

DEPARTMENT OF

Chemistry News



SPRING/SUMMER 2009 UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN



A Tradition of Innovative Thinking Since 1868

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CHEMISTRY
at Illinois
ESTABLISHED 1868


ILLINOIS
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Letter from the Department Head



"THESE ARE REMARKABLE TIMES FOR THE UNITED STATES," wrote the economist Lawrence Summers. Ironically, those words were not written recently about the global economic crisis, but rather in May of 1998 declaring one of the most sustained periods of economic growth and vitality in our history. Obviously things have changed rather significantly in the past 11 years. In this letter I hope to give you a sense of how the economy has affected the Department of Chemistry thus far, with the overall message being one of optimism.

Our core mission is to educate students and prepare them for careers in the chemical sciences or allied fields. How does the economic downturn affect this? Just a couple of weeks ago we passed out diplomas to another outstanding class of graduates. More than 185 students graduated with a degree in Chemistry, the majority (about 100) being Bachelor of Science degrees and most of the remainder being Ph.D. degrees. There is no question that in this current economic climate, these students have found it difficult to locate jobs. A higher percentage than normal are continuing their education in some fashion and others have chosen teaching positions where the job market has not been quite as tight.

Our own economic health is dependent on our funding streams. The Department of Chemistry receives support for our operations from three main sources: the State of Illinois, federal grants and contracts, and gifts from alumni and friends (including our growing endowment). The State of Illinois is a minor supporter of the University of Illinois (less than 18% of the total budget), but state funds still are critical. In this regard, it was a welcome relief when our state legislature recently impeached Rod Blagojevich. Although at this writing, final budget negotiations are ongoing, our new governor, Pat Quinn, appears to be a strong supporter of higher education. Indeed, he visited the U of I soon after taking office. The strong symbolic nature of that early trip was not lost on the local community.

With regard to federal grants such as those from NIH and NSF, we have been on a roller-coaster ride. In the 1990s the NIH budget was doubling, whereas in more recent times the percentage success rates on grant applications has dropped into the single digits. I am pleased to say that despite the highly competitive

environment of late, our faculty have actually increased our research portfolio. Indeed, grant expenditures continue to rise and our department spends more federal research funds than any other on campus.

The roller coaster ride described above became very exciting recently with the American Recovery and Reinvestment Act of 2009 or ARRA. For the past couple of months, faculty have been furiously writing grant applications for stimulus funds available in a range of newly announced programs. Some are writing for supplements to existing NIH proposals while others have written new NIH Challenge Grant applications in areas considered high priority for human health. We are not alone in seeking ARRA funds, as NIH received 16,000 Challenge Grant applications!

Our endowment is rapidly becoming a vital piece of the financial puzzle. With regard to fund raising, the *Brilliant Futures* campaign continues with nearly 75% of our goal achieved. There is no question that charitable donations have been impacted by the economic climate. But alumni and friends continue to make important gifts, both large and small. Recently, Mark Pytosh (B.S. '86) made a \$100,000 pledge to the Vision 2020 fund. Mark and his wife, Hilda, are wonderful friends of the department who have been building their own endowment, but decided to make a lead gift to the Vision 2020 fund. The next newsletter will feature an interview with Mark in which he will discuss his new position as Executive Vice President and Chief Financial Officer at the Covanta Holding Company and his support for Illinois.

So our financial picture is certainly not crystal clear, but there are some indications that we will avoid the painful cuts that others have experienced. Thanks to all who have helped keep Illinois Chemistry strong.

Sincerely yours,

Steve Zimmerman
Head and Roger Adams Professor
Department of Chemistry

Energy of the Future: The Hydrogen Economy

IN RECENT YEARS, THE MATTER OF A 'HYDROGEN ECONOMY' HAS BECOME HIGHLY topical as nations seek to diversify their energy sources and develop more environmentally-friendly technologies. Exactly how one creates a viable hydrogen economy to fuel the next generation has been the source of much debate, but as Dr. Thomas Rauchfuss and his research group are proving, the answers may lie in technologies billions of years old.

Since the early stages of life on earth, microorganisms have existed whose metabolism was depended on the processing of H_2 . To oxidize and to make H_2 , these microorganisms evolved enzymes called hydrogenases, highly efficient biocatalysts that provide concepts relevant to the development of practical catalysts. All hydrogenases contain iron sulfides bound to carbon monoxide. The findings of the Rauchfuss group indicate that the study of Fe-S-CO compounds is key to harnessing the reactivity of hydrogen. The area has a green chemistry component as well: iron-based biomimetic catalysts would be far more eco-friendly and cost-effective than their current industrial counterparts, which often require platinum. The Rauchfuss group refers to the general area as "primordial organometallic chemistry," because their biomimetic catalysts have primitive analogs.

The benefits of this hydrogen economy are not limited merely to fuels, however. Other areas that stand to be impacted by improved

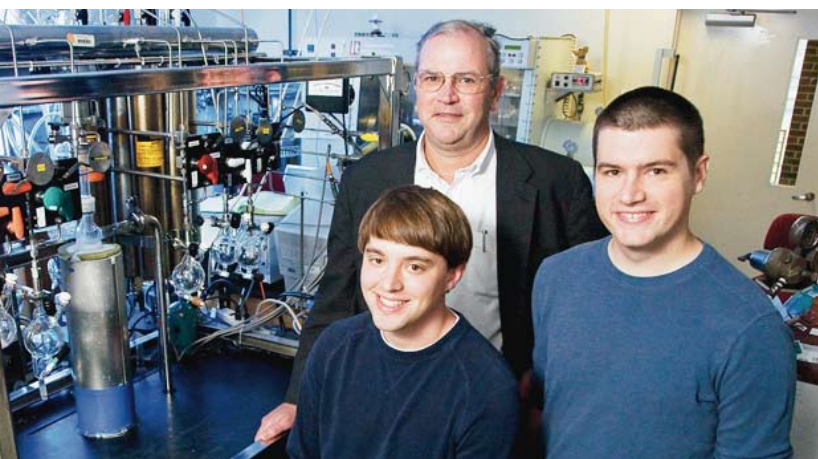


knowledge of biohydrogen include corrosion and the hydrogenation of organic compounds. A strong biomedical component motivates this research as well: an H_2 -based metabolism has been shown to support certain pathogens. The bacterium *H. pylori*, responsible for most stomach cancers, maintains its existence by "burning" naturally-occurring hydrogen in the human gut and thus may be countered by the mechanistic information obtained by the Rauchfuss lab.

"The broad goal of our work," states Rauchfuss, "is the elucidation of the mechanism of action of these enzymes, especially for the [FeFe]- and [NiFe]-hydrogenases, which interconvert the most fundamental of all substrates, H^+ , e^- and H_2 . Molecular information is very difficult to obtain directly from the proteins for many reasons, so we are able to fill an important missing gap."

"We have enjoyed many successes," Rauchfuss continues. "We were the first ones to show on a molecular level how nature is making hydrogen. And we are in the process of demonstrating the molecular 'choreography' required for converting hydrogen into H^+ and H^- ."

Research in the Rauchfuss lab benefits from parallel projects on both biomimetic and abiological chemistry of hydrogen, funded by the National Institutes of Health and the Department of Energy. The diverse synthesis and mechanistic program also provides an enriching environment for training students, while contributing to the nation's needs. ■



Tom Rauchfuss with students Bryan Barton (left) and Matthew Whaley (right).

Lauterbur and a Fuzzy MRI Image: How MRI Technology Almost Never Came to Light

WINNER OF THE NOBEL PRIZE, MEMBER OF THE NATIONAL INVENTORS HALL OF FAME: many people in the scientific world know the name of Paul C. Lauterbur, the creator of Magnetic Resonance Imaging, otherwise known as MRI. His discoveries reshaped the way the medical community diagnosed disease, and led to powerful new tools in the fight against cancer. But few may be aware of the difficulties Lauterbur faced when first pitching this revolutionary system to his collegiate institution and to a top scientific journal.

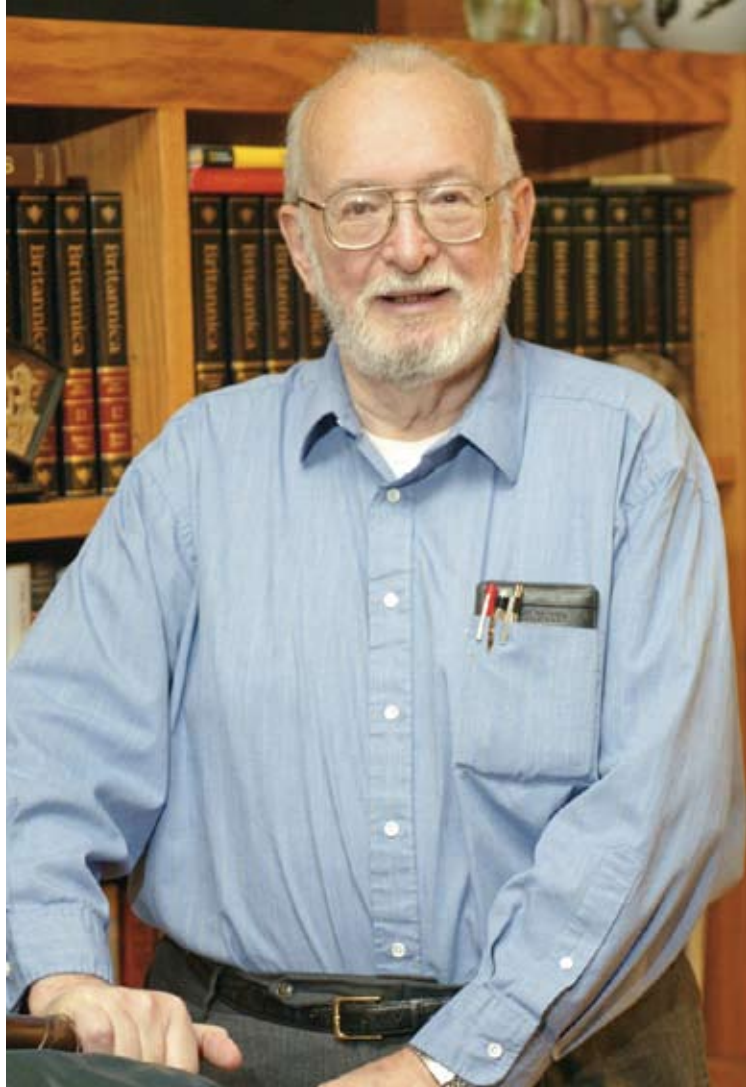
In the early 1970s, Lauterbur discovered that through an uncommon use of nuclear magnetic resonance spectroscopy, he could create an image of the molecules that were contained within a material. This technique – which differed from previous methods in that it used a varying field rather than one that was uniform – allowed him to distinguish between heavy water and ordinary water, something that no other technique at the time was capable of doing. In short order, he realized that this technique would have startling implications for medical imaging, including visualizations of the brain.

Lauterbur submitted an article on his findings to the journal *Nature*, only to have it rejected outright. Despite the fact that the pictures sent with the article were the first to ever show the difference between heavy water and ordinary water, the editors of *Nature* decided that the images were simply too fuzzy for publication.

Disappointed but still determined, Lauterbur appealed the rejection, and revised the article to explicitly include references to cancer and other relevant topics of the time. Based upon the revisions, the editors of *Nature* agreed to accept the paper.

“You could write the entire history of science in the last 50 years in terms of papers rejected by *Science* or *Nature*,” he later said.

Following this acceptance, Lauterbur quickly filed a patent application with his university, the State University of New York at Stony Brook, only to have this rejected as well. Stony Brook’s patent agency concluded that Lauterbur’s discovery would not generate enough funds to compensate for the cost of filing a patent application.



“That turned out not to be a spectacularly good decision,” Lauterbur said of the agency’s rejection.

After asking permission to file an independent patent application and never receiving a reply, Lauterbur resolved to spread the word through other channels. He invited anyone who was interested to visit his laboratory and learn about the technology. Soon, people from academia, industry and government labs came, and Lauterbur coordinated with all of them to compare results and methods in the hope of making even greater discoveries.

His magnanimity paid off. Within a decade, MRI had reshaped diagnostic radiology, commercial MRI machines were flooding the market, and Lauterbur’s discovery had paved the way for saving countless lives.

But when he won the Nobel Prize in 2003, Lauterbur brought attention not just to the explosion of research, the revolutionary nature of MRI or the high levels of recognition he now received. “The most gratifying experiences emotionally,” he concluded, “were those when a stranger would volunteer ‘you saved my daughter’s life’, or ‘your machine saved me from an unnecessary operation.’” ■



A rice farmer with water buffalo.

Global Impact: Teaching the Illinois Chemistry Curriculum in Vietnam

GLOBAL IMPACT IS A TERM THAT IS OFTEN HEARD IN HIGHER EDUCATION. Many universities have rushed to create international partnerships over the past several years, in some cases creating joint degree programs and even opening branch campuses on foreign soil. In a few cases, the goals have not been so clear and there are several well-publicized examples of costs outpacing the benefits, leading to programs being scaled back or even discontinued. The Department of Chemistry is entering the third year of a cooperative program with the Hanoi University of Science (HUS) in Vietnam and although it is too early to

judge its impact, faculty and students in both institutions are benefiting and sharing some unique experiences.

The program began in 2006 when the upper administration at HUS approached Chancellor Richard Herman about the possibility of developing a cooperative relationship with Illinois. This contact was part of a broader effort to open the country to the outside world. After more than a decade of struggle to reconstruct following the war with the U.S., in 1986 the Vietnamese instituted a series of political and economic reforms known as "Doi Moi." The Vietnamese expression Doi Moi translates into English as "renovation," and it was a process that ultimately led to the nation's reintegration into the international community. The U.S. and Vietnam normalized relations in 1995 and in 2001 signed a bilateral trade agreement. These various economic and political reforms led to a dramatic growth in the Vietnamese economy. In 2007 Vietnam joined the World Trade Organization and up until the recent global economic crisis, its annual GDP growth was about 7%.

In September of 2006 a delegation from HUS, including the Rector, Vice Rector and the Dean of the Faculty of Chemistry came to Urbana and signed an initial agreement with Steve Zimmerman, the Department Head, and Andy Gewirth, the Director of School of Chemical Sciences. The goal was clear. The undergraduate curriculum in chemistry at the U of I would be recreated at HUS and once established would be ported to all other universities that are similarly part of the National Vietnamese University system. Talk about global impact! It is hard to think of a larger impact than having all



Ha Long Bay, Vietnam

The undergraduate chemistry majors in Vietnam learn the Illinois curriculum from Illinois faculty and many are interested in pursuing graduate school in the United States.

university students in the 13th most populated country in the world taking the Illinois chemistry curriculum and learning from materials created in Urbana.

However, having a curriculum and course materials is one thing, teaching a course with them is another. Many of the HUS faculty members were educated in the Soviet system due to the Cold War relationship between the Soviet Union and North Vietnam.

Indeed, many of the faculty are fluent in Russian or another eastern bloc language. To improve their English skills and directly observe how Illinois chemistry courses are taught, the past three semesters have seen between two and four HUS faculty attending a range of courses in Noyes Lab, Chemistry Annex and Roger Adams Lab. They learn firsthand about the Illinois lecturing style, and collect course materials, including exams. They also explore the online course materials and instructional video labs, the latter having been pioneered at Illinois.

To date, six Illinois faculty have traveled to Hanoi as part of the cooperative program: Anne Baranger, Martin Gruebele, Jim Lisy, Alex Scheeline, Pat Shapley and Steve Zimmerman. It is an arduous trip to Hanoi, usually starting with a flight from Willard Airport to Chicago's O'Hare Airport, a nearly 13-hour flight to Narita Airport in Tokyo, a two or three hour layover and finally a five and half hour flight to Noi Bai Airport in Hanoi. Arriving at about 10 p.m. local time the Illinois faculty are often met by Dean Boi and HUS faculty and taken for a light dinner of Pho, a

rice noodle soup prepared with thinly sliced meat.

The Illinois faculty give three lectures a day, five days of the week. In this way, a highly compressed and very intense full semester course can be given during a three-week period. How do the freshmen (K51) students in the Advanced Chemistry Curriculum at HUS do? Jim Lisy, the first U of I faculty member to teach in Hanoi, noted that: "After I gave the students the first hour exam, (the same exam given to Illinois students), I was amazed with the results. The students performed as well as the accelerated chemistry program students at Illinois."

The HUS faculty are outstanding hosts, providing ample time for tourist activities and shopping. Most of the visiting Illinois faculty are taken on a boat ride on Ha Long Bay, a World Heritage Site that offers incomparable views of rugged terrain rising above the bay. A stop at a fishing village in an isolated alcove produces a freshly caught fish which is cooked on board. Along the tour, there also are stops to explore large caves.

One of the advantages of the cooperative program is that the undergraduate chemistry majors in Vietnam learn the Illinois curriculum from Illinois faculty and many are interested in pursuing graduate school in the United States. Several of the top students entering the third year of the cooperative program spent the summer in Urbana. They got their first taste of high-level research in the United States and learned more about the process of applying to graduate school. Of course, we hope that many of them will return to Illinois for their Ph.D. studies.

The HUS faculty are quick to point out that the first American faculty to visit their campus were from Illinois. This has led to a special bond and a partnership that is sure to benefit both campuses for many years to come. ■



Rector Cam receives an Illini tie from Steve Zimmerman.



Hanoi street scene

The Next Generation of Excellence: Interviews with Our Award-Winning Graduates



REBECCA MILSK (B.S. Chemistry, 2009) is the talented and determined recipient of a 2009 Fulbright Scholarship, granted by the U.S. Department of State's Bureau of Educational and Cultural Affairs. The scholarship provides support for travel and research to foreign partner nations, in the interest of promoting "mutual understanding between the people of the United States and the people of other countries." In the midst of hectic preparations for finals and Commencement, Rebecca sat down to talk with us about her upcoming studies and her time with Chemistry at Illinois.

Could you tell us about yourself?

I was born and raised in Chicago, and I graduated from Whitney Young High School. I come from a University of Illinois family. My father graduated from the U of I and so did my two older brothers. In addition to studying chemistry, I like to study the Japanese language.

What originally interested you in chemistry?

I enjoyed studying chemistry in high school. I came to college undecided about my major but with a pre-med concentration. I found that chemistry provided a strong basis in a variety of scientific fields, and that the curriculum gave me the flexibility I desired in order to take other classes, like Japanese language classes.

You previously researched with Dr. Michael Plewa in Crop Sciences at Illinois. Could you describe the work you did in his labs?

I investigated the cytotoxicity and mutagenicity of novel nitrogenous drinking water disinfection by-products using a *Salmonella typhimurium* assay. Changes in source water quality and disinfection methods have led to increased formation of nitrogenous disinfection by-products (DBPs).

My time in the Chemistry Department has been challenging but rewarding.

I conducted this work beginning in the spring of 2008 under the supervision of Dr. Michael Plewa and Dr. Elizabeth Wagner in the Department of Crop Sciences. In the summer of 2008 and during the past school year, I have continued this work as part of WaterCAMPWS, a center funded by the National Science Foundation.

What are your plans for using the Fulbright award?

I will be working in the laboratory of Dr. Shinya Echigo at Kyoto University. He is in the Department of Urban Engineering. My project will use *Salmonella* and mammalian cell assays to measure the cytotoxicity and genotoxicity of drinking water organic extracts that contain brominated and iodinated drinking water DBPs. DBPs are formed when the disinfectant, such as chlorine, reacts with organic material in the drinking water. A major source of bromine and iodine contamination of drinking water is sea water intrusion. With 50 percent of the American population living within 50 miles of a coastline, and Japan facing increasing levels of sea water intrusion into its fresh source waters, both countries have public health interests in investigating the effects of brominated and iodinated DBPs. I will also be taking Japanese language courses during my stay.

What are your plans following graduation?

I will be in Kyoto for a year beginning in September. After that, I hope to attend graduate school and pursue further health-related research in chemistry.

Have you enjoyed your time in the Chemistry Department?

My time in the Chemistry Department has been challenging but rewarding. I feel lucky to have taken classes with enthusiastic professors like Dr. Moore, and to have found supportive advisors in Dr. Scheeline and Debe Williams.



MALLORY COHEN (B.S. Chemistry, 2009) is the gifted and dedicated recipient of the 2009 John David Barnwell Memorial Award. The award was created through the donations of Ray and Lori Janevicius, and recognizes achievement, high personal ethics, passion for teaching, friendship and fluency in the arts. It is given once a year to a truly deserving young graduate of the Department of Chemistry at Illinois. Recently, we caught up with Mallory during her busy preparations for finals and Commencement, and had the opportunity to discuss what led her to chemistry, her plans for the future, and her time with Chemistry at Illinois.

Could you tell us about your background?

I was born and raised in the northwest suburbs of Chicago, specifically Barrington. I have an older sister and a younger brother. My mother is a florist and my father is a real-estate agent. I love speaking Spanish and, as a result, I am getting a minor in Spanish along with my chemistry major. I studied abroad in Spain for a summer and translated at a medical mission trip in Belize. I love to cook, paint, teach, and I plan on attending medical school in the fall.

What are your plans in medical school? What area of focus interests you?

I plan to work in Surgical Oncology. I have had family members and people close to me pass away from various cancers, and I would like to help other families cope with this disease. I have also shadowed many surgeons and love the rush that I get in the operating room.

I gained much more than a chemistry degree while being a student in Chemistry at Illinois.

How did you become interested in Chemistry as a major?

I started at the University of Illinois undecided about my major. I decided to take Chemistry 101 to get a jump start on my science classes and absolutely fell in love with chemistry. I then took Merit sections for the rest of my chemistry classes which allowed me to really understand the chemistry instead of just memorizing. These classes, along with the advising help from Gretchen Adams, inspired me to become a chemistry major.

How would you describe your time here in Chemistry at Illinois?

My time as a chemistry major has been very fulfilling. I learned a lot about the different areas of chemistry as well as the teaching of chemistry. I have been a teaching assistant for two years now, and have learned a lot about myself and my students in the process. I gained much more than a chemistry degree while being a student in Chemistry at Illinois.



Chemistry Graduates: Awards and Recognitions

John C. Bailar Award

Thomas Carberry

John David Barnwell Memorial Award

Mallory Cohen

Bronze Tablet Recipients

*Matthew D. Alvin
Natalie Jordan Bodmer
Andrew J. Hoover
Janaki R. Patel*

Chancellor's Scholars

*Matthew D. Alvin
Jennifer L. Anderson
Priscilla Lee
Rebecca Milsk
Jose Ricardo Regalbuto
David Mason Siebert*

Fulbright Scholarship

Rebecca Milsk

Reynold C. Fuson Memorial Award

*Alexandria Bruck
Cathy Feller
Paul Fina
David Siebert*

James Scholar Recipients

*Matthew D. Alvin
Natalie Jordan Bodmer
Thomas Carberry
Mallory H. Cohen
Andrew J. Hoover
Brett A. McGuire
Rebecca Milsk
Janaki R. Patel
Brian T. Phelan
Gautam Shah
Angelica Anne Vargas
Joyce Leyi Woo*

Peter C. and Gretchen Miller Markunas Award

Matthew D. Alvin

Carl S. Marvel Research Award

*Ting-Kai Chang
Andrew J. Hoover
Gautam Shah*

Phi Beta Kappa

*Natalie Jordan Bodmer
Andrew J. Hoover
Rebecca Milsk
Gerald William Moulton*

Double Major/ Dual Degree

*Matthew D. Alvin
Natalie Jordan Bodmer
Silvye M. Castillo-Soza
Edward H. Cho
Jisun Sara Choi
Paul Michael Fina
Seung Yun Lee
Steven Markwell
Romy Patel
Trisha Patel
Anthony Francis Rizzo
Edmund Seliga
Sagar Jagdish Shah
Stephen James Snider
Mansi H. Thakkar
Angelica Anne Vargas
Joyce Leyi Woo
Andrew Wood*

Triple Major

Linda Marie Johnson





Peter Beak Retires:

Excellence - 47 Years and Counting

AFTER 47 YEARS IN THE DEPARTMENT OF CHEMISTRY AT ILLINOIS, Dr. Peter Beak retired in late 2008. The occasion of his retirement brought together many of his friends, colleagues and former students in celebration of his career, and gave them the opportunity to reflect on all that Beak had meant to them, both personally and professionally.

"Pete has been a pillar of honesty, principle and calm in our department for more than four decades," said Dr. John Katzenellenbogen, a colleague of Beak's in Illinois Chemistry. "He has worked tirelessly to enhance our research and teaching and improve our national and international stature. We are a better – and a happier – place because of him."

Dr. Gary Schuster, another of Beak's colleagues, agreed. "The Chemistry Department at the University of Illinois and the discipline of chemistry is fortunate to be the recipient of Peter Beak's efforts and dedication. Through his thoughtfulness and creativity, his guidance and friendship Professor Peter Beak has changed lives, the department and the discipline."

Beak's contributions went beyond research and discovery, however. As a mentor and a friend, Beak impacted everyone he met.

"Peter Beak is a preeminent organic chemist who has left an indelible mark on the field," said Dr. Peter Stang, a friend of Beak's from the University of Utah. "He has made truly seminal and significant contributions to both the discipline of organic

chemistry and the community of organic chemists. Besides being an outstanding chemist, Peter is an excellent and caring mentor of young scientists and colleagues and a real human being."

Beak's former Ph.D. student, Dr. Doug Chrisope, agreed. "Peter was always interested in his students personally. He and Sandy were welcoming with their home and made those in the research group feel like part of a bigger family. We always knew about him and running, skiing trips, Springer Spaniels and how his children and grandchildren were moving along in their lives. While some like to portray science as a cold, impersonal discipline, Peter provides a great example of how science is truly a human enterprise of personal collaboration and accomplishment between individuals."

Brock Siegel, another former Ph.D. student of Beak's, concurred. He recalled Beak's "intrinsic drive and penetrating insights" that inspired him to believe that no problems were unsolvable, and said Beak's inspiration, rigor, hard work and insights gave him the base he needed for his career.

Beak's impact has extended beyond science, the students agreed, and has been to some extent a true measure of the amazing significance he has had to so many.

"In my opinion," said Dr. David Reitz, a former student of Beak's, "the highlight of Peter's career has not been all of the awards and recognition that have flowed from the scientific community, and there have been many over the years, but the thoughtful recognition he received from his former students in Chicago, on the occasion of his 65th birthday. I was very impressed with how many of his former students made the effort to travel to Chicago to attend the dinner and say 'thank you' personally. For me, this is what a truly great career is all about."

Celebrations of Beak's career were held by the Department of Chemistry, by his students and by his staff. At every party and occasion, each person agreed that Beak's continued presence in the Department of Chemistry is a tremendous benefit to all. ■

Investitures

ON MARCH 4, 2009, DR. MARTIN GRUEBELE was invested as the James R. Eiszner Chair in Chemistry. Dr. Gruebele received his bachelor's degree in 1984 and his Ph.D. in 1988, both from the University of California at Berkeley. In 1989, he became a postdoctoral fellow working in the area of femtochemistry in the Ahmed Zewail Lab at the California Institute of Technology. In 1992, he joined the faculty of the Department of Chemistry at the University of Illinois. Currently, he is engaged in experimental and computational studies of a broad range of fundamental problems in chemical and biomedical physics. His efforts are contributing to a deeper understanding of the



Dr. Martin Gruebele

way that proteins fold into their functional 3-dimensional forms, the details of how chemical bonds are broken by vibrational motion and the switching of energy flow in large molecular structures on surfaces. In addition to his appointment in Chemistry, he has faculty appointments in Physics and in Biophysics and Computational Biology. He has received numerous awards, including Fellowship in the American Physical Society and Biophysical Society and the Coblenz and Wilhelm Bessel Award. In 2008, he was elected to the German National Academy of Sciences, the prestigious and world's oldest academy for medicine and natural sciences.

ON MARCH 4, 2009, DR. JONATHAN V. SWEEDLER was invested as the James R. Eiszner Family Chair in Chemistry. Dr. Sweedler received his bachelor's degree in 1983 from the University of California at Davis. In 1988, he received a Ph.D. from the University of Arizona, and then spent the following three years as a postdoctoral associate at Stanford in both the chemistry and neuroscience departments. His research focuses on creating new technologies for assaying small volume samples and in applying these new methods to study novel neurochemistry in samples ranging from small brain regions to individual cells. Dr. Sweedler



Dr. Jonathan V. Sweedler

currently serves as the director of the Roy J. Carver Biotechnology Center, in addition to his professorship in Chemistry and his appointments in the Neuroscience Program, the Department

of Molecular and Integrative Physiology and the Department of Bioengineering. To date, Dr. Sweedler has published more than 240 manuscripts, coauthored 14 patents and has given 300 invited presentations. He is currently an associate editor for the journal *Analytical Chemistry*. Dr. Sweedler has received numerous awards, including the Merck Prize, the Instrumentation Award from the Analytical Division for the American Chemical Society and the Benedetti-Pichler Award for Microanalysis.

Dr. James R. Eiszner (1927 – 1990) was a loyal alumnus, an



Dr. James R. Eiszner

accomplished scientist and a man of notable integrity. To honor her husband's memory and high scientific standards, Mrs. Joyce Eiszner has endowed two faculty chairs to the University of Illinois Department of Chemistry; thus fulfilling a wish Dr. Eiszner often expressed. Dr. Eiszner received his bachelor's degree from the University of Illinois in 1950. In only two years, in 1952, he completed his Ph.D. at Illinois as well. For several years, he worked with oil companies including Standard Oil of Indiana, Indoil Chemical Company, Amoco Chemical Company and Ott

Chemical Company. In 1970, he took a leadership position at CPC International, transforming the company from "a stodgy producer of commodities to an aggressive marketer of some of America's favorite foods" including Skippy peanut butter and Hellmann's mayonnaise. He became president and CEO of CPC in 1979, and in 1987 he was elevated to chairman. Under his leadership, the company was ranked number 100 on the Fortune 500 list of 1989.

ON NOVEMBER 19, 2008, DR. RALPH NUZZO was invested as the



Dr. Ralph Nuzzo

G. L. Clark Professor of Analytical Chemistry. Dr. Nuzzo received his bachelor's degree in 1976 at Rutgers University with highest honors and highest distinction in chemistry. In 1980, he earned his Ph.D. in Organic Chemistry from the Massachusetts Institute of Technology. Following his graduation, he took a position with Bell Laboratories as the key member of technical staff with materials research. In 1991, he joined the faculty of Illinois, where he brought a new level of sophistication to the bioinorganic and materials research areas. His research since then has covered the complexity

and emergent properties of condensed matter systems, including self-assembled monolayers (SAMs). His work with SAMs has received honors such as the Adamson Award from the American Chemical Society and the Wall Street Journal Technology Innovation Award for Semiconductors. He has served as senior editor of the journal, *Langmuir*, and is a fellow of the American Academy of Arts and Sciences, the World Innovation Foundation and the American Vacuum Society.

ON MAY 5, 2009, DR. WILFRED VAN DER DONK was invested as the



Dr. Wilfred van der Donk

Richard E. Heckert Chair. Dr. van der Donk received his B.S. and M.S. from Leiden University. He moved to the United States in 1989 to pursue his Ph.D. under Kevin Burgess at Rice University. After postdoctoral work at MIT with JoAnne Stubbe as a Jane Coffin Childs fellow, he joined the faculty at the University of Illinois in 1997. The research in his laboratory focuses on using organic chemistry and molecular biology to gain a better understanding of the molecular mechanisms of enzyme catalysis.

Professor van der Donk has published more than 100 papers and has been

recognized by a number of awards including a Burroughs-Wellcome New Faculty award (1998), Beckman Young Investigator Award (1999), Cottrell Scholar Award (2000), Alfred P. Sloan Fellowship (2001), Camille Dreyfus Teacher-Scholar Award (2002), ACS Pfizer Award (2004), ACS Cope Scholar Award (2006) and the Tetrahedron Young Investigator Award in Bioorganic & Medicinal Chemistry (2007). Since 2008 he has been an Investigator of the Howard Hughes Medical Institute.

Dr. Eugene P. Bertin (1921 – 2008) was a patriot, a chemist and



Dr. Eugene P. Bertin

a loyal alumnus, as well as an extremely generous donor. As a tribute to his alma mater, and in honor of his beloved graduate advisor G.L. Clark, Bertin endowed the G. L. Clark Professorship in Chemistry at Illinois. Bertin enrolled in the Chemistry program at the University of Illinois after serving in World War II in both the European and Pacific theaters. During his time at Illinois, he earned a bachelor's degree in 1948, a master's degree in 1949 and a Ph.D. with Clark in 1952. Following graduation, he spent 34 years with the RCA Corporation,

working as a key member of their scientific staff with a specialty in X-ray fluorescence spectrometry. During his career, he authored two monumental texts, more than 30 technical papers and served as a principal lecturer at the International Center for Diffraction Data for over 20 years. He received the prestigious Birks Award in 1988, only the second Birks Award recipient at the time, and currently stands as one of only three U.S. scientists to ever be so honored.

Dr. Richard E. Heckert holds two degrees from the University of



Dr. Richard E. Heckert

Illinois: A.M. 1947 and Ph.D. 1949. He completed his undergraduate studies with Miami University of Ohio in 1944. Upon graduation from Illinois, he began his career with the E. I. DuPont de Nemours Company in Wilmington, Delaware, where he stayed until his retirement. While with DuPont, he held many positions, including that of President and Chief Operating Officer; Vice Chairman and Chief Operating Officer; and Chairman and Chief Executive Officer. Dr. Heckert has been involved in many civic, philanthropic and professional organizations during his lifetime, including service as the

president of the United Way in Delaware; trustee and Chairman of the Board of the Carnegie Institute of Washington; president of Longwood Gardens, Kennett Square, PA; member of the Advisory Commission of Trade Negotiations; Chairman, National Association of Manufacturers; and trustee, Delaware Council on Economic Education. He received an honorary degree from Miami University of Ohio in 1984; an Alumni Achievement Award from the University of Illinois in 1988; and an Alumni Achievement Award from the College of Liberal Arts & Sciences of the University of Illinois in 2004. In addition to his generous gift establishing the Richard E. Heckert Chair in Chemistry, Dr. Heckert also created the Snyder Graduate Fellowship in honor of his mentor at Illinois, Dr. Harold R. Snyder.



Douglas L. Cole: The Invisible World

DOUG COLE HAD BEEN AT MERCK PHARMACEUTICALS FOR ONLY A FEW MONTHS when a scientist from across the street came to his research team and announced, “We’ve discovered the most potent biologically active natural product that anyone has seen.” But to make it work, Merck needed the help of its fledgling 15-person natural product chemistry group, which included Cole, a 1974 graduate in organic chemistry.

This natural product reached the market in record speed—less than four years rather than the typical 10-plus years, Cole recalls. It became a series of compounds that included Avermectin, a drug with powerful uses for both animals and humans. In humans, it was particularly potent in combating river blindness, in which worms from contaminated water in undeveloped areas move into the eyes, causing blindness.

According to Cole, river blindness had been so common in parts of Africa that the entire function of children in some villages was to lead around older people who had lost their sight. But Avermectin, which Merck gave away in Africa, brought the affliction under control, becoming one of the first in a long line of pharmaceuticals that Cole helped bring to the marketplace—a 34-year career that earned him the 2008 LAS Alumni Achievement Award.

Cole grew up in Great Bend, Kan., a city of 12,000 where he first cultivated a fascination with chemistry in high school.

“I saw chemistry as the ability to manipulate reality at an invisible level,” Cole says. “It was discovering what really went on inside the things you can see, touch and feel.”

But, as Cole would soon find out, working at the invisible level could have a highly visible impact on the world.

After receiving his bachelor’s degree in chemistry from Fort Hays State University in 1969, Cole entered the military at the height of the Vietnam War. As he puts it, youth of the time “were either hippies or fatalists, and I was the latter.”

Cole then came to the University of Illinois to study chemistry, for he says, “the U of I was the only place I wanted to go.” He didn’t even apply anywhere else.

Cole received his Ph.D. in chemistry from the U of I in 1974, working with Nelson J. Leonard. He spent the next five years as a senior research chemist at Merck, Sharp and Dohme, Inc., working on such drugs as Avermectin and Mefoxin,

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which became the world's best-selling, hospital-based antibiotic. He worked in drug discovery, but it opened his eyes to the world of drug development, taking newly discovered drugs all the way to market. So, when he received a call from Ving Lee, (PhD, '57) another Illinois alum, asking him to come to American Cyanamid-Lederle to work in drug development, he leaped at the chance.

At American Cyanamid, Cole helped to rebuild the development group; and among the many drugs that he ushered along was an anti-cancer compound, mitoxantrone, which was used on solid tumors. This drug happened to have been discovered by another Illinois chemistry alum, a pattern of U of I connections that followed Cole throughout his career. In fact, it was yet another Illinois alum, Seemon Pines (PhD, '57), who lured him back to Merck in 1983 as associate director of chemical development.

When Cole came back on board, Merck was facing a logjam of drugs that needed to be developed. After the next two years of work by the development team, one month alone saw five new drugs approved for Merck, and among them was thienamycin, one of the broadest-spectrum antibiotics in existence.

In 1985, Cole joined a much smaller company in Kansas City, Marion Labs. In particular, he was attracted to their work on a drug they had licensed from a company in Japan. He had learned about the drug from a senior chemist in the Japanese company—another Illinois alum, of course.

"Marion Labs could see that the drug was likely to be a blockbuster," Cole says. And they were right. The drug, which other companies had passed on, became very effective in alle-

viating angina pectoris and in reducing high blood pressure. It qualified as a blockbuster, which at the time meant that it sold over a billion dollars per year.

Cole's longest stint followed at Isis Pharmaceuticals, from 1991 to 2004. What drew him to Isis was not another Illinois alum, but an idea that had intrigued him since his U of I days. The typical approach is to develop drugs that interact with certain proteins that create mischief. But at Isis, the goal was novel: to create drugs that prevented those proteins from being made by the body in the first place. The result was the world's first antisense drug, Vitravene sodium, which combats virally-induced blindness in AIDS patients. Cole led the successful development effort.

Ever the innovator, Cole holds more than 50 patents and currently works in California at Affymax, which is doing groundbreaking work on peptide drugs—short strings of amino acids.

"There was a long, deep-seated feeling in the scientific community that peptides were not stable enough to make drugs from," Cole says. But Affymax has made it work, developing a new drug to treat anemia.

So for Cole, his passion for exploring invisible worlds has not let up, and his work continues to have highly visible results, tackling problems ranging from elevated cholesterol and cancer to AIDS and anemia. What's more, the work never ceases to surprise him.

"Science is nothing if not serendipitous," he says. "Poke a complex system in one place and something happens in another. That's what fascinates me about chemistry." ■

By Doug Peterson, LAS News Winter 2009

An Illinois Legacy: Teacher, Colleague and Friend Robert Coates Retires

IN AUGUST OF 2008, THE DEPARTMENT OF CHEMISTRY, ALONG WITH ALUMNI AND FRIENDS, celebrated the career of Dr. Robert M. Coates – longtime faculty member and colleague in Chemistry at Illinois who retired in 2008. Approximately 40 former students and postdocs attended the event, along with Dr. Jim Burke and Dr. Dale Whalen, two former lab mates of Coates' from his years studying at Berkeley. Dr. John Katzenellenbogen and Dr. Steven Zimmerman of Illinois Chemistry also attended. Held at the ACS National Meeting, the reception honoring Coates was an exciting event filled with memories and stories from Coates' years as a student and as an educator.

"Several things come to mind when I think of our days as graduate students at Berkeley," Whalen reminisced. "I recall that he was the catcher of the Chemistry softball team one season. I also recall that Jim Burke, another graduate student at Berkeley, made a wager with Bob that he could not catch a softball thrown off the top of the campus campanile (over 300 feet high). Not to be intimidated, Bob caught the softball dropped from the top of the campanile on the second attempt. I'm quite sure that no other person has ever caught a ball dropped from the top of the Berkeley campanile. And I would recommend that no other person should ever attempt such a feat!"

The comments on Coates' student years were followed by recollections of his time at the University of Illinois. Dr. Ram Mohan of Illinois Wesleyan, one of the coordinators of the event, described his time with Coates fondly, saying: "As a postdoc in the Coates group, I learned so much that has now helped me be an active research faculty in a small school. What struck me the most about him was his attention to detail and thoroughness in everything he did. He never overlooked any detail, however trivial, and yet knew when to look at the big picture. In spite of the rigor he expected from his students, he has been one of the nicest people I have ever met, who genuinely cared about his students' well-being."

When asked about his colleague, Dr. Peter Beak, professor emeritus in Chemistry at Illinois, seconded the high opinions of Coates, saying that, "I was always delighted when Bob was appointed to one of my student's thesis committees. His exceptional thoroughness and knowledge were invaluable in assuring our work would meet the highest standards. These



"His exceptional thoroughness and knowledge were invaluable in assuring our work would meet the highest standards. These attributes are evident in his research, which is among the most well done in organic chemistry."

—Dr. Peter Beak, professor emeritus in Chemistry at Illinois, speaking about Dr. Robert M. Coates

attributes are evident in his research, which is among the most well done in organic chemistry."

"Bob was willing to take on the service tasks that faculty are asked to do, and that are essential to the good of the collective enterprise," Beak continued. "His editorial work, his committee work, his work on review groups and his teaching set a high bar for the rest of us. He is very highly respected and has the appreciation of the many beneficiaries of his work."

At the end of the event, the consensus view was that though Coates has left the University for retirement life, he never will truly retire. A hard-working chemist full of creative and fascinating ideas, Coates' legacy at Illinois will live on through his further studies, his research activities and the efforts and discoveries of the students he inspired. ■

In Memoriam: Eugene P. Bertin

On December 2, 2008, Chemistry lost one of its heroes with the death of Dr. Eugene P. Bertin. Passing away peacefully in his apartment in Harrison, N.J., Bertin left behind a large group of students, friends and colleagues who all mourn his passing greatly.

Born in 1921, Bertin was known for many things, not the least of which was being a patriot. At the beginning of the Second World War, Bertin enlisted in the U.S. Army at the rank of private first class. By the time he was discharged, he had reached the rank of Colonel. Immediately following his discharge from

the service, Bertin became a student at the University of Illinois. While at Illinois, he obtained his B.S., M.S. and Ph.D. (the latter of which he received in 1952), and studied with Professor G. L. Clark, the author of the first textbook on "Applied X-rays." With his Ph.D. in hand, Bertin stepped into the role of faculty at Illinois, teaching Chemistry 101 for two years. His close friend, Dr. Victor Buhrke, recounts that Bertin's lectures reached such a level of popularity that students skipped other 101 lectures in order to attend Bertin's. Buhrke recalls lecture rooms filled past capacity, requiring the fire department

to kindly but firmly eject students from the class, lest they create a fire hazard.

After two years at Illinois, Bertin was offered a position at the RCA Research Center in Princeton, N.J. While at RCA, Bertin's work involved the use of microprobes and XRF units. Buhrke recounts of Bertin that "he was so highly regarded at RCA that the company gave him permission to work 24 hours a day for four consecutive days and then have three days off. The company also permitted him to have a cot in his office. Both of these were unusual privileges that only he was granted."

G.L. Clark



Dr. Victor Buhrke (right) established the Eugene P. Bertin Fellowship in honor of his close friend, Dr. Eugene P. Bertin (left). Photo courtesy of Dr. Victor Buhrke.

During his life, Bertin contributed greatly to the science of X-ray spectroscopy. At Henry Chessin's school in Albany, N.Y., he served as principal lecturer for many years, and also led the International Center for Diffraction Data (ICDD) X-ray fluorescence courses. Bertin's textbooks on X-ray fluorescence (XRF) were recognized as the best in the world, and served as landmark texts for many. From the ICDD, Bertin received the Birks Award in recognition of those textbooks and the contributions his books had made to the science and application of XRF.

Remembered as an intellectual, a dedicated scientist and an incredible teacher, Bertin's passion for teaching and science led him to impact the lives of thousands of students through his textbooks, lectures and reprints. He also contributed tremendously through his generosity and magnanimity, giving more than \$1 million dollars to the Department of Chemistry at Illinois to endow a prestigious Professorship named after his graduate advisor, Dr. G. L. Clark. Additionally, he created a graduate fellowship named for Dr. Victor Buhrke, his friend and colleague. In honor of Bertin, Buhrke did likewise and created the Eugene P. Bertin Fellowship.

"Teaching is leaving a vestige of oneself in the development of another," Bertin is remembered for saying. "And surely the student is a bank where you can deposit your most precious treasures." ■

In Memoriam: Roger E. Koeppe

Roger E. Koeppe, alumnus of the Department of Chemistry at Illinois and former head of Biochemistry at Oklahoma State University, died at the age of 87 at his home in Stillwater, Okla. on May 16, 2009. Koeppe received his Ph.D. at Illinois in 1950, after studies with Dr. William C. Rose on amino acid metabolism. Following postdoctoral training with Dr. Rose and Dr. Wood of the University of Tennessee, Koeppe joined the Department of Biochemistry at Oklahoma State University as an Associate Professor in 1959. Only four years later, in 1963, he was promoted to Head of Biochemistry. Koeppe is survived by his wife, Norma, and their five children, eleven grandchildren, and four great-grandchildren; brother Owen J. Koeppe and JoAnn Moessner Koeppe of Columbia, Mo.; and sister Ruth Koeppe DeYoung and James DeYoung of Waupun, Wis.



Alumni Notes

Joseph (J. P.) Gerdt (B.S. 2008, Silverman) is finishing his first year as a Ph.D. student in Helen Blackwell's group at the University of Wisconsin-Madison. He was recently awarded an NDSEG graduate fellowship. J. P. was an undergraduate research student in the Silverman lab from June 2005 through July 2008 and published both a first-author JACS communication and a co-first-author *Org. Biomol. Chem.* paper during that time.

Kathy Kloepper (Ph.D., 2008, Rienstra) just completed a year teaching general chemistry and biophysical chemistry at St. Lawrence University in Canton, N.Y. In June she is moving to Macon, Ga. to join the Chemistry Department at Mercer University.

Robert J. Morris (Ph.D. 1990, Girolami) was a NIH Fellow at UC Berkeley with Bob Bergman, then moved to Ball State University as Assistant Professor of Chemistry, 1991, then became Chair of Chemistry in 2002 for five years, then was promoted to Associate Provost for Research and Dean of the Graduate School.

Timothy Mui (B.S. 2008, Silverman) is finishing his first year as a Ph.D. student in Jackie Barton's group at Caltech. Tim was an undergraduate research student in the Silverman lab from June 2005 through July 2008 and published a first-author *Org. Lett.* paper during that time.

James Patterson (Ph.D. 2004, Dlott) is Assistant Professor of Chemistry at Brigham Young University, and he just received the Air Force Office of Scientific Research, Young Investigators Research Program (YIP) Award.

Amanda Raymond (B.S. 1998) has achieved National Board Certification in 2008 from the National Board for Professional Teaching Standards (NBPTS). Amanda Raymond is a Chemistry and ESL Science teacher at Glenbard South High School.

Brian Smith (B.S. 2003, Silverman) earned his Ph.D. in Chemistry at the University of Wisconsin-Madison in July 2008. He will start in fall 2009 as a postdoc in Michael Marletta's laboratory at UC Berkeley.

Andrew T. Zander (B.S. 1968, Jonas - Ph.D., 1976, O'Haver, Univ. of Maryland) is directing the Engineering Development Department of the Atomic Force Microscopy Business Unit of Veeco Metrology, Inc., Santa Barbara, Calif.

We'd like to hear from you. Submit your alumni note. Visit chemistry.illinois.edu/alumni/chem_alum_news.html

Corrections and Modifications:

In the Fall 2008 edition of the *Chemistry News*, Willis "Bill" Flygare is listed as William. He should have been listed by his proper name, Willis.

In the Spring 2008 edition of the *Chemistry News*, Dr. Lee Melhado is listed as a student of Dr. Nelson J. Leonard, however, her position should have been given as a postdoctoral researcher.

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