while it searches for a permanent Director. Dr. Ray is a 2005 alumnus of the Department, where he earned his PhD under Professor Jeffrey Moore.

**On October 6, 2012, Professor Sharon Hammes-Schiffer was inducted into the American Academy of Arts and Sciences.** As a Fellow, she joins one of the nation's oldest and most prestigious honorary societies. She is the 14th member of Department of Chemistry to join the society.

Professor Hammes-Schiffer joined the Department of Chemistry in August 2012 after serving as Professor of Chemistry and the Eberly Professor of Biotechnology at Penn State University. She is an acknowledged world leader in theoretical and computational chemistry with research interests spanning the fields of chemistry, physics, biology, and computer science. For more information on Prof. Hammes-Schiffer and her research, see page 15.



**Professor Hammes-Schiffer has also been named the Swanlund Professor of Chemistry.** This prestigious campus-level endowed position is a testament to her dedication to scholarship and service as well as recognition for her outstanding career.

**Professor Prashant Jain has been named one of seven researchers at UIUC to receive an Institute for Advanced Computing Applications and Technologies (IACAT) Fellowship.** The one-year fellowship will enable Prof. Jain to pursue collaborative projects with the researchers and computer technology experts at the National Center for Supercomputing Applications (NCSA).

Jain will work with NCSA's Sudhakar Pamidighantam to develop a platform for computational characterization and prediction of novel nano-optic phenomena. This platform will provide key design guidelines for engineering of optical resonances and electromagnetic fields using metal/semiconductor nanostructures with utility in enhanced light harvesting, ultrasensitive sensing, and induction of non-natural light-matter interactions in materials and molecules.

**Professor Jain and Professor Ryan C. Bailey have been named two of the world's top young innovators by Technology Review, the oldest international technology magazine.** They were chosen by magazine editors based out of the Massachusetts Institute of Technology from a pool of more than 250 nominees. The award recognizes under-35 innovators for their research in biomedicine, energy, the Web, computing and materials, among other emerging fields.

Professor Bailey, who joined Chemistry at Illinois in 2006, was recognized for a chip-based test for early stage disease detection. Bailey's research interests lie at the interface of bioanalytical and biomaterials chemistry and he also is affiliated with the Department of Bioengineering, Institute for Genomic Biology, and Micro and Nanotechnology Laboratory at the U. of I.

Jain, who joined Chemistry at Illinois in 2011, investigates interactions between light and matter. The magazine recognized Jain for his work with quantum dots which have tunable optical properties. He is also affiliated with the Department of Physics and the Beckman Institute for Advanced Science and Technology.

**Professor Yi Lu was named the 2012 winner of the Champaign County (IL) Innovation Celebration Discovery Award, sponsored by the Champaign County Economic Development Corporation.**

The award recognizes an individual or group from the University of Illinois' Urbana Campus who has disclosed to the University's Office of Technology Management a groundbreaking discovery with potential for significant societal impact. Professor Lu is extremely active in the business side of chemistry, with several patents and co-ownership of the company ANDalyze.

**Professor Thomas Rauchfuss has been named to the Larry Faulkner Professorship in Chemistry.** Professor Rauchfuss, previously a William H. and Janet Lycan Professor of Chemistry and Director of the School of Chemical Sciences, joined the Department of Chemistry in 1978. His research

covers all aspects of the synthesis and reactivity of inorganic, organometallic, and main-group compounds and materials.

The Larry Faulkner Professorship in Chemistry was endowed in 2010 by Dr. Peixin He (Ph.D., 1985) and his wife, Mrs. Xiaoming Chen in honor of Professor Larry Faulkner, who was Professor of Chemistry and served in a number of administrative roles including Dean of the College of Liberal Arts and Sciences and Provost. For more information about the professorship and the inaugural investiture, see the next issue of *Chemistry News*.

**The Department of Chemistry is one of three groups on campus named recipients of a National Science Foundation grant to support the Merit Fellows Scholarship Program.**

The program, which debuted this academic year, will provide substantial financial support for academically talented but Merit students that demonstrate financial need are majoring in mathematics, chemistry, or integrative biology.

Along with providing a total of \$525,000 in scholarship funds over 5 years, the project will also provide a wide variety of enhanced student support services. Merit Fellows will be paired with both peer and faculty mentors for at least their first two years at the university. These mentors will provide guidance to help the Merit Fellows successfully navigate through these rigorous STEM majors.

The Merit Fellows will also have the opportunity to participate in a wide variety of cohort-building activities such as seminars about effective study strategies in STEM courses, group study sessions,

professional development presentations from a variety of speakers, and informal social functions.

Finally, the Merit Fellows, with help from their mentors, will be encouraged to participate in undergraduate research opportunities whenever possible. In parallel with this endeavor, the Department of Chemistry debuted a new undergraduate research website and process this fall in order to better serve the needs of undergraduates looking for research opportunities, an experience often cited as key in the graduate school application process.

**Doctoral candidate and Rienstra group member Kristin Nuzzio was named one of nine Eli Lilly Travel Award Recipients.** The award, sponsored by the Women Chemists Committee (WCC) of the American Chemical Society, provides funding for female undergraduate, graduate and postdoctoral fellows to travel to a national ACS meeting and present their research. The prestigious and highly competitive award also includes a luncheon and professional networking opportunities.



## Two Students Win HHMI Predoctoral Fellowships

TWO CURRENT GRADUATE STUDENTS, MAX PRIGOZHIN OF THE GRUEBELE GROUP AND JUNQI LI OF THE BURKE GROUP, WERE NAMED RECIPIENTS OF A NEW INTERNATIONAL STUDENT FELLOWSHIP FROM THE HIGHLY PRESTIGIOUS HOWARD HUGHES MEDICAL INSTITUTE. THE FELLOWSHIP PROGRAM, WHICH IS RUN VIA A NOMINATION SYSTEM, SUPPORTS TOP PREDOCTORAL STUDENTS IN THEIR THIRD, FOURTH, AND FIFTH YEARS OF THEIR GRADUATE STUDIES.

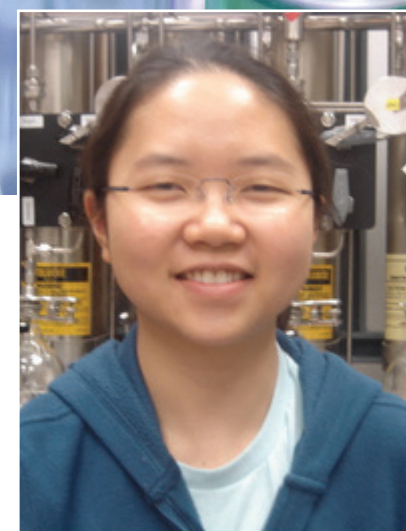
According to their website, “HHMI chose to start this program—a \$2 million commitment in its first year—because it recognized a problem: International students in U.S. graduate schools often have difficulty getting funding to support their studies. For example, they are not eligible for federal education and training grants, state scholarships, or other stipends that are reserved only for U.S. citizens. The Institute chose to fund the third to fifth years of graduate school because, by this time, most students have chosen a graduate advisor, identified a research project, and demonstrated their potential for success in the lab.”

Li’s research focuses around “a building block-based approach as a systematic way of making small molecules. The ultimate goal is to develop a platform for making small molecules in the same way that peptides and oligonucleotides are now made, so that even structurally complex chiral small molecules are freely available to the non-chemist for functional studies.”

Prigozhin’s PhD work is centered on “developing a technology that will allow [scientists] to use a sudden change in the hydrostatic pressure of a sample as a tool to study protein folding. In the long run, the goal is to construct a reliable atomistic model and use it to aid the identification of novel drugs that will target protein misfolding and aggregation.”

Sean B. Carroll, HHMI’s vice president for science education said of the program, “We hope, through these fellowships, to identify future scientific leaders.” Recognition in the form of fellowships, particularly by organizations as well-known and respected as HHMI, can be critical tools for students as they apply to postdoctoral and faculty positions, which both Li and Prigozhin plan to pursue post-graduation.

When speaking to Li and Prigozhin about their fellowships, their gratitude and the impact of the program was clear. Prigozhin said of winning the award: “Winning this



• • • • •  
Junqi Li (on left) and  
Max Prigozhin (on right)

fellowship means that my efforts have been recognized by some of the most prominent scientists in the world. Support at this level is very encouraging. It is an incredible honor but also a responsibility because I was the only Russian scientist to be awarded the fellowship this year. It also reminded me that over the years I have been very lucky to find great mentors who supported me throughout the application process.”

Li echoed Prigozhin’s sentiments, adding, “The award is a tremendous encouragement for me for me as it is a recognition that the goals outlined in the research proposal are important. In addition, it frees me from having any funding concerns for my PhD career.”

*Information and quotes from HHMI from: [http://www.hhmi.org/grants/individuals/intl\\_fellows.html](http://www.hhmi.org/grants/individuals/intl_fellows.html)*

“The award is a tremendous encouragement for me for me as it is a recognition that the goals outlined in the research proposal are important. In addition, it frees me from having any funding concerns for my PhD career.”

~ Junqi Li





## Eric Oldfield Invested as Harlin Professor of Chemistry

ON MAY 3, 2012, DR. ERIC OLDFIELD WAS INVESTED AS THE HARRIET A. HARLIN PROFESSOR OF CHEMISTRY. THE PROFESSORSHIP, SUPPORTED THROUGH A BEQUEST BY MS. HARRIET A. HARLIN, SERVES TO RECOGNIZE PROFESSOR OLDFIELD'S IMPACT BOTH AT UNIVERSITY OF ILLINOIS AND IN THE FIELD OF CHEMISTRY AT LARGE, PARTICULARLY HIS DISCOVERIES IN THE MOLECULAR PARASITOLOGY FIELD.

The ceremony was held at Alice Campbell Alumni Center, with Chemistry faculty and University administration taking time to honor both Professor Oldfield and Harriet Harlin, whose gift made the event and Professorship possible. Speakers including Chemistry Head Steven Zimmerman, SCS Director Andrew Gewirth, and Vice Provost Barbara Wilson reflected on Oldfield and Harlin's accomplishments as well as the importance of research and alumni giving to the success of the Department of Chemistry. After the official investiture concluded, guests were treated to a reception where they could network and catch up.

### Eric Oldfield

Professor Oldfield began his education at Bec School, London, and then received a BSc in chemistry from Bristol University, doing research with Jake Macmillan and Geoffrey Eglinton. He then attended Sheffield University where he received a PhD in biophysical

chemistry while working with Dennis Chapman. Next, Dr. Oldfield worked as an EMBO Fellow at Indiana University with Adam Allerhand and later was a visiting scientist at MIT with John Waugh. He joined Chemistry at Illinois in 1975.

His research interests have covered a broad range of topics, including deuterium NMR of lipids and proteins, carbon-13 NMR of proteins, NMR of non-integral spin quadrupolar nuclei, electrochemical NMR, and quantum chemical investigations of NMR, EPR, and Mossbauer spectra of metalloproteins and model systems.

Most recently, Professor Oldfield has developed new approaches to the treatment of infectious diseases targeting bacterial virulence factors. He is known for the development of novel anti-parasitics for tropical diseases, as well as the development of new lipophilic biophosphonates for use in cancer therapy and immunotherapy.



During his career, Professor Oldfield has been the recipient of numerous professional awards including the Royal Society of Chemistry's Meldola Medal and Prize, the Biochemistry Society's Colworth Medal, ACS's Award in Pure Chemistry, the American Heart Association's Basic Science Research Prize and the Biophysical Society's Avanti Award in Lipids.

In addition to the numerous awards for his science, Professor Oldfield has been recognized for his contributions to education at the University, being named the recipient of the Campus Award for Excellence in Guiding Undergraduate Research as well as a University Senior Scholar.

## Harriet Ann Harlin

Harriet Harlin (1924-2010) was a loyal alumna and accomplished teacher who wished to support her alma mater's endeavors in providing exceptional educational opportunities for students. Her gift, the Harriet A. Harlin Endowment for Chemistry Fund, not only establishes this Professorship that supports academic excellence in teaching and research, but also supports scholarships and programs that enrich the quality of undergraduate education in general chemistry.

Harriet Ann Harlin was born on September 2, 1924 in Chicago, IL. Her father—a doctor—and her mother—a schoolteacher—both inspired her career choice in science education.

After graduating from Alvernia High School in Chicago, Ms. Harlin attended the University of Illinois at Urbana-Champaign earning a BS in home economics from the College of ACES in 1946. Her academic concentration was in hospital dietetics.

She continued her studies at Kansas State University receiving a MS in chemistry and a second MS, also in chemistry, at Wesleyan University in Connecticut.

After working as a chemical analyst in the chemical and food industry, Ms. Harlin decided to seek a more satisfying career, one that would inspire youth. In 1955 she joined the Chicago Board of Education to teach high school chemistry. She was an instructor at several Chicago public high schools, ending her career at Taft High School. She retired in 1988 after 33 years as a celebrated teacher.

Harriet Harlin valued her education at Illinois and remained connected throughout her lifetime. She was a life member of the University of Illinois Alumni Association as well as the Bronze Circle and Foundation.

*Oldfield and Harlin biographical information provided by the College of Liberal Arts and Sciences.*



## Chemistry Convocation 2012

THE CHEMISTRY AT ILLINOIS FAMILY GREETED ITS NEWEST GROUP OF ALUMNI ON MAY 13, 2012 AS THE DEPARTMENT HONORED ITS UNDERGRADUATE, MASTERS, AND DOCTORAL STUDENTS AT THE 2012 CONVOCATION CEREMONY AT KRANNERT CENTER FOR THE PERFORMING ARTS.



*Dr. Marinda Li Wu*

Welcomed into Krannert Center's Tryon Festival Theatre by the Aduro Brass quintet, the graduates listened to introductions by then School of Chemical Sciences Director and Chemistry Professor Andrew Gewirth and College of Liberal Arts and Sciences Dean Dr. Ruth V. Watkins.

The Department was also honored to welcome back to campus alumna and current American Chemical Society President-elect Marinda Wu as the keynote speaker.

Dr. Marinda Li Wu received a BS cum laude with Distinction in Chemistry from the Ohio State University and a PhD in Chemistry under Professor Russ Drago from the University of Illinois in 1979. Her career has spanned over 30 years with experience in research and development at Dow Chemical and marketing at Dow Plastics. Dr. Wu also founded "Science is Fun!" to engage young students in the excitement of science and enhance public awareness of the importance of supporting and improving science education.

An ACS member for over forty years, Dr. Wu has served in many leadership roles at both the local and national levels. Dr. Wu has been a Councilor for the California Section for over 15 years and served on the ACS Board of Directors as Director-at-Large from 2006-2011. In

2011, she was elected to the Presidential succession of the American Chemical Society. She will serve as President-Elect for 2012, President for 2013, and Immediate Past President for 2014.

Additionally, four graduating seniors were specifically honored for their high achievement and dedication to the Department and field.

**Maaz Ahmed** was awarded the **John C. Bailar Award** for outstanding undergraduate thesis work. Maaz played an active role in research for three years, most recently with Professor Paul Hergenrother in organic synthesis. In addition to his time in the lab and serving as a teaching assistant, he worked for a number of pharmaceutical companies. This fall Maaz began attending graduate school at the University of Wisconsin-Madison, researching catalytic systems.

The **John David Barnwell Memorial Award**, given to a student who exemplifies high academic achievement, personal ethics and scholarship, along with a well-rounded interest in life, friendship, and the arts was given to **Emre Discekici**. Emre was a well-rounded student who had a second major in East Asian Languages and culture in addition to his commitment to his research in Professor Jeff Moore's group. This year he also helped translate a documentary about the devastating March 2011 earthquake in Japan. Following graduation, Emre traveled to University of Toyko where he was given a research grant in the Field of Natural Product synthesis.

**Christina Barrera**, a top student and one of the department's best teaching assistants during her time on campus, was awarded the **Reynold C. Fuson Award** for academic excellence in chemistry. As an undergraduate in the Teaching of Chemistry program, she was consistently ranked highly by her students as an excellent instructor and recently received the prestigious campus Teaching Excellence Award. In addition to her





## Graduates

work under Gretchen Adams as a teaching assistant, Christina was also active in Alpha Chi Sigma and the campus Winter Flags group. After graduation, Christina moved back to the Chicago suburbs to teach chemistry.

The **C. S. Marvel Award**, given for excellence in undergraduate thesis research, was presented to **Eric Novitsky**. Eric was one of our most active undergraduates, and was a well-known face around the Department of Chemistry. In addition to his research in Prof. Steven Zimmerman's group, Eric was also active in outreach, participating in the REACT program which provides chemistry demonstrations to local schools. Eric is currently attending the University of California, Irvine for graduate studies.

After the ceremony concluded, graduates as well as their family and friends joined department faculty and staff in the breezeway between Noyes Laboratory and the Chemistry Annex Building to enjoy a reception honoring the graduates.

\* *Bronze Tablet recipient*  
# *Chancellor's Scholar*  
+ *James Scholar recipient*  
& *Phi Beta Kappa*  
= *Double Major / Dual Degree*  
• *Triple Major*

### Bachelor of Science in Chemistry

Andrew W. Acosta  
Waseem Ahmad  
Maaz S. Ahmed  
Mark Richard Baker  
Allen Bark  
Muhammad Kumayl Bin Abdul Wahab  
Ellen M. Briggs  
John Craffey  
Joseph H. Cullen  
Aaron Jacob Gore +  
Heather A. Hanson  
Kevin Richard Hayek  
Kendon Scott Holtz  
Joel S. Johnson  
Steven Kelder  
Joseph E. Kelly  
SooKyum Kim  
Steven G. Lu  
Paige A. Malec =  
Christopher Paul Myers  
Christopher M. Nellessen  
Mark Allen Nesbit  
Eric James Novitsky  
Elizabeth Anne Ott  
Joseph Timothy Puhr  
Aaron Matthew Raiff +  
Jacob Ryan  
Sarah Marie Savegnago  
Brittany E. Schnepel  
Mohammed Hasan Siddiaui  
Kevin J. Sramek  
Sara Noelle Streeb  
Chi Pan Ting \*  
Ross Worobel  
Anthony C. Yerkes  
Michael Tyler Zoloty

### Bachelor of Science in Liberal Arts and Sciences

Yoonhee Ahn \*  
Corinne L. Aufmann  
Alexandra Barabanova  
Brian James Bergquist  
Denisa Evangela Bica =  
Jacob S. Bleyer =  
Nicholae B. Brown  
Collin E. Burdick  
Andrea E. Carmichael  
Dana Mast Caton  
Brian Chin =  
Heyim Cho  
Robert A. Craig  
Emre H. Discekici + =  
Cynthia Marie Donati =  
Jennifer Glenna Donenberg=  
James Drake +  
William Philip Fanning  
Peter Filip  
Brittney Lee Fiorello  
Julianna F. Gaffney  
Ritesh Gandhi  
Brianna M. Goen  
Anna Catherine Gormley +  
Anisha Gupta  
Niloufar Hafezi-Mashhadi =  
Michael R. Hardig  
Raymond Biondy Henka  
Sonam Jaglan  
Katie Sooyeon Kang  
Christopher Kemna  
Seon Kyung Kim  
Clark C. Kulak  
Shivani Kumar + =  
Mingshan M. Lai  
Ian Paul Thomas Lake  
Khair Lambaz =  
Michelangelo J. Latona  
Dong-Hoon Lee  
Hyunjin Lee  
Charlie Kyungchan Lee  
Benjamin Lew  
Kenneth Liu =  
Sarah Yu Malina  
Edmund Charles March

Daniel A. Marchwiany +  
Nicolas E. Martin  
Bradley James McAllister  
Eric Michael McCurley  
Kevin James McDaniel  
Richard D. McGee  
Kyle David McQuaid =  
Vincent Mei  
Phillip Mekeel  
Sabre Y. Mitchell  
Ancy S. Mohan  
Justin Jiwhan Moon  
Alyson Joy Moseberry  
Amanda E. Mulcrone +  
Nathan J. Nard  
Alyssa M. Novak  
Jung Min Oh  
Michael Ornelas  
Karla Padilla  
Mack-Anthony P. Parayo  
Marissa A. Pasquini + =  
Dev Rohit Patel +  
Dhara R. Patel + =  
Theresa Phan  
Tejas Rawal =  
Jessica Frank Reynolds  
Oliver Cereno Rivera  
Nicholas Joseph Romito \*  
Zachary Albert Rosenfeldt  
Patty Ann Rottinghaus  
Michael James Rummans  
Anna Katie Sankovsky \* +  
Zachary David Sasnow  
Kirsten J. Sawyer  
William John Schaeffer  
Tovah M. Schwartz +  
Rutvik Jay Shah  
Jinny Hyunjin Shin  
Jordan T. Sinnott  
Paul Francis Smith  
Ryan I. Solan  
Annemarie Spiezia  
Kamil Stelmach  
Sean T. Toenjes  
Selam Totonchi  
Brian B. Towell  
Mengyi Wang =

Rebecca Joan Wehrmann + =  
William Patrick Whalen  
Dionte Kenard Wiggins  
Jessica Wilson  
Sydney Yang  
Jessica Zhang  
Wendy Zhang

### Bachelor of Science in the Teaching of Chemistry

Christina Barrera  
Brendan Thomas Kane  
Daniel Hyun Kim  
Katherine Kokosinski  
James Jin Park  
Brian Rosten  
Benjamin S. Torrisi  
Janusz Wiczorek

### Master of Science in Chemistry

Ian Pearson Blitz  
Darivs Brown  
Jenna Audrey Klubnick  
Thomas Kirk Mahle  
David Frayne Shudy  
Robert Carl Weintraub

### Doctor of Philosophy in Chemistry

Cyrus A. Anderson  
Joseph S. Bair  
Audrey M. Bowen  
Brian Elliott Brumfield  
Christine Cecala  
Chaenyung Cha  
John Stephen Comninos  
Rusty W. Conner  
Dustin Joseph Covell  
Christopher Dailey  
Andrew Clifford Dunbar  
Nathan Webster Duncan-Gould  
Jessica F. Frisz  
Kaitlyn C. Gray  
Jeremy Jay Hatch

Christine Toh Herman  
Jonathan Wayne Kemling  
Ann M. Knolhoff  
Matthew Kryger  
Timothy John Kucharski  
Adam David Langenfeld  
An-Phong Le  
Luisel Rodriguez Lemkau  
Christopher S. Letko  
Seth L. Marquard  
Nicholas Marshall  
Andrew Allen Mills  
Andrew Jon Nieuwkoop  
Trent J. Oman  
Daniel S. Palacios  
Rahul Palchaudhuri  
Alexander A. Parent  
Abraham Jaleel Qavi  
Stacie Lynn Richardson  
Amit Sachdeva  
Lingjuan Shen  
Ting Shi  
Lindsay J. Sperling  
Erik M. Stang  
Matthew A. Thorseth  
Kevin Ryan Tucker  
Juan Esteban Velasquez  
Nicolaas Vermeulen  
Adam L. Washburn  
Nathan S. Werner  
Diana Christine West  
Tiffany Diane Wilson  
Tyler Winslow Wilson  
On Yi Wong  
Tianjiao Wu  
Hangxun Xu  
Jieqian Zhang  
Ming Zhong  
Andrew Theodore Zill

*This program contains an unofficial list of candidates for graduation on May 15, 2011 and a list of graduates who received degrees in August 2010, October 2010, and December 2010. Due to printing deadlines, the names of some degree recipients may not appear, while the name of some degree candidates who have not completed their degree requirements may be included.*





## New Faculty Introductions

AS MENTIONED IN PROFESSOR JEFF MOORE'S LETTER FROM THE HEAD, THE 2011-12 ACADEMIC YEAR MARKED A NUMBER OF SIGNIFICANT CHANGES IN THE DEPARTMENT. PROFESSORS ALEX SCHEELINE AND PATRICIA SHAPLEY RETIRED AT THE END OF THE ACADEMIC YEAR AND DEPARTMENT HEAD STEVEN ZIMMERMAN AND SCS DIRECTOR ANDREW GEWIRTH WRAPPED UP THEIR TERMS WHILE JEFF MOORE AND JONATHAN SWEEDLER STEPPED IN TO BEGIN THEIR NEW ADMINISTRATIVE ROLES. IN THE MIDST OF THESE INTERNAL CHANGES, THE DEPARTMENT WAS ABLE TO SUCCESSFULLY RECRUIT FIVE NEW FACULTY MEMBERS. TO GIVE READERS AN INTRODUCTION TO THE NEWEST MEMBERS OF THE CHEMISTRY AT ILLINOIS FACULTY, CHEMISTRY NEWS RECENTLY GOT IN TOUCH WITH EACH NEW FACULTY MEMBER TO ASK SOME QUESTIONS TO GET ACQUAINTED.

### Alison Fout



**Department of Chemistry:** Welcome! Can you tell us a bit about your background?

**Alison Fout:** I am a native Midwesterner and grew up on the shores of Lake Erie in northern Ohio. I attended Gannon University in Erie, PA for

my undergraduate studies where I majored in chemistry and ran cross-country and played water polo. After graduation I moved south to Charlotte, North Carolina to pursue a Master's degree in Chemistry at the University of North Carolina at Charlotte. During my time at UNCC, working in Prof. Dan Rabinovich's lab, I fell in love with research and mentoring students and it became evident to me, that I needed to pursue my PhD I then moved back to the Midwest and to Big Ten rival Indiana University, where I obtained my PhD under the guidance of Prof. Dan Mindiola. Another move, this time to the Northeast, for my postdoctoral work at Harvard University with Prof. Ted Betley, allowed me to continue to develop as a synthetic inorganic chemist.

**Department of Chemistry:** What attracted you to the University of Illinois?

**Alison Fout:** The department of Chemistry at the University of Illinois is ranked quite high nationally, meaning I would be able to work with not only the best and brightest students, but also with world-renowned colleagues. Adding that to the exceptional facilities, department collegiality and knowledgeable staff makes Illinois a desirable place.

**Department of Chemistry:** Were you always interested in being a professor? What attracted you to academia over something like industry?

**Alison Fout:** During the course of my graduate studies it became apparent to me that my favorite time during the day was mentoring the undergraduate students I was working with. I loved teaching them about research and watching them grow into scientists. In industry, I would not have had the opportunity to work with students and develop the next generation of scientists. During my postdoctoral work, I realized that the research ideas I was most passionate about were quite challenging and in order to pursue these ideas, I needed to work at a PhD granting institution. Over time I developed into wanting to be a professor so that I could investigate ideas I was excited about, all while mentoring students.

**Department of Chemistry:** Can you go into a bit more detail about your research interests?

**Alison Fout:** The Fout research program focuses on the synthesis of ligand architectures that can support transition metal complexes capable of mediating unusual transformations for biological, environmental and energy problems. Our main curiosities stem from catalytic, synthetic inorganic, and bioinorganic chemistry. The group is interested in using synthesis, reactivity, and mechanistic studies to understand the activation of small molecules by low-coordinate transition metal-ligand multiple bonds.

**Department of Chemistry:** Now that you've had a few months to settle into the community, what are your favorite things about UIUC and Urbana-Champaign?

**Alison Fout:** One of my favorite things (outside the chemistry department, my group and lab) about UIUC is the ability to watch some great sporting events—I have attended both football and basketball games. My favorite thing, thus far, about Urbana-Champaign is that it is a great college town with a variety of things to do. I been able to enjoy quite a few of the restaurants the town has to offer from Asian-fusion, to American, Mexican, Thai and Italian and have already established some favorites.

**Department of Chemistry:** One of your main roles as professor will be serving as a mentor to student researchers. Do you have any advice or words of wisdom to students interested in pursuing studying chemistry?

**Alison Fout:** My main advice for students interested in studying chemistry is to be passionate and work hard. Also it is important to get involved with a research lab as early as possible during your course of study. This will give you a great opportunity to get hands on experience doing research, which is different from the lab classes that you take, and really allow you to explore your interest in chemistry.

### Sharon Hammes-Schiffer



**Department of Chemistry:** Welcome! Before joining the University of Illinois, you were a professor at the Pennsylvania State University. What attracted you to the Chemistry at Illinois?



**Hammes-Schiffer:** I was impressed by the outstanding faculty, particularly the breadth and depth of the research, in this department.

**Department of Chemistry:** When did you first become interested in chemistry? You describe your research generally as the development and application of theoretical and computational methods for describing chemical reactions in condensed phases and at interfaces—what specifically drew you to study the interface of theoretical and physical chemistry?

**Hammes-Schiffer:** I was always interested in math and the physical sciences, and I decided to major in chemistry when I was a sophomore at Princeton. The interface of theoretical and physical chemistry allows me to combine my love of math, computers, chemistry, and physics.

**Department of Chemistry:** Tell us a little bit about your current research interests.

**Hammes-Schiffer:** My current research group is divided into three subgroups: proton-coupled electron transfer (PCET), biological systems, and fundamental aspects of electron-proton interactions. Our work combines the development of new analytical theories and computational methods with applications relevant to alternative energy sources such as solar cells, as well as biochemistry and enzymology. In the PCET subgroup, we study both electrochemical reactions, namely the design of molecular electrocatalysts for hydrogen production and oxidation, and photoinduced processes, specifically the ultrafast nonequilibrium dynamics following photoexcitation. In the biological subgroup, we investigate enzyme reactions, particularly the role of conformational motions, electrostatics, and hydrogen bonding, as well as the mechanisms of ribozymes, which are RNA enzymes. In the last subgroup, we develop quantum mechanical methods for studying electron-proton correlation and non-Born-Oppenheimer effects.

**Department of Chemistry:** You were recently inducted into the American Academy of Arts and Sciences, and have received numerous awards and recognition for your contributions to the field including being a fellow of the American Chemical Society and the American Physical Society as well as winning the Camille-Dreyfuss Teaching Award. Are any particularly meaningful to you?

**Hammes-Schiffer:** All of these honors are meaningful to me because they signify that my research and teaching contributions are appreciated by my colleagues.

**Department of Chemistry:** Now that you've had a few months to settle into the community, what are your favorite things about UIUC and Urbana-Champaign?

**Hammes-Schiffer:** I appreciate the sense of community and the collegiality of the university. We are also enjoying sampling the wide range of restaurants in the area.

## Kami Hull



**Department of Chemistry:** Welcome! Can you tell us a bit about your background?

**Kami Hull:** I am a native Midwesterner who grew up in Green Bay and later Whitefish Bay, Wisconsin. When I went to Macalester

College, in St. Paul, MN, I wanted to be a chemistry teacher and run the technical theater program at a high school. I really enjoyed both chemistry and designing and building theatrical sets. However, I quickly realized that I could combine the two areas together - as an organic chemist I could discover new reactions, design elegant syntheses, and synthesize much smaller scaffolds. During

my undergraduate career I participated in an REU program at Montana State University over the summer of 2001 where I worked in Prof. Paul Grieco's laboratory. This was my first exposure to organic chemistry research and I was hooked. Upon returning to Macalester, I worked with Prof. Ronald Brisbois for the next two years, which was my first exposure to organometallic catalysis. In 2003, after obtaining my BA in chemistry, I chose to pursue my PhD under the guidance of Prof. Melanie Sanford, at the University of Michigan. My doctoral research focused on the development of palladium-catalyzed oxidative functionalization of C-H bonds for the synthesis of C-O, C-F, and C-C bonds. I received several awards for my graduate work, including the ACS Organic Division fellowship, the Roche Excellence in Chemistry Award, and the Fajans Outstanding Thesis award. Upon graduation in early 2009, I went on to be an NIH Postdoctoral Fellow in the laboratories of Prof. Barry Trost, where I worked on the total synthesis of (-)-lasonolide A and the development of a palladium-catalyzed decarboxylative allylic alkylation reaction with lactam nucleophiles.

**Department of Chemistry:** What attracted you to the University of Illinois?

**Kami Hull:** I was excited to join the faculty at the University of Illinois due to the quality of the students, colleagues, and facilities - there was no better place for me to start my career.

**Department of Chemistry:** Were you always interested in being a professor? What attracted you to academia over something like industry?

**Kami Hull:** I have always enjoyed working with others and by the end of my undergraduate education I knew that I wanted to be a professor and by my third year at the University of Michigan I knew I wanted to mentor graduate students at an R1 university. Although I considered working in industry, I was attracted to the freedom in research that an academic career affords.

**Department of Chemistry:** Can you go into a bit more detail about your research interests?

**Kami Hull:** Research in the Hull group focuses on the development of transition metal-catalyzed reactions to access important organic products in a single step from easily accessible functionalities, ideally, without the generation of any stoichiometric byproducts. We aim to develop novel approaches to tradition bond disconnections, augmenting existing techniques.

**Department of Chemistry:** Now that you've had a few months to settle into the community, what are your favorite things about UIUC and Urbana-Champaign?

**Kami Hull:** UIUC is a fantastic university. I really like the supportive and dynamic atmosphere in the chemistry department and the university as a whole. Urbana-Champaign is a great place to live; as the home of a large university, there are great restaurants, people, and schools. Also, the sunsets on the prairie are spectacular.

**Department of Chemistry:** One of your main roles as professor will be serving as a mentor to student researchers. Do you have any advice or words of wisdom to students interested in pursuing studying chemistry?

**Kami Hull:** Follow your passion and be fearless - join the group and work on the chemistry that you are most excited about; if you do you will be both successful and happy. Graduate school is hard and requires a lot of work, but no matter how hard you try or how smart you are chemistry will not always work; keep things in perspective and don't let minor setbacks in chemistry discourage you from reaching your goals.



**Richard H. Perry**

**Department of Chemistry:** Welcome! Can you tell us a bit about your background?

**Richard H. Perry:** I grew up on a tropical island in the Caribbean. After leaving Jamaica, I attended Florida Atlantic University

where I completed degrees in Biology (BS) and Chemistry (MS). During my master's thesis research, I became fascinated with analytical chemistry and the ability of mass spectrometry to unravel the chemical composition of the world. This scientific interest led me to pursue a PhD degree with R. Graham Cooks at Purdue University, where I participated in inventing mass spectrometric instrumentation and in elucidating ion dynamics in novel mass analyzers. After learning these fundamentals, I was honored to work for Richard N. Zare as a postdoctoral fellow at Stanford University. I was involved in developing new analytical techniques to address complex problems in cancer biology and organometallic catalysis.

**Department of Chemistry:** What attracted you to the University of Illinois?

**Richard H. Perry:** I am excited to work for UIUC mainly because I admire its commitment to excellence in research and teaching, which is exemplified by the many Nobel Laureates, Pulitzer Prize winners, and outstanding scientists affiliated with the university. Public universities such as UIUC help societies to efficiently cope with the challenges of the 21st century through education, and I look forward to being a part of this process. In addition, the Department of Chemistry at UIUC is ranked among the best in the world, so I am privileged to be afforded the opportunity to work with great leaders in various fields of research. These are just a few of the factors that attracted

me to UIUC, and I look forward to contributing to the continued success of the university.

**Department of Chemistry:** Were you always interested in being a professor? What attracted you to academia over something like industry?

**Richard H. Perry:** Becoming a professor has always been my childhood dream. After completing my Ph.D. degree, I explored career opportunities in industry, and I received job offers from various pharmaceutical companies. However, I decided to accept a postdoctoral position at Stanford University because I believe that academia provides the greatest potential for personal and professional growth. The freedom to explore scientific questions puts great emphasis on acquiring new knowledge, and interacting with young, vibrant minds that inspire and motivate can only be found in academe. In addition, being a professor provides me the unique opportunity to teach students about the wonders of the Universe and to participate in their development as independent thinkers, a process that is tremendously rewarding.

**Department of Chemistry:** Can you go into a bit more detail about your research interests?

**Richard H. Perry:** To be effective, anticancer drugs must penetrate tumor microenvironments to reach cells existing hundreds of micrometers distal to blood vessels. One of my research interests involves developing label-free imaging methods that generate detailed maps simultaneously showing drug penetration, cell heterogeneity, and chemical composition in tumor microenvironments. These studies will allow the prediction of drug efficacy based on tumor morphology, chemical composition, and structure, thereby significantly facilitating drug discovery and cancer treatment. This powerful imaging capability can potentially transform biomedical research by advancing current understanding of tumorigenesis and by identifying new avenues to improve cancer therapies. Another area of research

area in my laboratory involves creating state-of-the-art mass spectrometric tools to intercept the transient intermediates of catalytic systems that are important for synthetic and energy applications. These capabilities may one day inform synthetic chemists about fast on- and off-path reactions, which will facilitate the design of more efficient catalysts.

**Department of Chemistry:** Now that you've had a few months to settle into the community, what are your favorite things about UIUC and Urbana-Champaign?

**Richard H. Perry:** I truly admire the unwavering collegiality at the UIUC. Interacting and collaborating with scientists from many different disciplines is easy because of their openness to new ideas and ways of thinking. In addition, I appreciate the immense and unique commitment of the administration to catapult the careers of young assistant professors toward success. The other aspects I appreciate are the university's exceptional support staff and facilities, especially in the Department of Chemistry, which enable scientists to perform world-class research. In the Urbana-Champaign area, I have found small treasures, such as the Arboretum, Japan House, and Krannert Art Museum, which are truly beautiful and inspiring attractions.

**Department of Chemistry:** One of your main roles as professor will be serving as a mentor to student researchers. Do you have any advice or words of wisdom to students interested in pursuing studying chemistry?

**Richard H. Perry:** My advice to students can be summarized in the words of Ralph Emerson: "Do not go where the path may lead, go instead where there is no path and make a trail." Making one's trail will be difficult and will require discipline, determination, and hard work. Despite the many obstacles, never lose sight of your goals, always be true to yourself, and do not be afraid to fail. True success can only come from your unique perception of the world and your courage to explore new ideas in the face of adversity.

**Joaquín Rodríguez-López**

**Department of Chemistry:** Welcome! Can you tell us a bit about your background?

**Joaquín Rodríguez-López:** I was born in central Mexico, in a town that seen in retrospect, has a similar weather to the Urbana-

Champaign area. I was always a good student at school, obtaining the highest grades and eager to learn things, but it was until middle school that I discovered that my real passion was science. My parents managed a restaurant and we did not eat at home, so soon, I had configured our kitchen as my own chemistry laboratory. In high school, I received mainly instruction in humanities, but a large impetus from my middle school experience helped me choose (correctly) chemistry as my path. I attended Tecnológico de Monterrey in north Mexico. There I had even better teachers and soon enough I was breathing analytical and physical chemistry. I was not exceptional at synthesis, so when I found I could direct and control chemical reactions using a potentiostat, I was sold and decided to become an electrochemist. I worked under the supervision of Prof. Marcelo Videa who gave me great freedom to work in the lab; I attended national meetings and even got a prize for my bachelor's thesis. Close to graduation, he suggested that I applied to Prof. Allen J. Bard's laboratory of electrochemistry at the University of Texas at Austin. I could not agree better with him and eventually moved to Austin, where my PhD years were fruitful and inspiring. The instruction I received with Prof. Bard really shaped me as a scientist, and gave me the tools to take the next step and move to Cornell University for a post doc in the prestigious laboratory of Prof. Héctor Abruña. There, I was exposed to a wider scientific world, where I learned much about materials chemistry and even got the opportunity of changing instrumental scales: from working with tiny electrodes to doing measurements in a building-size machine. If we stand on the shoulders of



giants, my case is not an exception, and that eventually gave me the push to pursue my independent interests at the University of Illinois.

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**Department of Chemistry:** What attracted you to the University of Illinois?

**Joaquín Rodríguez-López:** There are many reasons to come to a world-class research university such as the University of Illinois. One important reason was to notice the quality and motivation of the students. I could not be happier with the group of students that just joined my lab, whether graduate or undergraduate. This observation also seemed to be a recurring topic in the “hiring-period” conversations with my now colleagues, and it has not disappointed me. Additionally, I identified the great instrumental and micro- and nano-fabrication resources we have on campus as something that would allow me to achieve my research goals more readily. I still cannot wait to see how my students grow intellectually using these resources. Finally, knowing that the department was opening its doors to four new faculty, the idea of collaborating with people that were as engaged and motivated as I am, really made a great impression on me. Then you have the tradition of excellence in the Chemistry Department, and all the good things that come with it: collegiality, experience, learning from great groups and the opportunity to collaborate with researchers throughout campus, whether in Chemistry or not.

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**Department of Chemistry:** Were you always interested in being a professor? What attracted you to academia over something like industry?

**Joaquín Rodríguez-López:** I have always liked teaching and the idea of becoming a university professor. I had opportunities that I could have pursued for an industrial position, but I always knew that I wanted the opportunity to set up my own research program and to pursue my own scientific adventure. Not only that, I enjoy teaching very much. The teaching interaction

develops your intellect in unsuspected ways, there is always the motivation to study and understand things better because you want to deliver knowledge in ways that escape your own understanding. For example, teaching is like writing an interactive article. If you just wrote a simple article, there is only so much you can put down with your pen. But if you are constantly challenged by questions and requests for new analogies and examples you are always perfecting your explanations, you are able to engage in writing a never-ending story, one more complete and where you and your students get the benefit of knowledge. One hopes that this story at some point becomes a “best-seller” amongst the students. Thinking about the many things that I would have liked to do with my life, being a professor maximizes their number. You get to teach, learn, write, create, travel and maybe even generating knowledge that translates into wealth.

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**Department of Chemistry:** Can you go into a bit more detail about your research interests?

**Joaquín Rodríguez-López:** We study how electrons and ions interact with different materials, mainly for the purpose of developing new methods of analysis of samples and for understanding and modifying materials for energy conversion (e.g. alternative sources such as fuel cells) and energy storage (e.g. batteries). The branch of chemistry that deals with this is generally termed as Electrochemistry, but at its core, really one is combining a bit of everything, so in a typical experiment, we transform matter (synthesis), we transport it (mass transfer, engineering), we analyze the rate at which it is transformed (kinetics), we control with enormous precision the energy that we input into the system (thermodynamics) and we do so by developing new and exciting instrumentation (analysis). We even analyze light emission and absorption in our systems (spectroscopy). We keep our interests broad, and this allows us to think about strategies that make our research special. So we are developing platforms in which we can describe and better the performance of lithium-ion batteries. We develop experiments that will tell us key parameters

about electrocatalysts, i.e. substances that help us convert chemical energy into electricity. We like to give practical uses to new and exciting materials, such as the thinnest electrode possible: graphene. We produce reactions that give off light, and by doing so, we try to obtain hidden information from nanomaterials. We do all of this using very tiny electrodes and a technique called scanning electrochemical microscopy.

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**Department of Chemistry:** Now that you’ve had a few months to settle into the community, what are your favorite things about UIUC and Urbana-Champaign?

**Joaquín Rodríguez-López:** The parks in Champaign are great. It was also great to discover a couple of places with good Mexican food, this always appreciated. We like also the warmth and kindness with which we have been welcomed by our peers and the people we have interacted with in the town. The University has been a great place to explore. The gyms (both ARC and CRCE) are very fun places to do some exercise and they are very complete. Food around campus is great, but inside campus is even better, our favorite place to have quick lunch is Bevier Café. We have also enjoyed activities by the many organizations on campus and from the chemistry department; in our first departmental picnic I played soccer with the students and I hope they give me the chance next year as well! We think the Urbana-Champaign area is a very easy place to live in and it is very convenient and peaceful.

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**Department of Chemistry:** One of your main roles as professor will be serving as a mentor to student researchers. Do you have any advice or words of wisdom to students interested in pursuing studying chemistry?

**Joaquín Rodríguez-López:** In my short experience, wisdom is a big word but I do know that to be successful in anything, you have to enjoy what you do and be serious, might even say passionate, about it. You must be courageous to take opportunities and to follow your

interests. Chemistry is a very demanding science and any program, graduate or undergraduate, will test your skills in many levels, but it will also offer many opportunities in which you can blossom as a scientist or if you want, as an entrepreneur. One of the reasons why I chose Chemistry as my major is that it allowed me to combine all my interests in math, physics and biology in one science that somehow is radically different than these ingredients. This is a charm that chemistry has and it allows you to create very original things. So if you are already a student thinking in pursuing chemistry, I can only say “Great! You have already taken the first step into a career full of opportunities, I am sure there is one passion that you will find amongst all these fields that Chemistry touches, now it is up to you to study and work hard to find such a driving force for a successful career.” and my feedback would be that if you like the concepts involved in the quotation marks, you are heading the right way.



# Why Take Organic Chemistry

## RISK, FAILURE AND UNCERTAINTY – AN ESSAY ON THE HABITS AND ATTITUDES BENEFICIAL TO SOLVING COMPLEX PROBLEMS

By: Professor Jeffrey S. Moore

### A Re-evaluation of Instructional Objectives

For the past 13 years I've taught a two-semester sequence of introductory organic chemistry to students at the University of Illinois at Urbana-Champaign. The majority of my students are pre-professionals and most are not chemistry majors. While the format and means by which I deliver these courses has continually evolved, I have – until very recently – held steadfast to the idea that the organic chemistry content is the most important objective of my teaching. I was fully aware that the problem solving skills which students acquire are important too, but problem solving, as an intentional part of my instruction, took a secondary role to rigor in the subject matter. For the reasons explained below, I've flipped the priorities of these two instructional objectives. In fact, if I were to re-title the course today, I might call it, The Skills of Complex Problem Solving Learned Through the Study of Organic Chemistry.

The new title suggests that problem solving should supersede course content as the primary instructional objective. In this light, the organic chemistry content is the

means to acquire better problem solving skills. A course which develops the habits and attitudes beneficial of solving difficult problems is likely to produce greater value for the majority of the students enrolled in the course. After all, learning to solve problems, particularly the kind of complex, open-ended problems encountered in organic chemistry, has relevance and meaning to every future professional.

### A Framework for Solving Complex Problems

The title change and the emphasis it implies is likely to significantly alter my approach to instruction. For example, I will be more deliberate about teaching a framework to help students navigate their way through problem solving. The framework I have in mind is described in the next section and outlined schematically in this article's graphic. The graphic highlights the attitudes and habits that students must develop in order to successfully meet the challenges associated with solving many kinds of complex problems, including the ones in organic chemistry, where there are many multi-step synthesis or mechanism problems.

Most enter college trained to attack problems by memorization and “plug-and-chug” (i.e., algorithmic) approaches. A major goal of college teaching, in my opinion, should be to reprogram this mindset. Therefore, many of the problems encountered in my class are different than what students may be used to. Organic chemistry problems require solutions that multi-step, multi-faceted and non-algorithmic. Nobody solves these problems by memorization alone. Nor are solutions found by applying a simple formula. The pathway to a solution – and the main point to take away from the graphic – involves risk, failure and uncertainty. Getting used to taking chances, overcoming setbacks, and developing confidence to move through doubt, are the experiences you'll encounter in my class. Becoming comfortable with these experiences will help to confront the kinds of problems that are sure to fill future professional careers.

### The Iterative Process of Solving Complex Problems

The process begins by generating initial-step options symbolized by letters A through Z. The options are created by

*Professor Moore lecturing on organic chemistry during a recent trip to Beijing.*



“For those who are flexible and capable in problem solving, the course can be a turning point in intellectual development.”

using various techniques, or possibly by repeated application of just one technique. Consciously or unconsciously, expert solvers do the same when they attack such problems. For the expert solver, however, just one initial-step option is usually all it takes, being crafted intuitively and accurately from years of experience and stored information. But even the expert must follow through the iterative process to intuition, the initial-step options are almost certainly biased by a limited experience-base, although s/he still might intuitively produce an acceptable choice. Conversely, a novice solver may need to consider several initial-step options. If the novice uses his or her intuition, the initial-step options are almost certainly biased by a limited-experience base, although s/he might intuitively produce an acceptable choice. If you think “rule of thumb” sounds like an algorithm, you’re correct. However remember that the “rule of thumb” only provides an initial-step option, rather than guaranteeing a pathway to a solution.

Other techniques commonly used to generate initial-step options are reasoning-by analogy whereby a complex problem is seen in relationship to another problem whose solution is known. If all else fails, a slow, detailed and deliberate analysis is pursued which, for organic chemistry, might involve a bonds-made, bonds-broken association chart. This list of

techniques isn’t exhaustive, but the list represents the common approaches to create initial-step options.

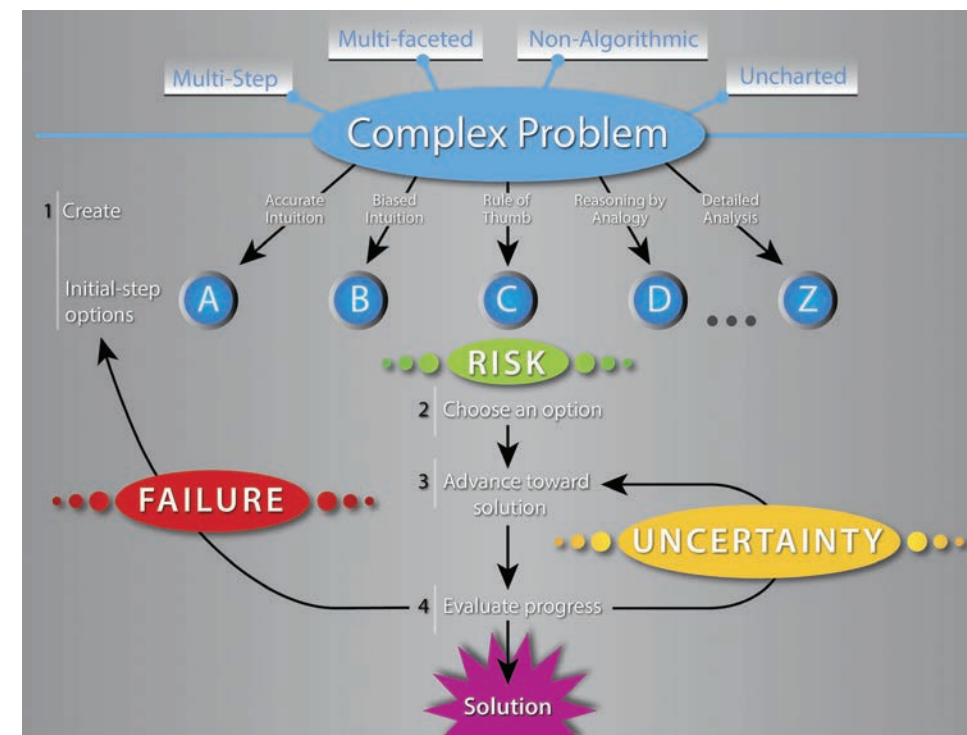
Next, one must choose an option from those created. It is very possible that one of the initial-step options stands out as better than the others, but it is also possible that none of them appear more reasonable than the others. It is also possible that the solver has yet to consider the solution. So, a risk must be taken – a choice must be made – an option must be pursued. With the initial choice in hand, the solver performs further action on the initial choice to advance it toward a solution. This “something” might be to create another set of options – the secondary-step options – using the techniques outlined above possibly with the aid of field-specific tools (e.g., organic chemists might use curved arrow notation). Once the secondary-step options are created, an evaluation is made by comparing the developing solution to the targeted solution, to see if there is an obvious pathway to completion. If no clear pathway to the targeted solution is yet in sight, the solver must contemplate defeat or face the uncertainty of continuing onward. If the developing solution shows obvious shortcomings, the solver may accept failure and return to the

initial-step choices, beginning the entire process again, possibly by creating an even larger set of initial-step choice. Alternatively, the solver may decide to proceed onward through uncertainty by generating another round of next-step options and further evaluating the result. This iterative process continues until a solution is reached.

The challenges are obvious: successfully generating a sufficient number of options, overcoming narrowness that results from biases, continually making choices from a growing and tangled web of options, knowing when to cut one’s losses, and knowing when to continue to plow through experiences that produce accurate intuition. This takes concentration, persistence, adaptability and regular practice over an extended time. The successful solvers are probably comfortable delaying their gratification.

#### On the Role of Memory – Practice and Repetition

Throughout high school and possibly even into the first year of college, rote learning serves students well. Since past success encourage one to stick with what worked, it’s not surprising that many students will try to rely heavily on memorization-only approach. But they shouldn’t! Complex problems are challenging, in



Graphic created by SCS Graphic Designer Dorothy Loudermilk

part, because they are new; the solver has never before charted a solution to the problem at hand. Since the problem is new, it follows that the solver’s memory provides no record of the complete solution. And while memory alone cannot possibly provide a complete solution to a complex problem, a strong and productive memory does help the solver by allowing him/her to quickly generate relevant options at each step of the iterative process. Given the benefits of memory, it is important to distinguish memorization that is productive from rote learning.

Rote learning is the act of storing information without meaning. To realize fast recall and to make proper connections, it is essential not only to have a wealth of relevant facts in one’s mind, but also to have those facts organized in an orderly manner and rote

learning fails to achieve this. Structured information is what provides insight and a deeper level of understanding. So how does one acquire a rich memory that is organized for solving complex problems? The answer is practice and repetition. By practicing a variety of complex problems, students are exposed to a wide range of fact-filled experiences. With repetition, they’ll learn to construct associations and recognize patterns. In other words, practice grows the information warehouse while repetition organizes it. Practice and repetition are thus effective means to a strong and productive memory. And unlike rote learning, this memorization technique does help solve complex problems.

The role of memory is easily seen by comparing students with strong memories to those whose memories are deficient.

When students with poorly developed memories reach in the information warehouse to generate initial-step options, they cannot find what the need, either because it’s not there or because the facts are not well organized. These students tend to grab and use whatever they find. The result is a poor set of initial-step options and almost certain failure. These students are relying on intuition that’s biased because their information warehouse is limited or in disarray. In contrast, students who perform best have practiced solving complex problems over and over again. Having an extensive collection of organized facts, these students are able to reach into their memories in the heat of the moment and quickly find what they need. You might say they are developing “accurate intuition”.

#### Educational Significance

In conclusion, my colleague Peter Beak makes a valuable observation:

*Too many students are unable to make the transition [from algorithmic to non-algorithmic approaches], and while not literally failing the course, miss the opportunity to develop an important professional and intellectual skill at this point. For those who are flexible and capable in problem solving, the course can be a turning point in intellectual development.*

I want to teach in a way that will help more of my students realize this turning point.



# The Allerton Conference: A History

THE ANNUAL BEAK-PINES ORGANIC AREA RESEARCH CONFERENCE IS HELD AT BEAUTIFUL ALLERTON PARK, AN ENGLISH-STYLE ESTATE LOCATED APPROXIMATELY 20 MILES SOUTHWEST OF CHAMPAIGN IN MONTICELLO, ILLINOIS. AT THIS CONFERENCE, ONE STUDENT FROM EACH ORGANIC CHEMISTRY RESEARCH GROUP PRESENTS HIS/HER WORK IN THE OLD LIBRARY OF THE ROBERT ALLERTON HOUSE.

Students from each group also present their work in the form of a poster. Lunch is enjoyed in the grand dining hall, and after lunch there is free time used to wander through the manicured grounds of the more than 5,000 acres of forest and prairie along the Sangamon River featuring formal English gardens and over 100 outdoor sculptures.

On October 17, 1987, the first Organic Area Allerton Conference was held. The intent of the conference was to provide students with an opportunity to present their work in the lecture and poster formats and informal discussions of scientific meetings, to facilitate communication about ongoing work between research groups and to give students organizational and leadership experience. The Organic Area Allerton Conference has been held each year.

Peter Beak developed the idea for the conference in 1986 and obtained funding for the first conference from the Monsanto Company. On May 26, 1987, Merck & Co. awarded Seemon H. Pines (PhD 1951 with N. J. Leonard) the Directors' Scientific Award for his outstanding contributions. Pines contacted the Chemistry Department to ask how this gift might be

used. The organic chemistry faculty, which included Beak, Broka, Schuster, Coates, Curtin, Denmark, Rinehart, Pirkle, Katzenellenbogen, P. Shapley, and Zimmerman, developed three proposals, one of which was to provide continuing support for the Allerton Conference. Pleased by this option, Pines donated the \$50,000 award to create an endowment to support the conference. In subsequent years, the conference has been supported by income from the Pines endowment with supplements from the organic area, faculty funds, and the Obiter Company.

In 2010 Peter and Sandra Beak began donations, which now total over \$150,000 for support of the Organic Area Allerton Conference. Dr. Beak said of the gift, "Sandra and my motivation in providing support for the conference was to try to assure that it can become permanent. The demonstrations of the high level of research in the areas involved the development of the capacities and independence of the students and the opportunities for them to broaden their appreciation of research beyond their own immediate interests should serve the students and the faculty well in the long term."

In honor of Dr. and Mrs. Beak's gift, Dr. Beak's initial idea for the conference, as well as Dr. Pines' critical gift which created and helped to sustain the conference, the organic area faculty decided to rename the Allerton Conference the Beak-Pines Organic Area Allerton Conference.

Although the donors and faculty have helped to facilitate the conference, its true success has been because of the initiative and leadership of graduate students. They chair and organize the conference, give the presentations, participate in the discussions and provide guidance to their successors. The Allerton conference is one of the academic high points of the year and is clearly fulfilling its initial purpose.

At the end of each conference, the Seemon Pines Award is given to the most outstanding presentation. This award was created in 1996 from a second gift from Dr. Seemon Pines which funds a \$500 cash prize for best presentation, as judged by the organic faculty. In addition, the name of each winner is engraved upon a plaque that permanently resides in Roger Adams Lab.



# Seemon Pines: A Life Remembered

The Department of Chemistry is saddened to announce the passing of Dr. Seemon Pines, an alumnus and longtime supporter of the Department and its students.

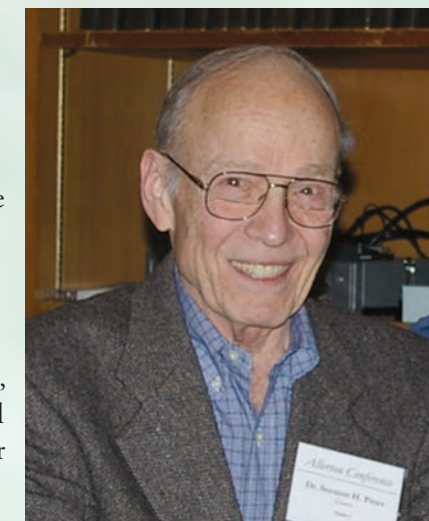
Seemon H. Pines was born in Portland, Maine and educated in public schools in Maine, New York, and Pennsylvania. He pursued undergraduate studies at Lehigh University, which were postponed for two years of service in the U.S. Navy from 1944 to 1946. In 1948, Dr. Pines completed his BS degree in chemical engineering. He continued his academic career at the University of Illinois and became a member of Professor Nelson Leonard's group. He received a Master's Degree in 1949 and a PhD in 1951 for his thesis titled "The Clemmensen reduction cum rearrangement of  $\alpha$ -Aminoketones."

After graduation, Dr. Pines joined Merck and Company as a bench chemist. He devoted his entire career to Merck and ultimately achieved the position of Vice President of Process Research and Development before retiring in 1991. In 1987, he received the Director's Scientific Award, the highest honor Merck bestows upon its researchers in recognition of outstanding scientific achievements.

Dr. Pines was honored for his leading role in the commercial development of the broad spectrum antibiotic, Primaxin. This work is considered one of the greatest synthetic challenges ever brought to commercialization and thus is a benchmark in the pharmaceutical industry. As a central figure at Merck, Dr. Pines was involved in a variety of projects, including the manufacturing process of niacin, glutamic acid, and penicillin, and other work on methyl dopa, indomethacin, carbidopa and sulindac. Dr. Pines guided the Merck Process Group to a preeminent position in synthesis and process chemistry. On October 13, 2000, Dr. Pines was honored with the 2000 LAS Alumni Achievement Award from the University of Illinois in recognition of his lifetime of outstanding accomplishments.

As mentioned in the previous article, Dr. Pines chose to allocate the monetary portion of his 1987 Merck Director's Scientific Award to the Organic Area of the Chemistry Department at the University of Illinois. This generous gift created an endowment which helps to sponsor the annual Organic Area Allerton Conference, held each year and also supported by Professor Emeritus Peter Beak.

In addition to his support of the Allerton Conference, Dr. Pines also funded the Pines Research Fellowship for organic graduate students and the Pines Travel Award. The award allows organic area students to present their Ph.D. research in the form of a seminar at the institution from which they received their undergraduate degree in chemistry.





## Alumni Notes

**Dr. David R. Corbin (PhD 1980, Stuckey)** has been recognized by the The DuPont Company as a 2012 Pedersen Medalist. The award is named in honor of DuPont chemist and Nobel Laureate, Charles J. Pedersen. Awardees are recognized for significant technological achievements that reflect scientific excellence and outstanding contributions to the company.

Dr. Corbin is an internationally recognized authority in the field of inorganic chemistry and an unparalleled expert in its application within DuPont. He is widely known for his important contributions to the development, characterization, and applications of novel zeolitic and mesoporous materials to solve a wide range of DuPont process challenges. Corbin's broad scientific contributions to this area have significantly impacted the field of inorganic chemistry as illustrated by his 124 heavily cited publications.

**Jinwoo Cheon (PhD 1993, Girolami)**, Horace G. Underwood Professor of Chemistry at Yonsei University in Seoul, Korea and the Director of National Center for Evolutionary Nanoparticles (CEN), is the recipient of the 6th POSCO TJ Park Prize (2012), one of South Korea's most prestigious prizes for achievement in science. The Foundation annually awards individuals who have been recognized for their outstanding contributions to the advancements in science, public service, and education.

In addition to his position at Yonsei University, he is a senior editor of *Accounts of Chemical Research* (American Chemical Society), and an editorial board member of *Nano Letters* (American Chemical Society). He is a Fellow of the Royal Society of Chemistry and a member of the Korean Academy of Science and Technology.

**Jessica Frisz (PhD 2012, Kraft)** was recently featured in a *Chemical & Engineering News* article about early career scientists in medical diagnostics.

James Spudich (BS, 1963)-- currently the Douglass M. and Nola Leishman Professor of Cardiovascular Disease at the Stanford University School of Medicine-- has been chosen to receive the 2012 Albert Lasker Basic Medical Research Award. The award is sponsored by the New York City-based Albert and Mary Lasker Foundation and carries an honorarium of \$250,000, which Spudich will share with two other researchers: biologist Michael Sheetz, PhD, of Columbia University, and cellular and molecular pharmacologist Ronald Vale, PhD, of the University of California-San Francisco.

## Get Connected

### Getting Involved with the Department of Chemistry

Interested in getting involved or finding out more information about Chemistry at Illinois? Here are a few of the options available to alumni and friends to engage:

- **Connect with our current and future students** by connecting with our alumni engagement group. Contact Kristin Lang at [klang2@illinois.edu](mailto:klang2@illinois.edu) for more details.
- **Read the latest news and updates** by visiting our news page: <http://chemistry.illinois.edu/news/index.html>
- **Get updates and fun facts** by becoming a Facebook "fan" of Chemistry at Illinois by visiting <http://www.facebook.com/chemistryatillinois>
- **Support the department financially** by visiting our giving page: <http://chemistry.illinois.edu/giving/> or calling us at 217-333-5071

- **Network online with other alumni and friends of the department** by joining the UIUC School of Chemical Sciences Alumni Networking Group on LinkedIn: [www.linkedin.com/groups?home=&gid=2177109](http://www.linkedin.com/groups?home=&gid=2177109)
- **Let us and your fellow alums know what you're up to these days** by submitting an alumni update on our website: [http://chemistry.illinois.edu/alumni/chem\\_alum\\_news.html](http://chemistry.illinois.edu/alumni/chem_alum_news.html)
- **Search for historical alumni information** by using the SCS alumni database: <http://www.scs.illinois.edu/alumnolist/>

If you have any questions, ideas, or comments, please contact us at [chemweb@scs.illinois.edu](mailto:chemweb@scs.illinois.edu)!



# In Memoriam

## Herschel D. Porter

The Department of Chemistry is saddened to announce the death of alumnus and longtime supporter of the department, Dr. Herschel D. Porter who passed away Tuesday, July 31, 2012.

He was born in Silverton, Ohio on Aug. 9, 1924 and earned his B.S. from Wilmington College (OH) in 1944 and his Ph.D. from the University of Illinois in 1947 under Professor Reynold C. Fuson. He was a research scientist from Eli Lilly & Co. from 1947 to 1990. Additionally, he served as the treasurer of the Indiana chapter of the American Chemical Society (1982-84) as well as chairman in 1985; he was awarded its Outstanding Contribution Award in 1991. He also taught chemistry at Indiana Central College in the 1960s.

Dr. Porter's experience at University of Illinois stuck with him throughout his career, and upon retirement he decided to honor his former advisor, Professor Fuson, through a gift in his honor. Along with his wife, Mrs. Angela Porter, he created a bequest to support the department's top faculty and students. The R. C. Fuson Fellowship, created in 1997, has supported over thirty graduate fellowships for top predoctoral students.

## Meredith Mallory, Jr.

Longtime Chemistry at Illinois supporter Dr. Meredith (Ace) Mallory, Jr. passed away on Wednesday, June 6, 2012. He was born on November 25, 1918 in Chicago, Illinois to the late Dr. and Mrs. Meredith Mallory of Orlando, Florida. He graduated from the University of Illinois in 1941 and received his M.D. from Tulane University.

He was a Lieutenant Colonel in the Army, serving in the Korean War as Division Surgeon of the 7th Infantry Division. The 7th fought the well-known battles of Pork Chop Hill and Triangle Hill. While stationed at Fort Sam Houston, he met his wife, Patricia Ann Murchison, and they were married in 1949.

He left the service in 1954, and the family settled in San Antonio. During his lifetime, the family spent many fun-filled summers in Port Aransas where he founded the Gulfside Gas Co. and was known for his spectacular annual island fireworks display celebrating the 4th of July. He was an avid sportsman, enjoying competitive pigeon shooting, hunting, fishing and handball. He supported the YMCA, helping to develop handball as a youth sport. More recently, he helped to fund the outdoor handball courts at the Haven for Hope Children's Park. In addition, he was a pilot, and his lifetime passion for flying often took him across the country on business, as well as to visit family and friends.

His career allowed him to fund endowments both at the University of Illinois and Tulane. At the University of Illinois his gift allowed for the founding of a professorship, the Murchison-Mallory chair, which is currently held by Professor, and Interim Head, Jeffrey S. Moore.

**Robert E. Allen** (MS 1942, PhD 1944, Snyder) passed away Aug. 7, 2012. He was born in 1919 and grew up in Hampton Iowa. A graduate of Grinnell College and a PhD in organic chemistry from the University of Illinois, Bob conducted research at the William S. Merrill Co and Cutter Laboratories in pre-clinical drug discovery, which included the fertility drug Clomid. He was later a patent agent for Bayer HealthCare Pharmaceuticals.

Bob was a lifelong student of art, music, bridge, and an avid gardener and world traveler. After retirement he regularly read to a housebound woman, was a companion to an AIDS patient, landscaped his garden, and was involved with his church.

**Jurgen Diekmann** (PhD 1960, Fuson) passed away August 26, 2012. He was born in Ludwigshafen, Germany to Heinrich and Paula Diekmann. He received his Bachelor's Degree from Kalamazoo College and a Ph.D. in organic chemistry from the University of Illinois. He started work for DuPont in 1959 in the Central

Research Department and ended his career in the Electronics Department. He retired in 1992.

**Elodie Emelda Diodene Fleming** (MS 1948) passed away on September 26, 2012. She was the devoted wife of the late Calvin A. Fleming, II, and beloved mother of her only child, Calvin, 3.

She was born January 20, 1927 in Gretna, Louisiana and was the valedictorian at Gretna High School. She received a full academic scholarship to Newcomb College of Tulane University, where she obtained her Bachelor of Science degree in chemistry at the age of 20. She then attended the University of Illinois where she received her Master's Degree in Chemistry at 22. While at Newcomb she was a member of the Newcomb dance club and Gamma Delta, a campus organization for Lutheran fellowship. In her senior year at Newcomb she was voted President of the Tulane and Newcomb math club. While at Newcomb she simultaneously pursued her musical interest by enrolling at Loyola University of New Orleans

where she studied classical piano and minored in piano studies.

When she concluded school, she went to the West Coast to work as a chemist. A few months thereafter she returned to Louisiana to marry her husband. After a honeymoon in Havana, the couple established their home in Lafitte, Louisiana on Fleming Plantation. After her son started school she briefly taught chemistry at Tulane University School of Medicine.

**Dr. Alfred Raymond Gould** (BS 1950) passed away on September 08, 2012, in Sugar Land, Texas. Doc, as he was called, was known as a gifted healer, who practiced medicine his own way - slowly and thoroughly.

Doc was born in New Orleans, on May 24, 1928, the son of Dr. Harley Nathan Gould and Dr. Mary Raymond Gould. He graduated from Metairie Park Country Day School in Metairie, Louisiana, in 1946, and attended the University of Illinois, receiving his Bachelor of Science degree in Chemistry with a minor in Humanities in 1950. He graduated from Tulane Medical

School in New Orleans in 1954, and performed post-graduate studies at Harvard University School of Medicine. On Christmas Eve 1952, he married the former Barbara Baird, daughter of Hal and Goldie Lou Baird, and they had five children, all sons.

After serving two years as a Senior Assistant Surgeon in the United States Coast Guard, he returned to St. Francisville in 1957 to practice medicine with his stepfather, Dr. Niebergall. Doc, along with Dr. Niebergall, worked for many years to create a hospital for the parish, and he was instrumental in raising funds to build West Feliciana Parish Hospital which opened in 1970 and still serves the parish today. For several years, he also served as a staff physician at the Louisiana War Vets Home in Jackson. He was coroner for West Feliciana Parish for many years, and was chosen as Citizen of the Year in 1997 by the West Feliciana Civic Association. In 2004, he was given the Lifetime Achievement award by the Louisiana State Rural Medical Association and retired in 2006.



**John D. McCollum** (BS 1949), a retired Amoco Oil chemist, died in September 2012. John was born in Evanston, IL in 1929 and graduated from the University of Illinois with a bachelor's degree in chemistry in 1949. He then went on to earn A.M and Ph.D. degrees in organic chemistry under P.D. Bartlett at Harvard.

He was hired by the Standard Oil Company in 1953 as a Project Chemist. He held positions of increasing responsibility as the company evolved to become the Amoco Oil Company, until his retirement in 1989. John was the author of several patents and publications over the course of his career. His principal areas of research focus included the development of beneficiation and liquefaction processes for coal and shale. John held memberships in Sigma Xi, the American Institute of Chemists, the Chicago Catalysis Society, the Union of Concerned Scientists, and he was a 60-year member of the American Chemical Society.

**Walter Smith, Jr.** (BS 1943), known as "Tom," was born in 1922 in Havana, IL, where he enjoyed fishing and boating on the Illinois River. He attended the University of Illinois and received a Ph.D. in chemistry from Indiana University in 1945. In that year he married the love of his life, Miriam "Micki" Nethery Smith.

After teaching at the University of Iowa, he escaped the bitter Iowa winters by moving to the University of Kentucky, where he taught organic chemistry for nearly four decades. A trip to Tangier, Morocco stimulated Tom's interest in the Middle East and he later taught at universities in Tripoli, Libya and Beirut, Lebanon.

**Donald E. Vidican M.D.**, (BS 1973) passed away Tuesday, July 10, 2012. Born May 4, 1952, in Geneva, N.Y., and the son of Edward and Cecilia (Jiral) Videcan, Don married Deborah Calabrese on June 20, 1980, in Columbia, Mo. He was an avid University of Illinois sports fan with his loyal friend, Jim.

Dr. Vidican, a Joliet native, graduated from Joliet Catholic High School and received a bachelor of science degree in chemistry with the bronze tablet award from the University of Illinois, Champaign. He earned his medical degree from the University of Illinois College of Medicine in Chicago. Dr. Vidican received his gastroenterology fellowship training at the University of Texas Southwestern Medical School in Dallas.

**Myrle C. White** (MS 1947) passed away August 26, 2012. She was born April 11, 1920, in Superior, WI., to the late E. Gilmore and Bertha E. (Swensen) Wagner. On September 11, 1954, she married Dr. Norman E. White in Duluth, Minn. and he preceded her in death in October 2010.

She received her Bachelor's degree from Duluth State Teachers College, now University of Minnesota at Duluth, and her Masters degree in chemistry from University of Illinois at Champaign. Myrle taught chemistry at Duluth State

Teachers College and at Drexel University in Philadelphia.

Myrle was an active member of the community. She was a Girl Scout leader, and vice president of the Penn's Woods GS council board. She was on the board of the United Way and active as a volunteer in the Red Cross blood drives. She belonged to the Ft. McClure chapter of the DAR, and the Ivy Club.

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