IU • CHEMISTRY

Association of Indiana University Chemists Alumni Journal

Vol. 59 • The College of Arts and Sciences • Fall 2014

In this issue:

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Intensive Freshmen Seminar (IFS) student Lee Enkoff lights a Dorito as fellow student Austin Hanebutt anticipates the outcome of thier third thermochemistry tral. Burn baby burn...

This magazine is published annually for graduates of the IU Department of Chemistry by the Department of Chemistry to encourage alumni interest in and support for IU.

Any questions regarding the content of this publication may be directed to the editor at creck@indiana.edu. The department may be contacted at chemchair@indiana.edu.

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Cover photo courtesy of Indiana University. Annebel Keizer christens a new rowing shell for the IU Women's Rowing Team.

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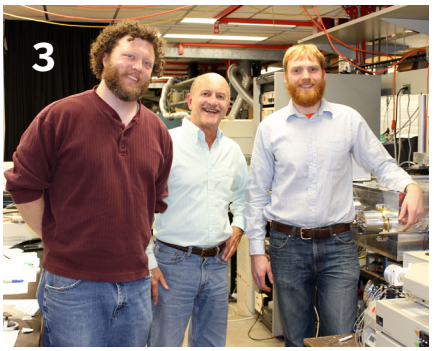
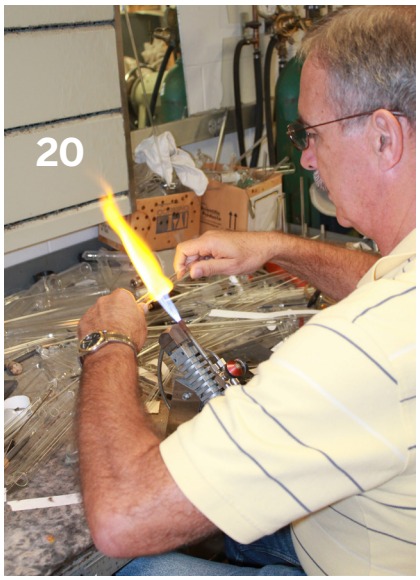




EDITOR'S NOTE

As I wrote this note, this past summer was upon us — the days were longer and our usually busy campus was quieter. Like most faculty, I love summer time on IU's campus. Students often ask me if I get the "summer off," and the truth is that our "summer" semester feels quite short although it can be my most productive time of the year.

If you know me I am always concocting some new class or redesigning the classes I teach. So my summers are never "off." I'm always a little restless without students. And in truth, I wouldn't have summer any other way.

We move almost immediately from the joy of our Chemistry Graduation Ceremony to the nervous excitement of incoming first-year student orientation. When the tempest of orientation ends in July, most faculty and staff are consumed with preparing for the first-year students' arrival in one month's time. Although I felt sorrow in saying good-bye to students we are now so proud to call Chemistry Alumni, I look forward to welcoming the Class of 2018 to our incoming chemistry family.

As Director of Undergraduate Studies and Editor of this magazine, one of my favorite experiences has been connecting with parents and alumni. Some alumni were students I have known over my 14 years on campus; others have become new acquaintances when they come back to visit campus and peek into C122 to recall the early morning 8 a.m. general chemistry lectures. They tell me which way the seats were facing, the professors they had, the funniest things they remember, and it is quite obvious their memories are still vivid of their time spent in this building. You will be happy to know we redid both C033 and C001 lecture halls this past summer (say good-bye to those old wooden chairs in C001!!!).

The common thread among all these encounters is a deep appreciation for the educational experiences that the IU-Chemistry Program has offered students. A repeated theme in these conversations is a desire to expand and invigorate the Indiana University Chemistry Alumni network. I emphatically agree that this goal is a priority for us in the department, and I'll be working diligently on this effort in the coming year(s). But, I need your help.

I invite you to be part of this important endeavor. We need you — each and every one of you — to make the Indiana University Chemistry Alumni network robust. Although summer is planning time for me and my office, I also hope you'll take a few minutes this fall to plan how your involvement can help the department.

Help can come in many forms:

- It's donating your time by talking to a high school student or high school class about your experiences at Indiana University and its Chemistry Department; you can do this in the neighborhood where you live now (no travel needed);
- it's serving the program by coming to campus and speaking at an event; our students love hearing from alumni and learning about what you do now and all the tangents your lives have taken;
- it's letting us know about an internship at your company that would be suitable for a current chemistry student; in today's economy, students are having harder and harder times getting the skills they need to become competitive in the workforce without an internship,
- and it's financially supporting the work we do, in whatever amount you can; if you do not know how to help, we have many ways your monetary support can help students on a day-to-day basis.

A great deal of our program is supported by donors and the cost to sustain and improve our program continues as tax dollars keep waning from the state. Your tax deductible monetary support can help sustain undergraduate academic or research scholarships, infrastructure improvements such as new chairs in the lounge or benches in the hallway, or new computers in the labs. One of our current campaigns is raising money for outdoor seating areas for people to enjoy meeting and eating outside next to the building. You can specify how your want your dollars spent (undergraduate or graduate level), or let us make good judgments based on our most current needs. Talk to our chair's office about what ideas you have in mind about how you can put your fingerprint on our department.

Many hands make lighter work, and the work we all do in this department can ignite the future for our students and Indiana University. I'm looking forward to working together with you on our upcoming projects. Please do not hesitate to contact me to see how you can become involved with your alma mater.

Don't hesitate to stop into the Chemistry Undergraduate Office if you are on campus!

Cheers,

Cathrine Reck

CHAIR'S MESSAGE

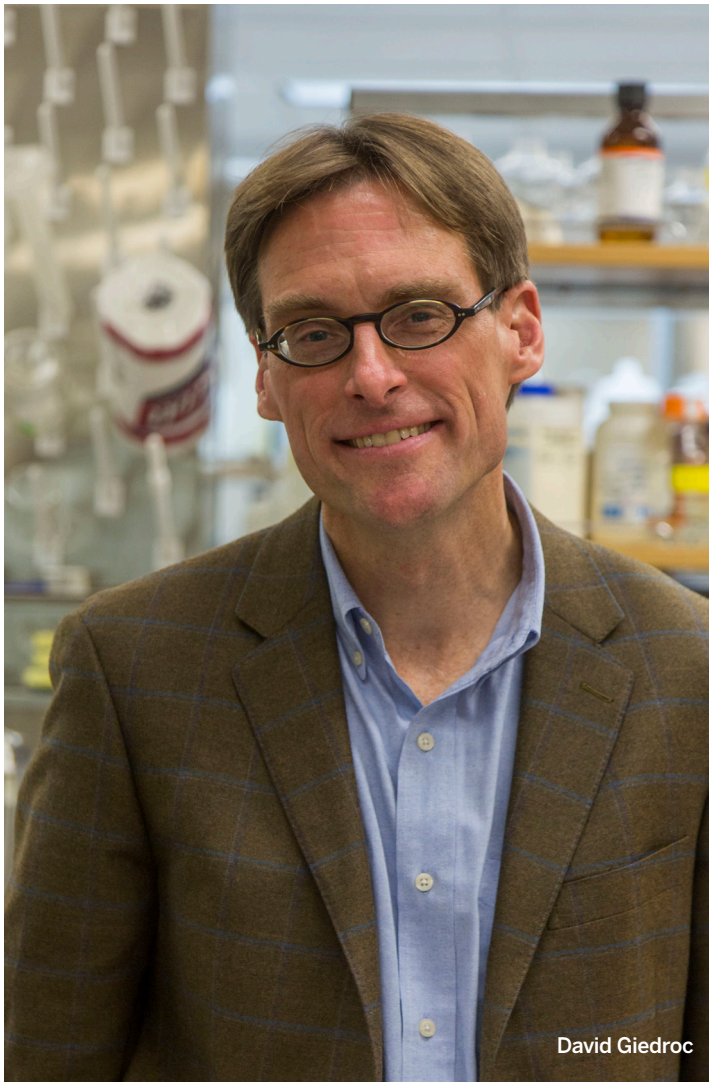
As we are now well into my fifth and final year as chair of department, we take some time to look back upon the previous year as well as look forward to what the new academic year holds for new and returning students, staff and faculty. For all of the latest news, please check out our departmental website (**http://www.chem.indiana.edu/**) and the periodic news releases from the IU Newsroom that highlight the accomplishments of Chemistry faculty and our students (**see http://www.chem.indiana.edu/news-events/index.asp**).

In January, we welcomed Prof. **Trevor Douglas** as Earl Blough Professor of Chemistry. Prof. Douglas is a biomaterials chemist and comes to us from the Department of Chemistry and Biochemistry at Montana State University where he was Regents Professor. Douglas is a classically trained organometallic chemist with broad research interests in biomimetic materials chemistry. His group pioneered the use of viruses and bacteriophages as supramolecular platforms for synthetic manipulation with a wide range of applications, from materials to medicine. Douglas is a member of our materials chemistry group and expands our already strong campus footprint in viruses and virus assembly.

Once again, our faculty are recipients of a number of significant national and university awards and recognitions since the last issue of IU Chemistry. Prof. **Sara Skrabalak**, College of Arts and Sciences Dean's Fellow and recently promoted Associate Professor, was named winner of the Camille Dreyfus Teacher-Scholar Award for her work in the area of inorganic materials chemistry. Prof. and former chair of department **David Clemmer** and **Krishnan Raghavachari** were named Distinguished Professors of Chemistry; Prof. Raghavachari also received a Distinguished Alumnus Award from the Institute of Technology, Madras, India. In addition, Distinguished Professor **Richard DiMarchi** was awarded the Erwin Schrodinger Prize for work in the area of diabetes and obesity.

Profs. **Lane Baker** and **Amar Flood** have been named James F. Jackson Associate Professors of Chemistry, made possible by a generous bequest of the estate of IU alumnus and Pleasantville, IN native **James Francis Jackson**. Prof. **Bogdan Dragnea** was named Provost Professor, while Profs. **Kevin Brown** and **Ted Widlanski** and Senior Lecturer **Ben Burlingham** were recognized as winners of the IU Trustee Teaching Awards. Prof. **Steve Tait** was the recipient of an IU Outstanding Junior Faculty Award as well. Finally, Prof. **Mike VanNieuwenhze**, in collaboration with Prof. Yves Brun in the Department of Biology, was selected to receive an inaugural Outstanding Faculty Collaborative Research Award, jointly supported by the Office of the Provost & Executive Vice President and the Office of the Vice Provost for Research. This award recognizes the achievements of a collaborative team of IU Bloomington Faculty whose research, scholarship or creative activity is making important scholarly contributions. I am extremely proud of all the accomplishments of our faculty at all ranks, which speaks volumes about the quality of science ongoing in the department.

Our department and broader campus community also hosted a number of important symposia during the Fall 2014 semester. Our annual 24th Inorganic Alumni Mini-Symposium was held on



David Giedroc

Friday, October 3. Invited speakers included **Aalo Gupta,** Associate Scientist, Phillips 66 Company in Bartlesville, OK, **Yogita Mantri**, Senior Scientist, Proctor & Gamble Company in Cincinnati, OH, **Xuan Jiang**, Senior Research Chemist, 3M Center, Corporate Research Material Lab in St. Paul, MN, and **David Clark** Laboratory Fellow & Program Director, Los Alamos National Laboratory in Los Alamos, NM. In addition, our fifth annual Watanabe Symposium in Chemical Biology was held on Saturday, October 11. Guest speakers included **Catherine L. Drennan**, Howard Hughes Medical Institute (HHMI) and Massachusetts Institute of Technology, **Xiaowei Zhuang**, HHMI and Harvard University, **Michael A. Weiss**, Case Western Reserve University, and **Philip S. Low**, Purdue University. Lastly, the Linda and Jack Gill Center for Biomolecular Science hosted the Gill Symposium & Awards on October 15 with featured speakers **Sabrina Diano**, Yale University, **Tony K.T. Lam**, University of Toronto, and **Randy Seeley**, University of Michigan. This year's symposium was focused on the emerging intersection of metabolic disease, neuroscience

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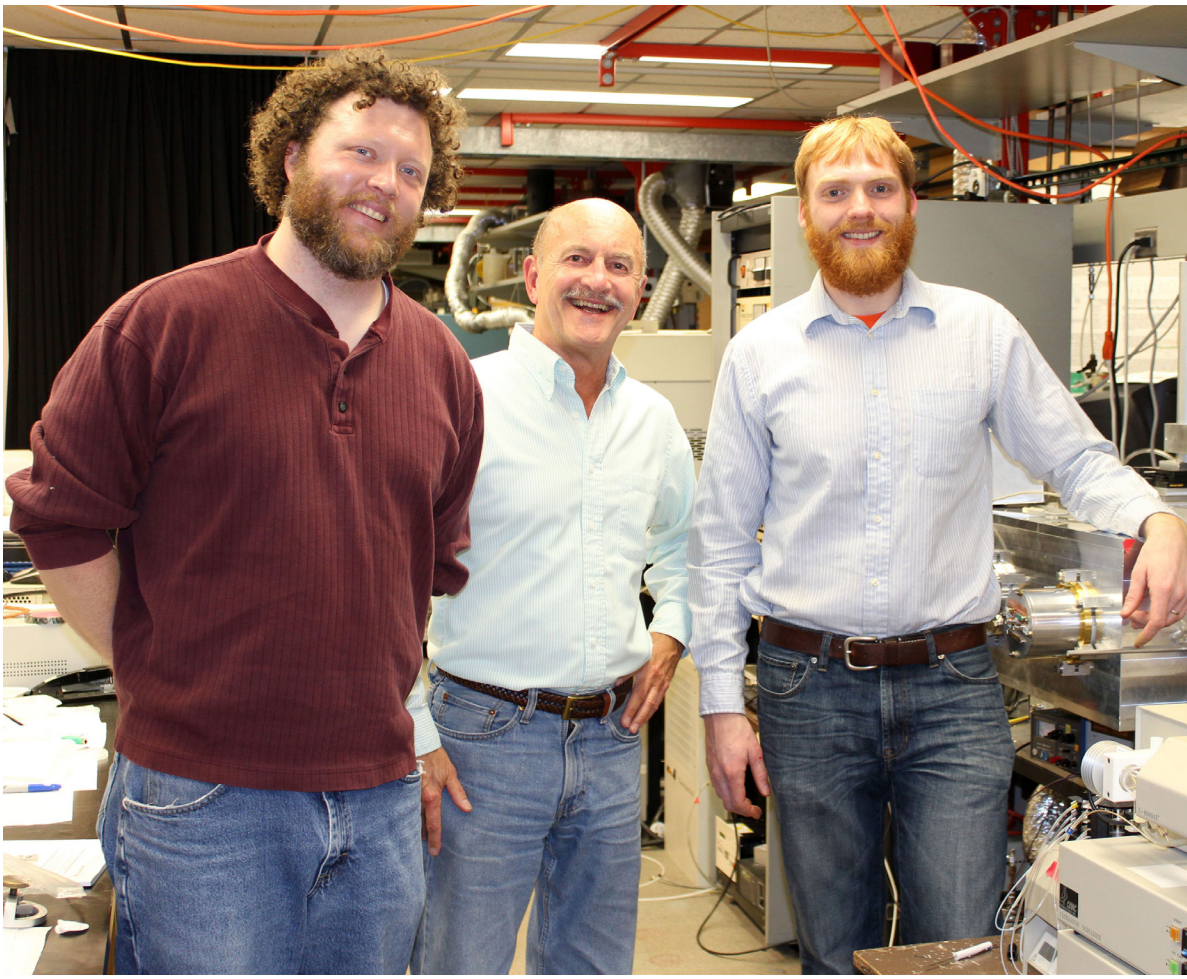
A New Generation of Mass Spectrometers

by Gary Hieftje

Until recently, mass spectrometry was viewed mainly as a tool for structural characterization of organic compounds. However, it is now realized that mass spectrometry is critical in fields such as proteomics, metabolomics, metallomics, and other areas of bioscience. The reasons are clear: mass spectrometry offers unparalleled sensitivity, rapid analysis, and exceptional information content.



Dr. Steve Ray, Professor Gary Hieftje and graduate student Alexander Graham in the Hieftje lab.

Conveniently, there are many kinds of mass spectrometers from which to choose. Each, of course, has its own set of strengths and weaknesses. Specifically, Fourier transform mass spectrometry and the Orbitrap® provide extremely high resolution but at the cost of speed. Quadrupole mass filters are inexpensive and compact, and can operate at modest pressure. However, the resolution they provide is limited. Time-of-flight mass spectrometers are extraordinarily fast and have an unlimited mass range. For this reason, they are often coupled with separation methods such as liquid and gas chromatography, and can be used with techniques such as matrix-assisted desorption/ionization (MALDI) and electrospray ionization for biomolecular analysis. Yet, they offer limited isotope-ratio precision and are often large and cumbersome. In contrast, ion traps are relatively simple, compact, and inexpensive, and offer tandem MS capability, but have modest resolving power and dynamic range. Finally, sector-field instruments are excellent at isotope measurements and can be used to collect and accumulate mass-separated ions. Unfortunately, they have a restricted mass range, and are therefore less commonly used for measurements in bioscience.

This lineup is now being supplemented by a new form of mass spectrometry being explored in the **Hieftje group** at Indiana University. This new design, termed distance-of-flight mass spectrometry (DOFMS), offers its own set of advantages and disadvantages. Like time-of-flight mass spectrometry (TOFMS), DOFMS has an unrestricted mass range and can operate at repetition rates above 40 kHz. Unlike TOFMS but similar to sector-field instruments, however, DOFMS spatially separates ions according to their mass-to-charge ratio (m/z). This means that DOFMS can be used to segregate, collect, and accumulate ions for later characterization or use. As importantly, DOFMS can employ new advanced analog detection technologies, and thereby overcome many problems that plague conventional TOFMS detection, such as errors caused by pulse pileup.

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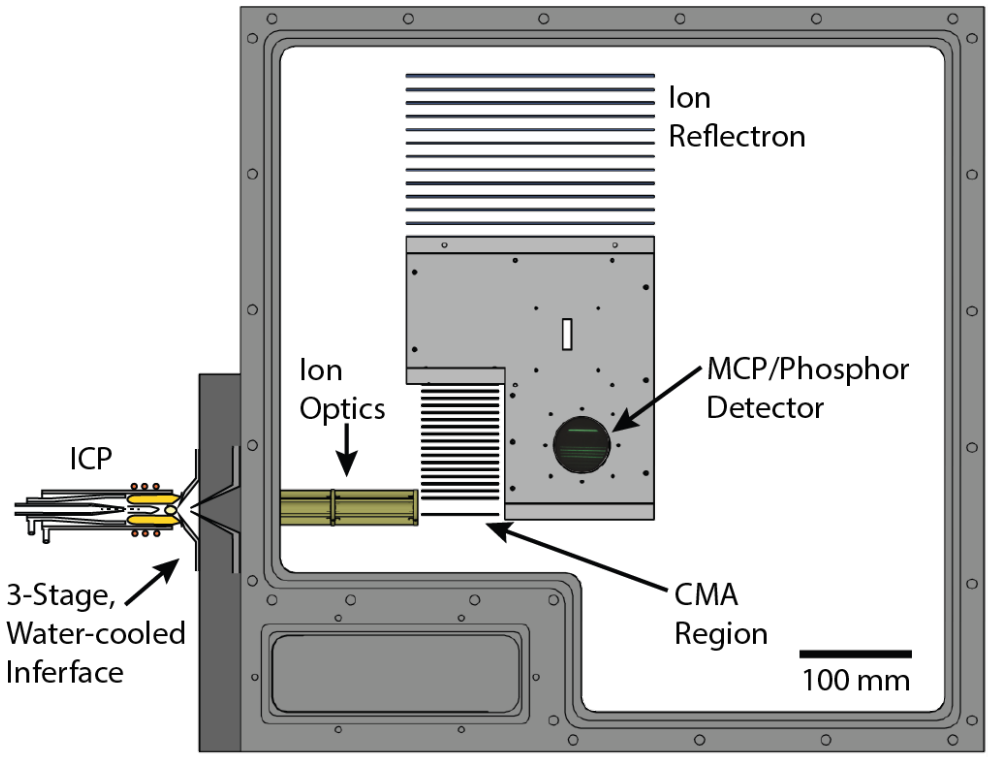


Figure 1: A schematic of the ICP-DOFMS Instrument Diagram; Gundlach-Graham, A.; Dennis, E. A.; Ray, S. J.; Enke, C. G.; Barinaga, C. J.; Koppenaal, D. W.; Hieftje, G. M. J. *Anal. At. Spectrom.* 2013, 28 (9), 1385-1395.

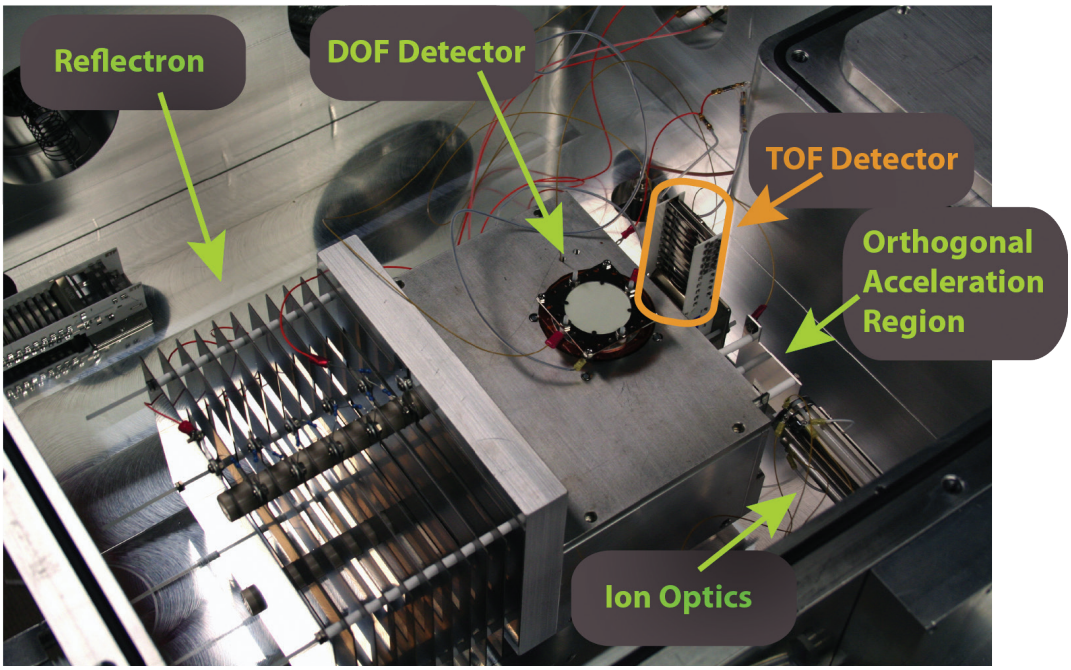


Figure 2: A photograph of the assembled ICP-DOFMS Instrument.

In many ways, DOFMS can be considered to be the converse of TOFMS. In TOFMS, ions of interest are given the same kinetic energy by accelerating them across an applied voltage drop. Because kinetic energy (KE) produces a mass (m)-dependent velocity (v) (i.e. KE = mv^2), lighter ions travel more rapidly down a field-free flight tube and arrive at a distant detector earlier than do heavier ions. The time-dependent output of the detector is then the mass spectrum itself.

Just as in TOFMS, ions are given a mass-dependent velocity in DOFMS. Again, the lightest ions achieve the greatest velocity. However, before the lightest ions of interest reach the end of the flight tube, they are focused in a perpendicular direction onto a position-sensitive detector or an array of detectors, and the *m/z* of each ion is measured based on the distance it travels.

Practical application of DOFMS requires use of a position-sensitive ion detector. Serendipitously, such a system was developed previously through a collaboration among Indiana University, Pacific Northwest National Laboratory, and the University of Arizona; the work was funded by the U.S. Department of Energy. The focal-plane camera (FPC) that emerged from that collaboration is a monolithic semiconductor chip made specifically for ion detection; the latest version contains 1696 individual ion-collection electrodes, each of which is connected to a dedicated, directly integrating amplifier circuit and operated under computer control. The FPC permits ion flux to be measured with very high sensitivity (100 charges), wide dynamic range (109), and excellent spatial resolution (12.5 µm). For DOFMS, such attributes are critical, since each *m/z* will arrive at a specific detection location, and the signal at each detector element can be integrated independently and read individually. Practically, the ability to control detection conditions based on the abundance of a particular *m/z* means there is no danger of missing ion counts, even if the ion flux is high. Moreover, the detector can be replaced by a collection surface, so biomolecular species can be accumulated, removed from vacuum, and tested or employed in other applications or in different ways.

DOFMS was originally conceived in 2007 by Prof. Chris Enke of the University of New Mexico. However, he never had the opportunity to reduce it to practice. As a result, a collaboration was forged between professor Enke and members of the Hieftje group, with seed funding provided by a "Laboratory-Directed Research and Development" (LDRD) fund at Pacific Northwest National Laboratory, and with subsequent funding from the National Science Foundation. **Dr. Steven Ray** at Indiana worked with Prof. Enke to

design a functioning DOFMS prototype. The prototype was then tested by Dr. Ray and two graduate students in the Hieftje group, **Alex Graham** and **Elise Dennis**. To make this collaboration even more effective, **Prof. Enke** assumed an adjunct faculty position in our department, visits periodically, and remains in contact with the research team at other times. The results of these studies are briefly summarized below. A schematic and photograph of the completed instrument can be seen in Figures 1 and 2.

Collaborator and IU Adjunct faculty member Professor Chris Enke of the University of New Mexico.

From the earlier description, it should be apparent that DOFMS has many of the same characteristics as TOFMS. Indeed, the architectures of the two instruments are nearly identical. In TOFMS, however, ions of different *m/z* values must all be brought to focus at a specific distance (where the detector is located) but at different times; in contrast, DOFMS requires that the ions be brought to focus at a particular time but at different distances. This distinction requires that in DOFMS, ions be given the same *momentum* (mv) rather than the same *energy* (mv^2) when they are accelerated. In turn, imparting an identical momentum necessitates that ions be given the same "kick." This need can be met by terminating the accelerating pulse before the lightest ion of interest leaves the acceleration region. Thus, it is possible to switch between constant-momentum and constant-energy acceleration merely by employing accelerating pulses of different duration.

Graduate student Elise Dennis who helped to test the ICP-DOFMS prototype.

Employing constant-momentum acceleration carries an important side benefit. Specifically, ion turn-around time errors are eliminated. These errors arise in conventional, constant-energy TOFMS when ions are initially moving in a direction opposite to their intended travel after acceleration and is one of the greatest contributors to resolution loss in TOFMS. The overall result is that DOFMS ordinarily yields higher mass-spectral resolution than TOFMS.

It is probably apparent that the accessible mass range in DOFMS is limited by the length of the multichannel or position-sensitive detector system. Although this limitation is not a serious one when inexpensive spatially selective detectors (e.g. those based on phosphor screens) are used, it becomes critical when monolithic solid-state arrays are employed. This complication can be addressed by incorporating both DOFMS and TOFMS into the same instrument package. The advantages of DOFMS can then be enjoyed over the mass-spectral range accessible by the DOFMS detector array, while the balance of the range can be recorded in TOFMS mode. Importantly, it is simple to switch between mass ranges that fall upon the DOFMS detector merely by adjusting timing electronics, so consecutive injections of ions into the instrument can address different regions of the mass spectrum.

In addition, recent experiments have revealed that the improved resolution available in DOFMS can be realized in TOFMS also, albeit over a restricted mass range. This benefit arises when constant-momentum acceleration is used in TOFMS mode, so turn-around errors are eliminated and ion focusing is improved. Operation of the instrument then occurs in two alternating modes. First, a conventional TOFMS spectrum is generated by accelerating all ions to a constant energy. Next, if improved resolution is needed over a selected mass range where peak overlap is suspected, constant–momentum acceleration is employed for better resolution in that range. This alternating operation, turned "zoom-TOF", has been demonstrated on two instruments already and is expected to be a convenient after-market add–on for existing TOFMS instruments.

The investigations described above have already yielded three new kinds of mass-spectrometer configurations: distance-of-flight mass spectrometry, a combination of DOFMS and time-of-flight mass spectrometry, and zoom-TOF, for improved resolution in existing instruments. In addition, an instrument is now being tested that will offer "soft-landing" capability. This last instrument will use DOFMS to separate, collect, accumulate, and utilize biomolecules, radionuclides, and perhaps even intact viral particles. Already, the potential of these new instruments is being widely acknowledged; the first publication describing DOFMS as a new paradigm in mass spectrometry received the **Ron Hites Award**, intended to recognize the best publication of the year in the *Journal of the American Society for Mass Spectrometry*. The same paper was also recently named as the recipient of the Lester Strock Award, given to the top publication in the last five years in the area of spectrochemical analysis. ■

***Professor Hieftje** received an A.B. degree from Hope College, Holland, MI, in 1964 and a Ph.D. from the University of Illinois in 1969. He joined the faculty at Indiana University as an assistant professor of chemistry in 1969, becoming full professor in 1977, and named a Distinguished Professor in 1985. He is the author of over 550 scientific publications, 10 books, and holds 18 patents. Over 60 students have received doctorates under his direction; many others have received M.S. degrees, and scores of undergraduates and visiting scientists have performed research in his laboratories.*

Professor Hieftje's research interests include the investigation of basic mechanisms in atomic emission, absorption, fluorescence and mass spectrometric analysis, and the development of instrumentation and techniques for atomic methods of analysis. He is interested also in the on-line computer control of chemical instrumentation and experiments, the use of time-resolved luminescence processes for analysis, the application of information theory to analytical chemistry, analytical mass spectrometry, near-infrared reflectance analysis, and the use of stochastic processes to extract basic and kinetic chemical information.

Programming Immune Cells with Biometric Materials

by Yan Yu

Yan Yu

The immune system is a double-edged sword. When the immune system is too weak, one can easily get infections or cancer. When the immune system is over active, one may get autoimmune diseases. Humans have been searching for ways to manipulate the immune system for thousands of years. Since the ancient Chinese began to use smallpox inoculation in the 1000 AD, immunotherapeutic approaches, mostly in the form of vaccines, have blossomed. Yet, we are still in critical need of methods that can harness the power of the immune system to treat and prevent a wide spectrum of diseases from cancer and diabetes, to arthritis.

The **Yu group** is developing novel materials that can manipulate immune cells from the cell surface. The idea is to "retrain" diseased immune cells through cell interactions with materials that display well-defined stimuli. While cell therapy is traditionally done by genetic engineering of proteins inside cells, programing immune cells from the outside in provides complement strategies that could enhance the specificity and efficiency of traditional methods.

The first problem my group tackled since I started at IU in 2012 was to control particle ingestion (also known as "phagocytosis"). Immune cells set up the innate defense by engulfing and destroying foreign particles such as bacteria, viruses, airborne dust particles, pollen, and synthetic particles. How to control particle phagocytosis has been a grand challenge in the field of drug delivery — a majority of drug carriers are often cleared by immune cells in the blood stream before reaching their destination within the body, while particles that are designed for vaccine delivery are not "eaten" efficiently enough. In recent years, particles of various sizes, shapes, and surface chemistries have been developed in an effort to manipulate particle-immune cell interactions.

The Yu lab is developing a novel approach to tackle this challenge. While other research groups focus on particles that have uniform surface functionality, we design anisotropic particles that mimic the surface heterogeneity of pathogens. Just like how bacteria display patches of proteins at two poles, we engineer two-faced particles that have different proteins on two hemispheres. The particles are called Janus particles, named after the two-faced Roman god Janus. The beauty of these particles is that we can bring proteins of different or even opposite functionalities into one entity. By controlling what proteins are displayed on the particle surface and how they are presented, we hope to fine-tune particle phagocytosis by immune cells. The potential of this approach has been demonstrated in our recent studies.

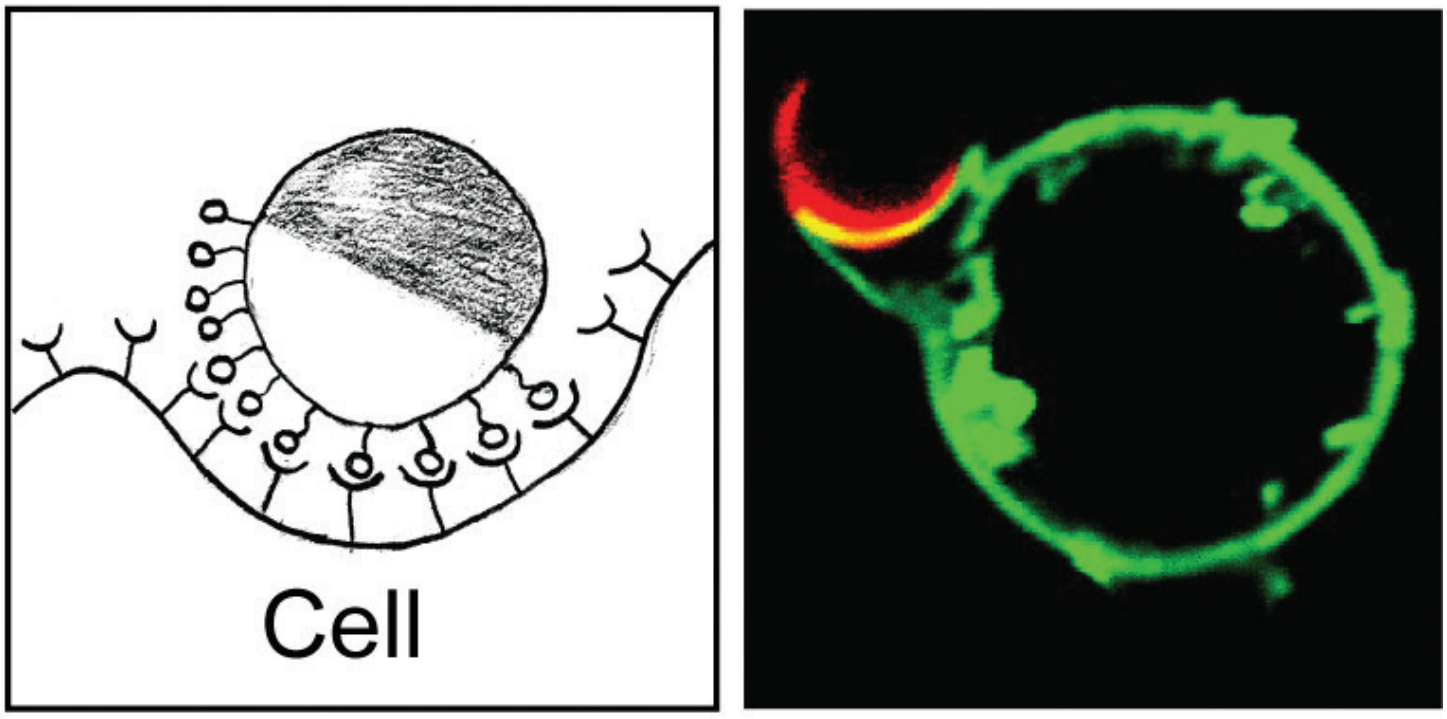


Figure 1. Control immune cell phagocytosis by designing two-faced Janus particles. Adapted with permission from Gao and Yu, *J. Am. Chem. Soc*. 2013.

In our paper published in Journal of *American Chemical Society* in December 2013, we discovered that by simply decorating the protein ligands onto only one hemisphere of a Janus particle, we could manipulate how the immune cells extend their cell membrane around the particle and how efficiently the particles are ingested. More specifically, the immune cells recognize the anisotropic distribution of ligands and they extend the cell membrane as "arms" to strictly follow the pattern of the molecules on the particle surface (See Figure 1). It was the first study to show that surface presentation of ligands can be used to modulate particle ingestion by immune cells. As almost all drug delivery carriers are currently designed with uniform distribution of ligands, we believe that the surface patterning of ligands will provide a new design parameter to improve the delivery specificity of the drug carriers.

Immune functions are much more than just ingestion of particles. For instance, a cancer patient's very own immune cells can be "retrained" to attack tumor cells. It is an emerging approach known as adoptive cancer immunotherapy. The Yu group is currently working on developing novel particles that can help to stimulate and expand immune cells outside of body, with potential applications in cancer immunotherapy. ■

Yan Yu received her B.S. in Chemistry from Peking University (Beijing, China) in 2004. She pursued her Ph.D. degree in the Department of Materials Science and Engineering at the University of Illinois-Urbana Champaign from 2004 to 2009 under the direction of Professor Steve Granick. Her research focused on lipid-based biomaterials and their interactions with nanoparticles and proteins. Subsequently, she started her postdoctoral research at the University of California at Berkeley with Professor Jay T. Groves and changed her research direction to biophysics of primary immune cells. She joined the faculty at IU in July 2012.

Research in the Yu laboratory is at the interface of materials, bioanalytical, and physical chemistry. The research vision is to quantify and control cell behavior with novel materials and chemical approaches. Specific research projects in the Yu group include: (1) self-assembly and interactions of lipid membranes; (2) biomaterials-cell interactions: develop biomimetic materials to manipulate cell behavior; and (3) cell-cell interactions: quantify how molecular interactions and dynamics in membranes determine cell functions.

Chair's Letter

Continued from page 2

and behavior, and named Prof. Mathias Tschöp of the University of Münich as Gill Distinguished Scientist Awardee. Tschöp is a long-time collaborator of Distinguished Prof. and Linda and Jack Gill Chair Richard DiMarchi in our department.

On a sad note, we remember one of our own graduate student family, **Karlijn Keijzer**. Karlijn came to Indiana University from the Netherlands on a rowing scholarship in 2010 and smitten with Bloomington, stayed on to work toward a Ph.D. in Chemistry as a member of Prof. **Mu-Hyun Baik**'s group. During this past summer, following work in the Netherlands in collaboration with a group at VU University Amsterdam focused on simulations of anti-tumor drugs, she and her boyfriend (Lars) embarked on a short vacation to Indonesia in late July. Both Karlijn and Lars were passengers on Malaysia Airlines Flight 17 that was shot down in eastern Ukraine, killing all 200 passengers aboard. Memorial services were held in Amsterdam as well in Bloomington, with the Keijzer family attending the IU event hosted jointly by IU Athletics and the Department of Chemistry on September 17 at Henke Hall of Champions. It was during this time that the entire campus community celebrated Karlijn's posthumous receipt of the Ph.D. in Chemistry. Karlijn's personality and work ethic was infectious, and she will be remembered as a strong and confident woman in chemistry.

On one final sad note, our department community notes the September passing of Veronica Siedle, wife of Adjunct Professor, IU alumnus and retired group leader at 3M Company, **Allen Siedle**. Allen has been lifelong supporter of our department, having endowed the annual Siedle Lectureship and a number of graduate scholarships in inorganic chemistry.

In closing, let me express my personal gratitude for your continued support of the department. Please stop by during your next trip to Bloomington — you're always welcome.

— David Giedroc

The Chemistry of Food: Don't Lick the Spoon

by Kate Reck

Cooking may be the oldest and most widespread application of chemistry, and recipes may be the oldest practical result of chemical experimentation. Chemistry is defined as the study of matter and the changes it undergoes. All food can be broken down into four basic food molecules: ***water***, ***lipids*** (fats and oils), ***carbohydrates*** (simple and complex sugars) and ***proteins*** (meat).

This year's Themester topic is *Eat, Drink, Think: Food from Art to Science*, and I have been looking forward to this topic for two years. To check out current and previous year's Themester events, you can check out their website and calendar of happenings: http://themester.indiana.edu/.

IFS class at Trader's Point Creamery.

This summer I was fortunate enough to teach a new course, *The Chemistry of Food: Don't Lick the Spoon*, offered through the Intensive Freshmen Seminar (IFS). IFS is an amazing opportunity for motivated students to come to campus two weeks early, take a 3-credit class, in a small class of 18 students, and get a leg-up on college before the campus picks up again for fall. I was impressed by these students, as we were in class for 6-7 hours a day: 3-4 hours of lecture and 3 hours of lab. We focused primarily on intermolecular forces, structure and function. Only half of the students expected to pursue a science major, but they were all committed.

Students performed a calorimetry experiment measuring the Calories produced while burning Doritos, they made soap from olive oil, peanut oil and coconut oil, and they made cheese from different kinds of milk. Lab was the students' favorite part of the day.

The small class allowed us to take a field trip to Indianapolis to visit the *Smoking Goose* (an organic and humane meat producer) and *Trader's Point Creamery* (an organic dairy and creamery). Students learned about how meat can be cured without nitrates. Students were able to see how cheese was made in a large-scale operation.

Meat curing at Smoking Goose.

This summer represents what I like about being in academia; I learned a great deal about food and chemistry preparing for the course. In fact, I enjoyed it so much that I changed all my *C341: Organic Chemistry* I lecture notes to be food themed this fall as well. After checking out the entire library's collection of food related references, I believe I could teach any chemistry course with a food-related theme.

Here are some examples of food-related concepts that you might find interesting:

- **Plasmoid generation:** Try and cut a grape in half, while keeping the skin intact in one location between the two halves. A grape placed on a glass plate and into a microwave for about 30 seconds, produces a form of matter called plasmoid. [Note: be careful if you try this at home as we do not know what effect this has on your microwave!!]

- **Chocolate bloom:** Chocolate that has turned greyish on the outside has not turned "bad", but instead is an example of polymorphism. Cocoa butter, a major fat in chocolate, has six different polymorphs with melting points ranging between 17-36°C. The difference in color arises from the changing in polymorphs upon sitting and experiencing changes in ambient heat.

- **Enzymatic browning:** Enzymatic browning is a chemical process involving the reaction between phenolic compounds and molecular oxygen that create melanin and benzoquinone from naturally-occurring phenols, resulting in a brown color. An example of this happens when bananas brown or when the flesh of apples or avocadoes turns brown. (Figure 1: Reaction between a phenolic compound, such as catechol, and molecular oxygen to produce a brown compound, benzoquinone.) Enzymatic browning can be beneficial as it is responsible for developing the flavor in tea leaves and developing the color and flavor in figs and raisins. Catechol oxidase activity is also of economic importance as it's been estimated that half of the world's fruit and vegetable crops are lost due to post-harvest browning reactions due to this enzyme. Citric acid and sulfur-containing compounds can inhibit this enzyme process. Sulfured fruits retain their natural colors whereas unsulfured dried fruits turn brown and develop a more cooked flavor.

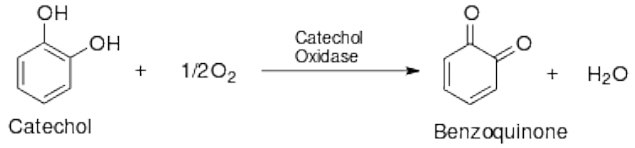


Figure 1

- **Coffee fats:** Unfiltered coffee contains more fats than filtered coffee. Two lipids, *cafestol* and *kahweol*, (Figure 2: Structures of lipids found in coffee: cafestol and kahweol.) present naturally in coffee are present in higher quantities in espresso, press-pot (plunger), and boiled coffee processes. The significance is that these fats increase blood cholesterol levels, however, the detriment is still unclear.

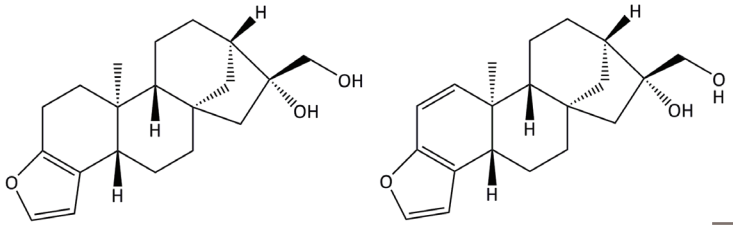


Figure 2

- **Brazil nuts:** Brazil nuts are native to the Amazon in South America and 8-24 nuts grow in a pod that weighs about 5 pounds (similar to a coconut). Due to their high oil content, two large Brazil nuts are equal in caloric content to one egg. Most notably, Brazil nuts have the highest levels of selenium, more than any other food. While selenium can help prevent to development of cancer, an overdose is toxic. The recommended amount of Brazil nuts if ½ oz. or 14 gm per day.

- **Seaweed:** Brown seaweed contains high amount of alginates which are anionic polysaccharides (Figure 3: Generic structure of alginic acid.), with high level of calcium counter ions. These polysaccharides form several structural variations and are capable of absorbing 200-300 times its own weight in water to form a viscous gum. Due to these properties, alginates has been extracted from seaweed and used in several consumer applications such as additives in slimming agents, in the manufacture of paper, waterproofing and fireproofing fabrics, gelling agents, thickening drinks, ice cream and cosmetics. In the medical field alginates are used for impression-making in dentistry, prosthetics, and burn dressings that promote healing and can be removed with less pain than conventional dressings.

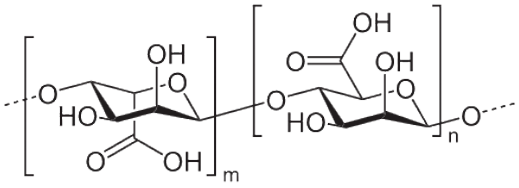


Figure 3

- **Fresh fish:** All fish have bacteria on them, especially *Pseudomonas*, which is cold-tolerant. They digest amino acids, producing ill-smelling nitrogen containing compounds (ammonia, trimethylamine, indole, skatole, putrescence, and cadaverine) and sulfur-containing compounds (skunk-smelling compounds such as hydrogen sulfide and methanthiol). The best defense is washing, a close wrap of wax paper or plastic wrap to limit oxygen, and then keeping the temperature as cold as possible to slow the enzyme process.

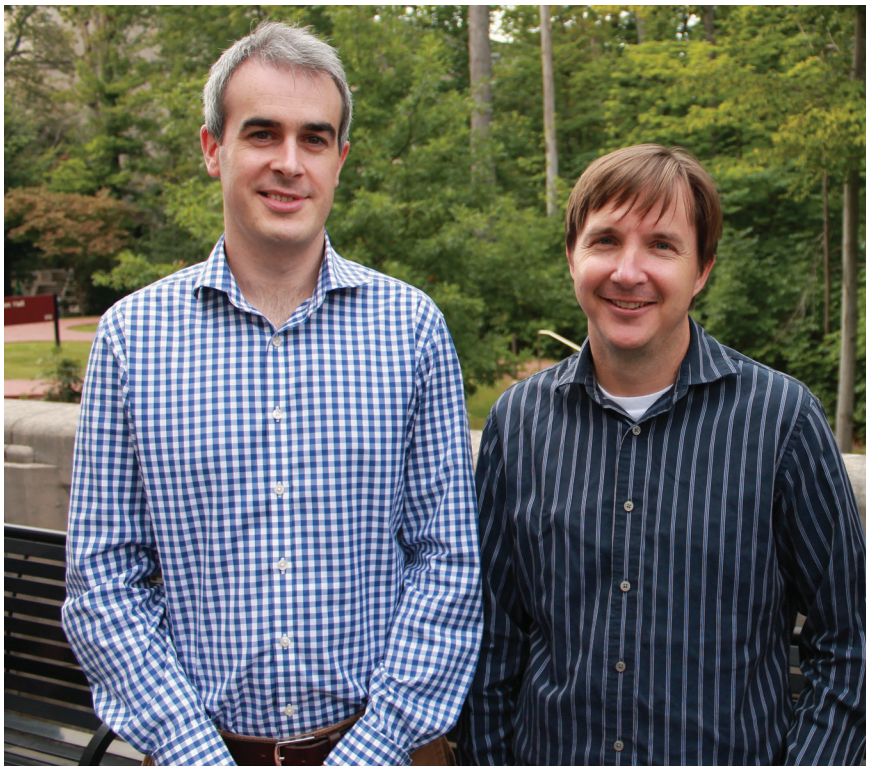
- **Green yolks:** Older eggs often produce a greenish-grey color on the surface of the yolks while hard boiling eggs. This harmless reaction occurs at the interface between the egg yolk and white when sulfur in the egg white reacts with iron in the yolk to form ferrous sulfide (FeS) under basic conditions of the yolk. The older the egg, the more alkaline the egg, and the more prevalent the reaction. How do you know if your egg is older? As eggs age, they lose moisture through the porous shell. Older eggs float in water due to lower density and fresh eggs sink in water. If you are concerned about your eggs being old, carefully place your eggs in water and see if they float. If they do, don't use them. ■

Cathrine "Kate" Reck, Ph.D. earned a B.A. in chemistry from Kalamazoo College (Kalamazoo, MI) and a Ph.D. in inorganic/organometallic chemistry (highly-metalated organic systems), from Wayne State University (Detroit, MI). Postdoctoral work ventured into the synthesis of highly electrophilic olefin polymerization catalysts (The University of Iowa and The University of Chicago). She accepted a teaching faculty position at IU in 2001, becoming Director of Undergraduate Studies and Clinical Professor in 2007 To date, she has taught over 70 courses, developed 15 new courses, and over 15,000 students. She teaches courses within the areas of freshmen chemistry, non-majors chemistry, inorganic chemistry and organic chemistry. Among her many ongoing projects, she is currently working with one of her student organizations, Timmy Global Health Water Project, to provide potable water in Ecuador along the Amazon basin for indigenous populations.

Intensive Freshmen Seminar Field Trip: Smoking Goose and Trader's Point Creamery

New Professors Jeremy Smith and Thomas Snaddon

Our department welcomes two new faculty to our fold, one senior colleague, Professor **Jeremy Smith**, and one junior colleague, Professor **Thomas Snaddon**. Below are overviews of their research to introduce them to our alumni community.



Professors Snaddon (left) and Smith (right)

New synthetic scaffolds in the Smith lab

Many of the challenges related to humankind's energy generation and consumption, e.g. the efficiency of industrial commodity chemical synthesis, the development of alternative energy sources and new methods of information storage, can be viewed as problems in inorganic chemistry, especially the chemistry of the metallic elements. The Smith research group aims to address some of these challenges through chemical synthesis, an art form that involves combining elements of the periodic table into unprecedented molecules with unusual and interesting properties.

As synthetic inorganic chemists, our interests are in the synthesis of transition metal-based molecules. These molecules are designed to contain entities of physical and chemical significance, such as proposed intermediates in important industrial and biological catalysts. The intellectual challenge of chemical synthesis lies in developing strategies for isolating these heretofore elusive chemical entities. Successful synthesis of these species makes it possible to undertake detailed studies into their physical and chemical properties. In the case of catalyst intermediates, these studies will ideally yield important scientific insights leading to improved catalysis, or more excitingly, the development of new catalytic transformations.

The key challenge to chemical synthesis is in controlling the assembly of atoms so that desired molecules are constructed. Our strategy is to design supporting scaffolds that force metals into unusual coordination environments. These environments can endow metals with unique and unexpected properties, allowing us to stabilize previously unknown chemical bonds, develop new reaction chemistry and create molecules with unprecedented physical properties. Although it is not strictly important to do so, we like to make aesthetically pleasing molecules that have high symmetry. Parenthetically, it is worth noting that our molecules are often very air-sensitive, requiring that we use special handling techniques to prevent their aerobic decomposition.

Much of our research revolves around the properties of molecules containing multiple bonds between transition metals and other elements, e.g. oxos (M=O), nitridos (M≡N) and imidos (M=NR). Because some of these species have never been isolated, they are sometimes referred to as trophy molecules. Fame and fortune awaits those who are the first to prepare these molecules! Beyond this momentary glory, we are interested in answering fundamental questions relating to the structure and bonding of these species, which is important for developing and modifying their reactivity as well as using them in new applications.

In one ongoing project, we are developing the chemistry of the iron nitride functionality, [Fe≡N]. One motivating factor is that the [Fe≡N] unit has been proposed as an intermediate in both industrial and biological catalysts for N_2 reduction. Another is that this unit also has the potential to act as a source of nitrogen atoms, which could be harnessed in more efficient methods for accessing important nitrogen-containing molecules, e.g. pharmaceuticals. We have developed scaffolds that allow this unusual functionality to be isolated and subject to detailed spectroscopic investigations that probe their electronic structure (typically conducted with collaborators). The insights from these studies have allowed us to

Continued on page 12

rationally develop the chemical reactivity of the [Fe≡N] unit. As is often the case in research, interesting and important serendipitous discoveries can occur. In this project we were fortunate to be the first to isolate a bona-fide iron(V) compound, where the iron is an extremely rare oxidation state that has been proposed as an intermediate in some enzymes.

Another ongoing project builds on our expertise in making metal compounds in unusual environments. The environments can induce the compound to behave as a single molecule magnet. As the name implies, single molecule magnets are molecular species that behave similarly to the more familiar bulk magnets. In such molecules, the unpaired electron density (spin) has a preferred orientation (i.e. spin up or down), akin to the preferred orientation of a bulk magnet. The interest in this behavior stems from the fact that these two magnetic orientations confer each molecule with the capacity to store one bit of information, potentially leading to devices with very high information storage densities.

We are using the tools of synthetic inorganic chemistry to assemble well-defined transition metal clusters that behave as single molecule magnets. Specifically, by the appropriate choice of supporting scaffold, metallic elements and bridging groups, we aim to prepare compounds with large spin numbers and preferred magnetic orientations. An important result has been our recent discovery of the first class of photomagnetic molecules. These compounds are non-magnetic until they are exposed to light, at which point they behave as single molecule magnets. Such molecules have the potential for even higher information storage densities due to their ability to access three states, one of which is non-magnetic and two of which are magnetic but differ in their spin orientation.

Asymmetric catalysis and synthesis in the Snaddon lab

Chemistry provides a unique understanding of the molecular world that allows us to design new and ever more complex molecules with the wide-ranging biological, physical and electronic properties that are necessary to fulfill the ever-increasing demands of our society.

On the atomic level, there is a very strict correlation between the relative placement of atoms and functional groups (specific clusters of atoms that have useful properties) within a molecule and the overall function of that molecule. However, in the vast majority of cases the already complex task of assembling or constructing of such chemical entities is further complicated by asymmetry; each molecule must be prepared as a single *enantiomer*. Enantiomers are non-superimposable mirror images and their importance in the natural world cannot be overstated. In your body, for example, the amino acids that make up the proteins and enzymes, and the sugars that comprise your DNA all exist as single enantiomers. This asymmetry is everywhere and, as one might expect, has an enormous impact on the development of *inter alia* new medicines.

To illustrate this one can consider his/her right and left hands. They are mirror images of one another and are non-superimposable. The major implication of this concerns how single enantiomers interact with other molecules (that are also single enantiomers). For example, using your *right hand* to shake the *right hand* of another person is a comfortable interaction (the two right hands "fit" together well); however, using your *right hand* to shake the *left hand* of another person produces quite a different interaction (the "fit" is far less comfortable). This analogy extends to biology and medicine where the two enantiomers (mirror images) of a drug can interact in very different ways with a particular enzyme or protein in the body and thus elicit a different biological response.

In some cases the response of the undesired enantiomer can be negligible (or even positive) but in some cases the biological response can be catastrophic. This was true in the tragic case of thalidomide, a remarkably effective treatment for morning sickness in pregnant women used widely in the late 1950s and early 1960s. Developed and marketed by *Chemie Grünenthal*, a respected German pharmaceutical company, thalidomide was administered as a 50:50 mixture of enantiomers (a *racemate*) and whilst the "correct" enantiomer of thalidomide performed its task well and brought effective relief from morning sickness, the "wrong" enantiomer caused severe birth defects in the resulting children. It is thought that the incorrect enantiomer of thalidomide binds to and inactivates a protein required for limb development in the unborn fetus. Largely due to this tragedy the Federal Drug Administration (and equivalent International regulatory agencies) requires all molecules that possess chirality ("handedness") to be prepared, tested and often administered as single enantiomers.

The preparation of complex three-dimensional molecular scaffolds in single-enantiomer forms is extremely challenging and research in my laboratory is directed towards this issue. As a research group we are broadly concerned with *asymmetric catalysis and synthesis*, that is the development of methods to enable the preparation of complex molecules with defined shape as single enantiomers. In particular, we develop and design new catalysts and reactions to forge carbon-carbon and carbon-nitrogen bonds (those most prevalent in medicines) with control over enantioselectivity. Where traditional approaches employ a single catalyst (often a metal) to control the formation of a new chemical bond, our laboratory focuses on the unique reactivity enabled by the combination and/or cooperation of two or more catalysts. This enables us to design and harness hitherto unknown reactivity and thus make a significant impact on the preparation of important single-enantiomer compounds.

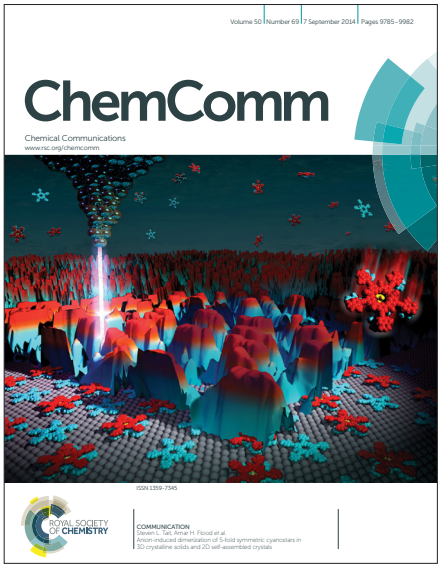
In addition, we apply our newly developed reactions to the synthesis of very complex molecules. The molecules we target display medicinally useful and even unique biological activity but are only available in minute quantities for the natural source. Further, they present unique structural challenges and probe the very limits of our chemical understanding. In this target-guided approach we are able to simultaneously advance chemical synthesis (through the discovery of new reactivity) and impact the development of new medicines (by providing new molecules with important and medicinally-relevant biological activity). ■

Jeremy Smith received his B.Sc. (Hons) from the University of the Witwatersrand, Johannesburg, South Africa. He completed his Ph.D. in 1996 at the same institution, working with Neil J. Coville on the quantification of steric effects in organometallic chemistry. He subsequently spent time in the laboratories of Russell P. Hughes (Dartmouth College), where he worked on the activation of C-F bonds by organometallic complexes, and Patrick L. Holland (University of Rochester), where he investigated low coordinate iron complexes as models for nitrogenase. From 2003-2013, Prof. Smith was a faculty member in the Department of Chemistry and Biochemistry at New Mexico State University. He was named a Camille Dreyfus Teacher-Scholar in 2009.

Thomas N. Snaddon received B.Sc. (Hons.) (2003) and M.Phil. (2004) degrees from the University of Strathclyde, Glasgow, Scotland. In early 2008 he was awarded a Ph.D. from the University of Leeds, England, for research in the arena of natural product synthesis conducted under the mentorship of Professor Philip J. Kocienski, FRS. Postdoctoral appointments with Professor Alois Fürstner at the Max-Planck-Institut für Kohlenforschung in Germany (2008-2010) and Professor Steven V. Ley, FRS, at the University of Cambridge, England (2010-2013) further confirmed his broad interests in synthetic chemistry. He joined the Department of Chemistry at Indiana University in August 2013.

The **Flood group** celebrated its 100th paper this past July 2014. The paper showcases a new collaboration with **Steve Tait** and came with a cover in *Chemical Communications* (see right) that was earned by the lead author, **Brandon Hirsch**, when he won a grand poster prize. The paper involves anion binding, a central theme in the group, but this time at the surface of graphite. The anion-binding macrocycle, called cyanostar, was the brainchild of **Semin Lee** and published in *Nature Chemistry* in 2013. On the back of this excellent piece of work, Semin earned a 2014 Beckman Institute Postdoctoral Fellowship and will soon join Jeff Moore's group at the University of Illinois. Semin was also a co-author on a paper on 3D printing molecules — check our website for the "open access" paper that is free to download. Members of the Flood Group were recipients of many awards and fellowships earned in the Chemistry Department as well as from the ACS and at conferences. We were involved in co-organizing the International Symposium on Macrocyclic and Supramolecular Chemistry, the premier conference in the area as well as a symposium on Supramolecular Nanomaterials at the 2103 Indianapolis ACS meeting. **Kevin McDonald** defended his thesis in December 2013 and is now employed with Ecolab in Chicago. Amar has taken on the role of the Director of Graduate Studies and is the recipient of the *James F. Jackson Associate Professor Chair*.

At the Electrochemical Society meeting in Orlando, Florida in May, 2014, **Erick Pasciak** and **Dennis Peters** were coauthors of an invited oral paper on the electrosynthesis of coumarins at silver cathodes, **Ethan Wappes** and **Dennis Peters** gave an invited oral paper dealing with one-carbon ring-expansion reactions induced by reduction of 1-bromomethyl-2-oxocycloalkane-1-carboxylates at silver cathodes, and **Tyler Barnes** and **Dennis Peters** presented an invited oral paper on X-ray photoelectron spectroscopic studies of the grafting of alkyl groups onto glassy carbon cathodes (a project done collaboratively with the research group of **Steven Tait**). So far in 2014, the Peters group has published six papers, with four more articles in press. In February, 2014, **Elizabeth Wagoner** was awarded her Ph.D. degree, and she is now employed at Exxon Corporation in Philadelphia; her doctoral thesis was entitled *"Saving the World, One Electron at a Time: Electrochemical Remediation of Halogenated Pollutants."* In August, 2014, one undergraduate research student (**Ethan Wappes**) left the group to begin doctoral work in organic chemistry at The Ohio State University. Another former undergraduate research student (**Ian Walker**) is taking the 2014–2015 academic year off, before starting medical studies at Indiana University.



This past year has been an exciting year for the **Skrabalak group,** with Professor Skrabalak being promoted to the rank of Associate Professor. The group continues to develop new synthetic methods toward nanocrystals, which are characterized by their small dimensions (a nanometers is approximately 100,000 times smaller than the diameter of human hair) and size-dependent properties. The group is especially interested in studying how the shapes of nanocrystals influence their properties for a variety of applications, including catalysis. In fact, graduate student **Moitree Laskar** was first author on a manuscript published in ACS Catalysis, which examined palladium nanocrystals as a function of both size and crystal shape for use as semi-hydrogenation catalysts. She found that controlling both size and shape are necessary to maximize performance. This insight could make better use of expensive, rare metals which are typically used as catalysts. The past year has also brought good fortune to many in the Skrabalak group, with **Nancy Ortiz** graduating with her PhD and accepting a position at Exxon Mobil and undergraduate researcher **Matthew Bower** heading to UC-Irvine for medical school, his top choice! Professor Skrabalak also received the ACS Award in Pure Chemistry sponsored by Alpha Chi Sigma Fraternity and was named a Camille Dreyfus Teacher-Scholar.

Continued on page 14

José Alfons Clément Broekaert (born, September 7th, 1948) is professor emeritus of analytical chemistry at the University of Hamburg (Germany). He studied chemistry at the University of Ghent (Belgium). In 1976 he obtained a Ph.D. degree in chemistry from the University of Ghent and in 1985 the degree of "Geaggregeerde voor het Hoger Onderwijs" from the University of Antwerp (Belgium).

In 1977 he was a Research Fellow of the Alexander von Humboldt Foundation and in 1978 received an appointment as Senior Scientist at the Institute for Spectrochemistry and Applied Spectroscopy, Dortmund (Germany), now the "Leibniz Institut für Analytische Wissenschaften-ISAS e.V.". In 1991 he became associate professor of Inorganic and Analytical Chemistry at the University of Dortmund and in 1998 a full professor of Analytical Chemistry at the University of Leipzig (Germany). Since 2002 he is full professor of Analytical Chemistry at the University of Hamburg. In 1998 he was a Visiting Fulbright Research Scholar at Indiana University (Bloomington, IN, U.S.A.) and since 2004 there is Adjunct Professor of Chemistry. From 1983 until 2014 he taught at the graduate level on Atomic Spectrometry at the University of Antwerp.

His research interests focus on Analytical Chemistry in general with an emphasis on Atomic Spectrometry especially with plasma sources for the determination of the elements and their compounds. Prominent fields of application are material analysis and Analytical Chemistry in the Environment.

Besides over 250 peer-reviewed articles, about 100 articles in non-reviewed journals and about 15 book chapters he authored a scientific textbook "Analytical Atomic Spectrometry with Flames and Plasmas" (Wiley-VCH, 2002 – 2nd edition appeared 2005). He is/was a member of the editorial advisory boards of the journal Analytical and Bioanalytical Chemistry, the ICP Information Newsletters, the Journal of Analytical Atomic Spectrometry, the International Journal of Environmental Analytical Chemistry, Microchimica Acta, Spectroscopy and Spectral Analysis (P.R. China) as well as of Spectrochimica Acta, Part B. He was the Chairman of the 1991 European Winter Conference on Plasma Spectrometry, Dortmund as well as of the 3rd International Colloquium on Process Related Environmental Analytical Chemistry (PREACH), Leipzig (2000) while being a co-organizer of the biannual "Anwendertreffen Plasmaspektrometrie" (since 1980) as well as of the annual "Anwendertreffen Röntgenfluoreszenz- und Funkenemissionsspektrometrie" (since 1994). He was President of the German Working Party on Applied Spectroscopy (DASp) from 1995-1998 and from 2002-2010 and since 2010 is President of the International Association on Environmental Analytical Chemistry (IAEAC). In 1994 he received the Kasimir Pulaski Medail at the Technical University of Radom, in 2008 he became a Fellow of the Society for Applied Spectroscopy (U.S.A.) and in 2012 he received the Török Tibor Medail of the Spectrochemical Association of the Hungarian Chemical Society. He became a member of the Academy of Sciences and Arts in the class IV Natural Sciences in 2014

Further details can be found at the homepage: www.chemie.uni-hamburg.de/ac/broekaert

CONFERENCES, SPECIAL LECTURES & SYMPOSIA

Over the last calendar year, IU Chemistry was treated with over 120 seminar speakers presenting their recent research efforts in our department. These speakers included fifth-year graduate students and defending Ph.D. students, present IU faculty and staff, including faculty visiting IU from around the world, representing all areas of chemistry and biochemistry. A few major highlights of this past year's lectures and symposia are provided below.

September 25, 2013:

Gill Symposium — "Model systems for studying human disease"

The Linda and Jack Gill Center for Biomolecular Science (GCBS) was established to advance the understanding of complex biological processes and to train next generation scientists in state-of-the-art biomolecular measurements, especially in the field of neuroscience. Collaborations include Indiana University's world-class Departments of Biology, Chemistry, Molecular and Cellular Biochemistry, Physics, Psychological and Brain Sciences, Neuroscience, and the School of Medicine.

- Featured Speaker: Professor **Ivan Soltesz**, University of California-Irvine, *"Organization and Control of Hippocampal Chronocircuits"*
- Featured Speaker: Professor **Joshua Dubnau**, Cold Spring Harbor Laboratory, *"Micro-RNA 276a and the Zombie Fruit Fly"*
- 2013 Gill Award Lecture by Professor **Bruce McNaughton**, The University of Lethbridge, *"Doughnuts in the Brain: A Toroidal Attractor Theory of the Cognitive Map"*
- 2013 Gill Young Investigator Award Lecture by Professor **Loren Frank**, University of California-San Francisco, *"Neural Substrates of Memory and Decision-Making"*
- The symposium culminated with a panel discussion and graduate student poster session in the Frangipani Room, Indiana Memorial Union.

October 12, 2013:

4th Annual August M. Watanabe Symposium in Biotechnology

The Watanabe Symposium honors the late August "Gus" Watanabe, a renowned physician, researcher and professor who led research and development at Eli Lilly and Company for nearly a decade, and who was a pioneer in the study of the cellular mechanics of the heart. In 1994, Watanabe assumed the role as President of Lilly Research Laboratories and is responsible for launching eleven new and pivotal pharmaceutical products. IU hosted the 4th Annual Watanabe Symposium on October 12, 2013, and the list of speakers is below.

- Professor **William DeGrado**, Department of Pharmaceutical Chemistry, University of California at San Francisco, *"Analysis of Proton Channels: From the Structure and Mechanism of Viral Proton Channels to the de Novo Design of Zinc-proton Antiporter"*
- Professor **Shahriar Mobashery**, Department of Chemistry and Biochemistry, University of Notre Dame, *"How Staphylococcus aures Became Methicillin-Resistant Staphylococcus aures (MRSA)"*
- Professor **David Giedroc**, Department of Chemistry, Indiana University, *"Fighting Over Metals: Transition Metal Chemistry at the Host-microbial Pathogen Interface"*
- Professor **Tom Meade**, Department of Chemistry, Northwestern University, *"Seeing is Believing: Coordination Chemistry of Molecular Imaging Probes"*
- Professor **Jane Aldrich**, Department of Pharmaceutical and Medicinal Chemistry, University of Kansas at Lawrence, *"Novel Opioid Peptides: New Approaches for an Old Target"*
- Professor **Lane Baker**, Department of Chemistry, Indiana University, "Unconventional Pipetting for Bioanalysis"

October 11, 2013:

23rd Inorganic Annual Alumni Symposium

Speakers came with a variety of perspectives from both academia and industry, as well as accumulated wisdom of how to inspire students to deeper learning. A picnic was held on Saturday, October 12, at the farm home of long time secretary **Clarice Moser** and her husband **Bill Moser**, whom many of you will remember. Lots of old-time memories were exchanged including those by emeritus adjunct Prof. **Riley Schaeffer** who built inorganic chemistry at Indiana into what it has become in modern times.

- Dr. **James Martin**, (Ph.D. 1990, Professor Malcolm Chisholm alum), Professor, North Carolina State University, Raleigh, NC, *"What's Really in that Solution?"*
- Dr. **Wayne Mahoney**, (Ph.D. 1989, Professor **Kenneth Caulton**/**Jeffrey M. Stryker** alum), Lead Research Specialist, 3M Company, St. Paul, MN, *"3M, not just Post-it Notes and Scotch Tape"*
- Dr. **Bryan Eichorn**, (Ph.D. 1987, Professor **Malcolm Chisholm** alum), Professor, University of Maryland, College Park, MD, *"The Chemistry of the Written Word: The Structure and Chemistry of Amorphous Iron Gall Ink"*
- Dr. **George Bodner**, (Ph.D. 1972, Professor **Lee Todd** alum), Arthur Kelly Distinguished Professor, Purdue University, West Lafayette, IN, *"I'm Finally Beginning to Understand Why I Didn't Understand..."*

Continued on page 16

CONFERENCES, SPECIAL LECTURES & SYMPOSIA

Continued from page 15

October 26, 2013:
Ernest Campaigne Symposium

Indiana University announces the Ernest E. Campaigne Symposium on Heterocyclic Chemistry to be held Saturday, October 26, 2013. The Department of Chemistry is pleased to present this symposium to feature recent advances in the studies of synthesis and medicinal chemistry of heterocyclic substances. The event honor the scientific achievements and career contributions of the late *Professor Emeritus Ernest E. Campaigne* with lecture presentations by the following three distinguished scientists:

- Professor **Marvin Miller**, Department of Chemistry and Biochemistry, University of Notre Dame, Notre Dame, IN, *"Chemistry Related to the Design and Syntheses of New Antibiotics"*
- Professor **Daniel Comins**, Department of Chemistry, North Carolina State University, Raleigh, NC, *"Chiral Heterocycles as Synthetic Intermediates"*
- Professor **Amos B. Smith, III**, Department of Chemistry and the Monell Chemical Senses Center University of Pennsylvania, Philadelphia, PA, *"Evolution of Anion Relay Chemistry (ARC): Design, Synthesis and Validation of Recoverable Siloxane-Based Transfer Agents for Palladium-Catalyzed Cross-Coupling Reactions"*
- A buffet lunch (12:00-2:00 p.m.) featured poster presentations of graduate student and undergraduate research. The symposium was held from 8:30 a.m. to 2:00 p.m. on October 26, 2013 in the Grand Hall of the Neal–Marshall Black Culture Center.

April 5, 2014:
John Richardson Scientific Symposium

- Professor **Ronald C. Conaway**, Department of Biochemistry & Molecular Biology, Stowers Institute for Medical Research, Kansas City, MO, "Mechanisms Governing Mammalian RNA Polymerase II Transcription"
- Professor **Robert Landick**, Department of Biochemistry and Bacteriology, University of Wisconsin, Madison, WI, "Sense, Nonsense, Antisense, and Silencing: Regulation of Transcription by Pausing, H-NS, and Rho in Bacteria"
- Distinguished Professor **Norman R. Pace**, Department of Molecular, Cellular & Developmental Biology, University of Colorado, Boulder, CO, "Adventures in the Natural Microbial World: the Human Interface"

June 26, 2014
First Annual Symposium on Materials Chemistry

The First Annual IU Symposium on Materials Chemistry took place on June 26, 2014. The one day meeting consisted of oral and poster presentations by IU Chemistry graduate students and postdocs as well as a dinner and social event at Bryan Park. The symposium was sponsored by the Chemistry department and organized by Prof. **Steven L. Tait** and his M800 students (2nd year Materials chemistry Ph.D. students). This event coincided with the 10th anniversary of the Materials Chemistry program at IU and was successful in bringing together a large number of students, postdocs and faculty for an exciting afternoon of interdisciplinary science.

Other Special Seminars

October 1, 2013
ACS Student Selected Seminar:
Professor **John Hartwig**, Professor of Chemistry, The Henry Rapoport Chair in Organic Chemistry, University of California, Berkeley, CA, *"Selective Functionalization of Alkyl and Aryl C-H Bonds"*

January 29, 2014
ACS Student Selected Seminar:
Professor **Mark Johnson**, Arthur T. Kemp Professor of Chemistry, Department of Chemistry, Yale University (New Haven, CT), *"Cryogenic Ion Chemistry and Spectroscopy: A New Way to Capture and Characterize Reaction Intermediates"*

March 12, 2014
ACS Chemistry of Everyday Life Seminar:
Professor **Sue Ebler**, Professor & Chemist, Department of Viticulture and Enology, Agricultural and Environmental Sciences, University of California (Davis), *"Analytical Approaches for Understanding Wine Flavor"*

April 9, 2014
Student Chapter of the Electrochemical Society (ECS) Invited Speaker:
Professor **Keith Stevenson**, Professor, Department of Chemistry & Biochemistry, University of Texas (Austin), *"Investigations of Electrochemical Interfaces and Interphases with Spatially-resolved Analytical Tools"*

April 16, 2014
Raymond Siedle Lecture:
Professor **Robert H. Crabtree**, Whitehead Professor, Department of Chemistry, Yale University (New Haven, CT), *"Organometallic Catalysts for Energy Applications"*

Roger Beckman, Emeritus Librarian: A Canny Fellow

by Jennifer Laherty

We pay tribute this year to librarian emeritus, **Roger Beckman**. Roger served as the Chemistry Librarian and Head of the Chemistry Library from 2003-2014 and as its Assistant Head from 1988-2003, and according to his colleagues, such as **Brian Crouch** (Manager of the Information Technology Group), he is "the genuine real deal." Crouch recalls Roger's genuinely helpful nature, as he often stepped in to solve licensing issues in that pesky era of the CD-ROM that plagued libraries before the Internet. Crouch also knows Roger as a true artisan who came up from a brick/masonry background following in his father's footsteps. Many of us can attest to the incredible collection of wood Roger carries in his garage and have seen the beautiful furniture pieces he creates from them.

Professor **Amar Flood** is credited with labeling Roger as "Canny." Professor Flood and I played a wonderful game of thesaurus roulette when it came to describing Roger: perspicacious, artful, shrewd, wily — oh, and also, effective. Flood recalls asking Roger from time to time for help accessing information — that seemed inaccessible and receiving that knowing glance and wry smile in return. The next day, access would be available and Flood simply admired the level of service — the sort that makes you feel like you were receiving very special attention, but probably it was just a librarian's simple trick up the sleeve at play.

Professor **Gary Hieftje** provided the following:

> All of us in the Chemistry Department owe a deep debt of gratitude to Roger Beckman for shepherding our Library through some very trying and turbulent times. Roger assumed directorship of the Chemistry Library from Gary Wiggins, who transitioned the Library from a largely hard-copy operation to one that emphasized electronic storage and retrieval. The skill with which the transition was achieved set a very high bar for Roger to meet. Nevertheless, he stepped in and stepped up, continued and accelerated the transition, and did so in the face of declining budgets and increasing faculty demand. Without exception, Roger kept faculty and students informed about changes underway, served as an essential resource for how to get things done smoothly, and consulted with all when it became necessary to consider journals for termination. Amazingly, he accomplished all this with a pleasant demeanor and a ready smile. He will be missed by all.

On the Library-side, his acquisitions colleagues remember Roger:

> As the most dogged selector in terms of ensuring access to electronic resources for library users. He lets us know about broken links we might never have identified. His customer service is beyond compare!

In 2011, Roger Beckman was awarded the Libraries' highest achievement by an IU Bloomington Librarian, the William Evans Jenkins Award. The following are excerpts from colleagues who wrote in support of his nomination for the award.

Librarian **Jian Liu** [Head of Science Libraries, Head of School of Public Health Library and Head of the GeoSciences Library] wrote about Roger's care for his mentees, students in the Information and Library Sciences program. Many of those graduate students have gone on to become successful librarians, including **Marilyn Dunker**. Ms. Dunker, a Senior Infolytics Analyst for the Procter and Gamble Company, cited Roger's active participation in professional organizations at the state and national levels and his role as a mentor encouraging others.

Librarian **Robert Noel** [Head of Swain Hall Library] wrote that Roger, "quietly and astutely blazed new trails." This related in part to the exploding nature of information on the Internet and to providing support in the sciences, where the multi-discipline approach has soared.

Chemistry Librarian Emeritus **Gary Wiggins** (1976-2003) stressed that Roger is extremely reliable and that his "rich and varied experience as a general reference librarian and cataloger, as well as his government documents and branch library experience made him a fine [colleague]. Roger Beckman quickly earned my lasting respect and admiration."

Chemistry Professor **Dongwhan Lee** discussed Roger's ability to make good "executive decisions under stringent budget control while not compromising the quality of library service."

As Mr. Crouch recently expressed to me, "Jen, you have big shoes to fill." Indeed, I do. Not only did I have to lower the desk I inherited from Roger due to our height differentials, but reflecting on Roger's tenure in the IU Libraries has given me a view on his success. I know Roger as the mentor who graciously comes to campus to discuss matters with me despite his busy retirement schedule. As the colleague who has all the publishers on speed-dial. As the generous man who gifted to me a patch of beautiful daffodils when I returned to Bloomington in 2007. And, as the librarian whose 'house-calls' to labs and department offices are laudable and a tradition I will carry forward.

Once a librarian, always a librarian. Roger Beckman has given the IU Chemistry Library a wonderful legacy. We thank you, Roger, very much. ■

STAFF NEWS

by Cheryl Johnson and Amy Van Pelt

John Avera was hired as a Lab Tech III for the Douglas laboratory in the Chemistry Department. John graduated from Indiana University in May 2014 with a BS in Microbiology and a BA in Japanese Language.

David Bancroft was hired as a Senior Electronics Engineer Specialist in the Chemistry Department. Dave came to Bloomington from New Freedom, Pennsylvania. He received a BS. in Electrical Engineering in 1991 from Penn State University and a MS. in Electrical Engineering in 2000 from Villanova University. Dave has experience working as an Electronics Engineer for the Naval Undersea Warfare Center in Suffolk, VA (1991-1995); Sr. Design Engineer at Lockheed Martin Missiles & Space in Newtown, PA (1995-2000); Sr. Researcher at Hitachi Digital Media Systems Laboratory at Princeton, NJ (2000-2002; FPGA Engineer, General Dynamics Advanced Information Systems in California, MD (2002-2003); FPGA Engineer at Harris Government Communications Systems Division at Palm Bay, FL (2003-2005). During the period 2005-2013 Dave has been a Science and Math Teacher at New Freedom Christian School and working as the head deacon at his local church.

Marcia Brown was hired as a Supplies Coordinator in the Chemistry Scientific Storeroom (replacing **Devon Underwood**). Marcia has 16 years of experience working at Sunrise Greetings as a Shipping Clerk, Manifest Operator/Operations Specialist and Order Prep Clerk. In 1997 she received Associates degrees in Conservation Law and Law Enforcement from Vincennes University.

Cesar Masitas Castillo was appointed as a Research Associate in the Laboratory for Biological Mass Spectrometry in the Department of Chemistry under the direction of Dr. **Jonathan Trinidad**, Director of Biological Mass Spectrometry. Dr. Masitas received his PhD in the spring of 2012 from the University of Louisville, Kentucky. He performs routine maintenance on the instruments to insure optimal performance. He also provides analysis and interpretation of service samples received by the facility.

Chris Chatelain was hired as a Lecture Demo Technician in the undergraduate teaching labs (replacing **Oscar Judd**). Chris has a BS in Biochemistry and has experience in performing chemistry demonstrations at the Boys and Girls Club events and at IU Chemistry Open House. He also worked as the Preparatory Laboratory Assistant for the Chemistry Undergraduate Program since August 2010. Sadly, Chris left for a position at Crane Naval Base in October 2014.

Ray Cross was appointed as the Coordinator of System Services (replacing **David Felker**) as head of the Database Architecture Group. Ray has been employed at Indiana University in information technology since October 2009. His prior IT experience was from Cook Medical (IT Tech and Database Administrator/Developer) and BioConvergence (Database Administrator), and more recently as the IT Support Developer Team Lead for the Vice President for Research at Indiana University. Ray has an AAS in Computer Information Systems from Ivy Tech State College, a BS in Business Information Systems from Indiana Wesleyan University, and an MS in Human Computer Interaction from Indiana University.

Jane Hanser was appointed as a full-time staff to the Chemistry Department. Jane has been hired as the Office Services Assistant (previously **Linda Cage**) in the Chemistry Business Office. Jane has been working in the Physics Department as a part-time Academic Administrative Secretary since August 2012. Previously she worked at University Publishing Corporation (1999-2008); Office of Student Ethics & Anti-Harassment (Jan.-May 2009); School of Education (June 2009-August 2011). Jane has a Technical Certificate in Secretarial Sciences from IVY Tech.

Kate Schnabel was appointed as a full-time Administrative Secretary in the Research Support Group (replacing Jeannette Silvers). Kate earned a Bachelor's of Social Work in 2011 from Andrews University in Berrien Springs, Michigan. She has previous administrative assistant work experience at Walla Walla University, Andrews University, and at Starks & Menchinger Funeral Home. She more recently worked for Bloomington Housing Authority as a Family Self-Sufficiency Coordinator/Case Manager.

Eric Twum was appointed as an NMR Spectroscopist under the direction of Dr. Frank Gao, NMR Facility Director. Dr. Twum received his PhD in May 2013 from the University of Akron in Ohio. He is responsible for both service- and research-related activities. He is also involved in training new users, performing routine maintenance on the instrumentation, helping with any new NMR spectrometer installations, and helping to maintain NMR software and hardware.

Service Recognition

10 years – Bruce Frye, Derek Piper
15 years – Tricia Miles
20 years – Paul Ludlow
30 years – Doug Garvin

2014 Staff Award Recipients

Jeremy Boshears
Linda Cage
Susie DuMond

Retirees

Gayla Bradfield retired from Indiana University on December 31, 2013. Gayla began working at Indiana University in 1980 at the Indiana University Bookstore as a clerk and cashier. Beginning in 1988 she was hired as a research secretary in the Department of Chemistry. For nine years (1989 through October 1998) she worked in the Chemistry Chair's office providing administrative and secretarial support for the chair and associate chair. On October 18, 1998 she transferred to the Chemistry Business Office as an Accounting Associate to monitor and reconcile the departmental statement of accounts and worked in that position until her retirement. Gayla was valedictorian from Rockville (Indiana) High School and a member of the Alpha Lambda Delta women's scholastic honorary society. She attended Indiana State University and Purdue University, obtaining a Doctor of Veterinary Medicine from Purdue University in 1972.

Jack Baker joined the department of Chemistry on October 14, 1985 as the Chemistry Engineer. Originally from Columbus Indiana, he came to Bloomington via a Mechanical Engineering degree from Purdue University (1969), majoring in thermodynamics and heat transfer, design and kinematics of mechanisms. He obtained his Professional Engineering license from the State of Indiana in 1981 and shortly thereafter began to implement important physical changes to our department's infrastructure which were critical to growth and development of a top Chemistry facility.

One of Jack's first tasks within the department threw him into the heart of the world of chemistry. His task was to spearhead a remodel of the aging chemistry department building, stages that would take years of design and construction, all while maintaining a highly functional environment for research. This would require him to move labs and offices, some several times, to accommodate evolving construction and renovation work to repair and enhance existing facilities. Jack admits, he was learning on the job. With this new experience, he developed an intimate knowledge of the intricate inner-workings of the chemistry buildings and their support facilities. As Chemistry and other sciences expanded, there was a growing need for additional research space. Jack accepted the responsibility of serving as the department representative for the campus research space committee and worked extensively to preserve our interests in IU's first Multi Science Building, commonly known as Simon Hall. It is fair to say that without Jack's experience, technical capabilities, and willingness to help others realize their needs to conduct novel research, Chemistry at Indiana would not enjoy the strong reputation it has today.

Jack is more than a gear-guy and has always enjoyed many interests and hobbies outside of Chemistry. He is an active member of the community and has been a participating member of change as Bloomington has evolved. He is currently on the board of Martha's house and has served on the Bloomington Planning Commission for many years. He has been an active advocate for the community as part of city projects such as the B-line trail and the addition of I-69 into the MPO. He is an avid gardener and has created a series of "garden rooms" flanking his 1924 cottage bungalow in downtown Bloomington. As a wine collector for twenty years, he takes his knowledge and love of wine to the classroom as part of the Bloomington Cooking School. He loves traveling, and takes frequent trips to Italy partly to feed his wine interests.Jack's first trip as a retiree was to Istanbul Turkey — a first for him to this destination. We are excited that Jack will be able to fill his retirement days doing activities that he is passionate about and that enrich him and others within the community.

Jack's in-depth familiarity and experience will be greatly missed. He takes with him a wealth of historical knowledge of the chemistry building and operations that will take years to replicate. He was the face of chemistry to many of the campus departments, including Physical Plant, Risk Management, and Environmental Health and Safety. While we will miss him dearly, at the same time we wish him the very best in his retirement. He has earned it.

Jeannette Silvers retired from Indiana University on May 31, 2014. She worked for the university for almost fourteen years. She started working at Indiana University for the Department of Kinesiology in October 2000, then transferred to the Department of Chemistry in September 2004 to work as an Administrative Secretary for the inorganic chemists. Jeannette was a graduate of Shawswick High School in Bedford, Indiana, and received an Associate degree in Computer Information/ Systems Programming from IVY Tech State College in 2000. She is enjoying her retirement with her husband, grandkids, and family in Bedford, Indiana.

Jeannette Silvers sitting in her paddle boat, her departmental retirement gift.

Fire and "Ice" ... In Chemistry:
Don Garvin

by Norman Dean




Every year the department invites the community to visit and celebrate National Chemistry Week by participating in the Chemistry Open House. While they are here they do hands-on chemistry activities, watch our chemistry demonstration show, and take tours of the department. Every year when you ask people what they liked best the answer is almost always the same..."the glassblower." People just have a natural fascination with a skilled craftsman shape glass in a fire. In the chemistry department that person is master glassblower **Don Garvin**.

Don was born and raised in Bloomington and it's where he and his wife Shirley raised their son Darren and daughter DeeAnn. He joined the Department in 1981, working first in the chemistry store and later as the shipping and receiving clerk.

So how do you become a scientific glassblower?

While there are many art programs that teach glassblowing, scientific glassblowing is still handed down from a master glassblower to an apprentice. Don started a 4-year apprenticeship under the chemistry department's previous glassblower, **Don Fowler**, in 1986. They then ran the glass shop together until Fowler's retirement in 1997. Even though his apprenticeship lasted 4 years Don says it really was 10-11 years before he felt like he had really mastered his craft. Unlike art glass which is made of soft glass that can be shaped at a lower temperature and stays workable for a much longer time, scientific glass work is done with Pyrex or quartz, both of which require much higher temperatures and are far less forgiving to work with.

The range of items that have been produced in the glass shop might be surprising. In the 1990's during the height of the department's reputation for synthetic chemistry, the glass shop produced 5-liter reaction systems and chromatography columns as tall as a person. As the cost of solvents and waste disposal increased, most research groups have moved to much smaller scale equipment, and you might find Don working on reaction vessels that hold as little as 3 mL's of solvent. While simple repair work may only need to be in the flame for 15 or 20 minutes, larger more complex construction can take several days with repeated sessions of working the glass, followed by careful annealing to relieve strain and prevent it from shattering. One of the most technically challenging projects was creating glass cold streams designed by **John Huffman** in the Molecular Structure Center to keep crystals near liquid nitrogen temperatures during analysis.

Outside of the department Don's interests don't always involve glass. They do include fishing, and restoring a 1930 Model A Ford Coupe. While he doesn't participate in quite as many pick-up basketball games as he used to, he remains a fan of the Hoosiers basketball team and most other IU sports, particularly the women's volleyball team (his daughter was a volleyball player for Olivet Nazarene University). But his greatest outside interest these days may be his grandchild Drew, with another one on the way.

Much of the research that has been conducted in the department for the last 20 years has depended on Don's abilities with glass and for his contributions to the department. Don was awarded the 2012 Outstanding Staff Award to honor him. ■

IU Chemistry morns the passing of Karlijn Keijzer

by Mookie Baik

On July 17 this year a plane of the Malaysia Airline, flight MH 17, headed from Amsterdam to Kuala Lumpur was shot down over the Ukraine. What appeared to be a tragic event item in the news on first sight, became very personal for all of us in the chemistry department, when we learned that one of our own graduate students, **Karlijn Keijzer**, was on board. Karlijn, a Dutch national, was a fourth year graduate student working in the Baik research group towards her Ph.D. in computational inorganic chemistry and was only 25 years of age. She was on her way to Indonesia for a short vacation with her boyfriend **Laurens van der Graaff**, who was a high school teacher living in Amsterdam.

Karlijn in her rowing crew photo.

Karlijn was recruited to IU from the Athletics department, as she was a world-class student rower, who had led several Dutch rowing teams to great success at international collegiate competitions as an undergraduate athlete. Because she had already completed her bachelor's degree at the Vrije Universiteit Amsterdam that year, she had to be enrolled into a graduate program to be eligible for collegiate competitions. Of all programs, she chose chemistry to the surprise of her rowing coaches, and when we had a look at her undergraduate files, we could not believe that this was the academic record of a student athlete competing successfully at the highest international levels. She was a straight A student with impeccable record of academic achievements and was determined to study towards a Ph.D. in chemistry.

Her first year in the chemistry department must have had been hard: The rowing team insisted on practice six days a week, starting with endurance training at 5:30 a.m. each day. When she arrived at the chemistry department for her normal work day to take classes and conduct research, she had already completed a two-hour intensive workout in the gym. Despite the demanding schedule and the overwhelming amount of work, she never complained and never asked for special treatment. Starting her second year at IU, Karlijn was no longer eligible for rowing competitions, and she concentrated fully on her studies and research in chemistry.

The grand challenge of her doctoral work was to develop methods and algorithms for automatically and systematically deriving force fields of inorganic, mostly transition metal containing molecules to enable Newtonian mechanics based computer simulations of large biomolecules. By treating atoms to be balls connected by imaginary springs in a molecule that obey Newtonian laws, many properties of the molecules can be simulated. Transition metal complexes and metalloenzymes require special attention, because quantum mechanical features must be incorporated. And Karlijn's doctoral work aimed at designing a universal method that will allow these otherwise tedious and difficult parameterization work to be done automatically. Karlijn used these new models to investigate a variety of bioinorganic problems, mostly related to human health.


Mookie Baik speaking at the memorial.

In addition to being an exceptionally creative and a highly driven researcher, Karlijn had an infectious smile, was genuinely happy and very kind to everybody that she encountered. She was beloved by the whole chemistry community at IU and her untimely departure has left many in the department heartbroken. Karlijn's remarkable life was celebrated at a memorial in August, held at her favorite concert hall in Amsterdam, which was attended by 1100 people and 1500 people in 20 countries via livestream. IU and the chemistry department was represented at this memorial by her doctoral advisor, Mookie Baik. In September, the IU community gathered in the Henke Hall of Champions at the Indiana Memorial Stadium to remember Karlijn and celebrate the posthumously awarded Ph.D. degree in chemistry. The diploma and academic regalia were presented to Karlijn's family that afternoon by IU's **President Michael McRobbie** during a small ceremony at the President's office in the circle of selected officials of the University including chemistry Professors **David Giedroc** and **Mookie Baik**. ■

The Karlijn Keijzer Memorial Graduate Support Fund was established through a gift made by an Indiana University College of Arts and Sciences Alumni Board member and fellow College alumnus who wanted to honor Karlijn's legacy. Additional contributions can be made through the IU Foundation's online giving page (http://iufoundation.iu.edu/give-now/payment.html). Gifts to the Karlijn Keijzer Memorial Graduate Support Fund may be tax-deductible to the extent allowed by law, and will be used to support graduate students in the Department of Chemistry studying any aspect of inorganic or computational (theoretical) chemistry.

GRADUATE NEWS

by Toni Lady

During the 2013-2014 school year, Professor **Amar Flood**, was the Director of Graduate Studies. Serving with him on the Standards Committee were professors **Mu-Hyun Baik**, **Lane Baker**, **Srinivasan Iyengar**, **Liang-shi Li**, **Martha Oakley** and **Michael Van Nieuwenhze**.

Bogdan Dragnea chaired the Graduate Admissions Committee. Evaluating the hundreds of dossiers submitted to the department were professors **Richard DiMarchi**, **Megan Thielges**, **Yan Yu, Steven Tait**, **Mu-Hyun Baik** and **Kevin Brown**.

Fellowship Award Winners for 2013-2014

- **Lucy Sanchez** was awarded the Graduate Scholars Fellowship. Lucy joined the lab of Dr. **Yan Yu** in the fall of 2013.
- **Daniel Skomski** was awarded the Arts and Sciences Dissertation Fellowship. Daniel joined the lab of Dr. **Steven Tait** in the fall of 2010.
- **Yuan Gao** was awarded the McCormick Science Fellowship. Yuan joined the lab of Dr. **Yan Yu** in the fall of 2011.
- **Doug Crandell** was awarded the Chester Davis Inorganic Fellowship. Doug joined the lab of Dr. **Mu-Hyun Baik** in the fall 2011.
- **Wei You** was awarded the Chester Davis Organic Fellowship. Wei joined the lab of Dr. **Kevin Brown** in the fall 2011.
- **Yun Liu** was awarded the Raymond Siedle Materials Fellowship. Yun joined the lab of Dr. **Amar Flood** in the fall 2011.
- **Andy Schwartz** was awarded the Kraft Fellowship. Andy joined the lab of Dr. **Gary Hieftje** in the fall 2010.
- **Elizabeth Pierson** was awarded the E.M. Kratz Fellowship. Lizz joined the lab of Dr. **Martin Jarrold** in the fall 2010.
- **Brian Cook** was awarded the Raymond Siedle Inorganic Fellowship. Brian joined the lab of Dr. **Ken Caulton** in the fall of 2011.
- **Chris Rasik** was awarded the Paget Organic Fellowship. Chris joined the lab of Dr. **Kevin Brown** in the fall of 2011.
- **Qiqi Li** was awarded the Robert & Marjorie Mann Fellowship. Qiqi joined the lab of Dr. **Liang-shi Li** in the fall 2010.

Other Fellowship recipients were:

- **Michael Ewing**, ACS Analytical Fellowship
- **Kaelyn Wilke**, Aldrich Graduate Student Innovation Fellowship
- **Andrew Schwartz**, Analytical Society for Applied Spectroscopy Fellowship
- **Moitree Laskar**, Arts & Sciences Travel Grant
- **Rachel Lecker**, Baxter Fellowship
- **Rachel Lecker**, Baxter Recruiting Fellowship
- **Alison Vickman**, Bernard Berk Fellowship, and Paget add-on Organic Fellowship
- **Kaitlyn Logan**, Bernard Berk Fellowship
- **Meghan Porter**, Briscoe Teaching Scholar Fellowship
- **David Keifer**, ChemGRC Travel Grant Fellowship
- **Qiqi Li**, ChemGRC Travel Grant Fellowship
- **Brendan Monks**, ChemGRC Travel Grant Fellowship
- **Niya Sa**, ChemGRC Travel Grant Fellowship
- **Ethan Harak**, Chester Davis Inorganic/Organic Recruiting Fellowships
- **Scott Curtis**, Chester Davis Inorganic/Organic Recruiting Fellowships
- **Alison Smith**, Crane Fellowship
- **Jonathan Dilger**, Crane Fellowship
- **Meghan McCormick**, Future Faculty Teaching Fellowship
- **Edward Hall**, Lilly Organic Fellowship
- **Erin Martin**, Mann Recruiting Fellowship
- **Kevin Schwarz**, Mann Recruiting Fellowship, Paget Organic Recruiting Fellowship
- **Ziran Li**, Mann Recruiting Fellowship, Paget Organic Recruiting Fellowship
- **Brittany Witherspoon**, Mays Diversity Fellowship
- **Keevan Marion**, Mays Diversity Fellowship
- **Benjamin Schwarz**, National Defense Science of Engineering Fellowship
- **Jonathan Snider**, Paget Organic Recruiting Fellowship
- **Elise Dennis**, Provost's Travel Fellowship
- **Xiaoxiao Qiao**, Provost's Travel Fellowship
- **Jie Fu**, Provost's Travel Fellowship
- **Latisha Jefferies**, Provost's Travel Fellowship
- **Rebecca Weiner**, Provost's Travel Fellowship
- **Anna Weber**, QCB Training Grant Fellowship
- **Edward Basom**, QCB Training Grant Fellowship
- **Elizabeth Pierson**, QCB Training Grant Fellowship
- **Elizabeth Yuill**, QCB Training Grant Fellowship
- **Kendall Mayer**, QCB Training Grant Fellowship

Annual Chemistry Department Award Winners

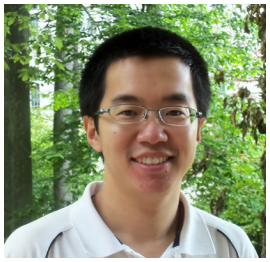
At the Chemistry Honors Banquet in April 2014, the following students were honored:

- E. Campaigne C500 Award: **Anne Hickey**, Professor Jeremy Smith lab
- E. Campaigne C500 Award: **Dennis Chen**, Professor Sara Skrabalak lab
- Wendell P. Metzner Memorial Award: **Qiqi Li**, Professor Liang-shi Li lab
- William H. Nebergall Memorial Award: **Rebecca Weiner**, Professor Sara Skrabalak lab
- Felix Haurowitz Award: **Siohban Deis**, Professor Charles Dann III lab
- Felix Haurowitz Award: **Yun Liu**, Professor Amar Flood lab
- Henry R. Mahler Award: **Andy Johnson**, Professor Erin Carlson lab
- David A Rothrock Award: **Andrew AbiMansour**, Professor Peter Ortoleva lab

- Associate Instructor Awards:
  Ben Draper, Professor Martin Jarrold lab
  Gabe Nagy, Professor Nicola Pohl lab
  Chris Rasik, Professor Kevin Brown lab
  Chris Tempas, Professor Steven Tait lab
  Lushan Zhou, Professor Lane Baker lab


Lucy Sanchez


Yuan Gao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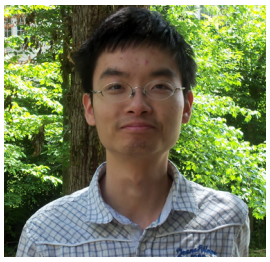
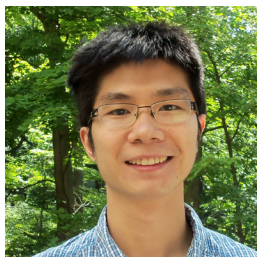

Yun Liu


Andy Schwartz


Lizz Pierson


Brian Cook


Chris Rasik


QiQi Li


Rebecca Weiner


Anne Hickey


Dennis Chen

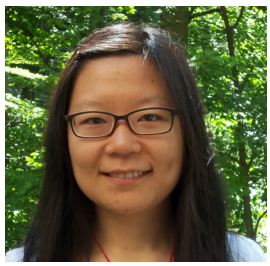

Siobhan Deis


Andrew Johnson


Andrew AbiMansour


Benjamin Draper


Gabe Nagy


Lushan Zhou

Continued from page 23

Congratulations to recent graduates!

Ph.D. Degree Recipients

- **Nathan Contino**, Analytical, July 2013, Professor **Martin Jarrold**
- **Xiao Cui**, Materials, November 2013, Professor **Liang-shi Li**
- **Jonathan Dilger**, Chemical Biology, May 2014, Professor **David Clemmer**
- **Albert Felten**, Organic, December 2013, Professor **Zach Aron**
- **Jeremy Felton**, Analytical, April 2014, Professor **Caroline Jarrold**
- **Rebecca Glaskin**, Analytical, August 2013, Professor **David Clemmer**
- **Alexander Graham**, Analytical, August 2013, Professor **Gary Hieftje**
- **Edward Hall**, Organic, May 2014, Professor **Michael Van Nieuwenhze**
- **Robert Hansen**, Analytical, February 2014, Professor **Phillip Stevens**
- **Johnathon Hutt**, Organic, August 2013, Professor **Zach Aron**
- **Zhiyu Li**, Analytical, April 2014, Professor **David Clemmer**
- **Seth Madren**, Analytical, August 2013, Professor **Stephen Jacobson**
- **Kevin McDonald**, Organic, April 2014, Professor **Amar Flood**
- **Indranil Mitra**, Analytical, March 2014, Professor **Stephen Jacobson**
- **Fese Mokube**, Organic, December 2013, Professor **David Williams**
- **Celeste Morris**, Analytical, August 2013, Professor **Lane Baker**
- **Partha Nag**, Organic, December 2013, Professor **David Williams**
- **Raghunath Ozhapakkam**, Physical, January 2014, Professor **Krishnan Raghavachari**
- **Niya Sa**, Analytical, December 2013, Professor **Lane Baker**
- **Akshay Shah**, Organic, May 2014, Professor **David Williams**
- **Huilin Shi**, Analytical, November 2013, Professor **David Clemmer**
- **Rahul Thakar**, Materials, October 2013, Professor **Lane Baker**
- **Darci Trader**, Chemical Biology, December 2013, Professor **Erin Carlson**
- **Elizabeth Wagoner**, Analytical, February 2014, Professor **Dennis Peters**

MS Degree Recipients

- **Aditi Dabir**, Physical, April 2014, Professor **Bogdan Dragnea**
- **Felicia Konopka**, Inorganic, May 2014, Professor **Silas Cook**
- **Caitlyn Krukau**, Materials, December 2013, Professor **Bogdan Dragnea**
- **Hyuna Lim**, Materials, December 2013, Professor **Liang-shi Li**
- **Craig Marlatt**, Physical, September 2013, Professor **Amar Flood**
- **Roxanne Smoker**, Chemical Biology, May 2014, Professor **Erin Carlson**
- **Abraham Verdoes**, Organic, December 2013, Professor **Zach Aron**
- **Rashid Zakeri**, Materials, December 2013, Professor **Lane Baker**

MAT Degree Recipients

- **Cori Weinel**, Analytical, May 2014

UNDERGRADUATE NEWS

by Carly Friedman

We added 86 new alumni to the IU-Chemistry family between 2013-2014 winter and spring graduations. The Department of Chemistry conferred 17 Chemistry BS degrees, 27 Biochemistry BS degrees, 28 Chemistry BA degrees, and 14 Biochemistry BA degrees to our students. Although the economy had been poor for the last few years, it seems like things have been picking up and students have been finding better success in their post-graduation plans.

An important part of undergraduate career preparation includes experiences outside the classroom and formal coursework, not just completing 'major requirements'. It is always quite impressive how students seek out and find amazing opportunities between study abroad, involvement in student organizations, and work with internships over the summer. We have had a sharp increase recently in students pursuing internships, thankfully due to the involvement of local businesses taking an interest in our students. Luke Kurowski and Jillian Williams pursued learning experiences outside the classroom this past year.

Luke Kurowski is a fourth-year student who is pursuing a Biochemistry BS and a Germanic Studies BA. Luke spent the 2013-2014 school year participating in the 30th Congress Bundestag Youth Exchange for Young Professionals. It is a highly competitive fellowship sponsored by the U.S. Department of State, the U.S. Congress, and the German Parliament (Derdeutsche Bundestag). Luke attended many political seminars and lectures and was afforded the privilege of being on the parliament floor for the celebration of the 65th anniversary of the current German constitution. During the Language School Phase of the program, Luke studied German intensively for two months at the Carl Duisberg Centrum in Cologne, Germany. Here he was able to refine his German grammar and vocabulary skills as well as write a résumé using subject-specific words and phrases related to his fields of study. Luke completed the University Phase at Technische Universität Dresden where he enrolled in parasitology, macromolecular chemistry II, biochemistry II, and another German language course. This experience provided him with his hardest academic challenge yet, as all of the material was taught in German, and he was the only student to attempt and pass all of the exams. It also proved challenging to navigate the differences between German and American universities. During the Internship Phase Luke worked at the Carl Gustav Carus University Hospital on an interdisciplinary visceral, thorax, and vascular surgery station. His tasks ranged from measuring blood pressure to conveying information between doctors and nurses — all in German. Most of the patients experienced the German Democratic Republic and some experienced World War II as children, and their stories, advice, and wisdom were life-changing for Luke.

Jillian Williams is also a fourth-year Biochemistry BS student. Jillian was approached by Cardinal Sprits to work as their intern on a special project. Cardinal Spirits is a craft distillery opening in Bloomington, Indiana, in the summer of 2014, and they are the makers of high quality whiskey, gin, vodka, and fruit liqueurs. They sought out a student intern to analyze the flavored compounds in several different types of alcohol with the hopes that they would be able to use this data to modify or improve their spirit selection. In order to provide them with this data, Jillian used techniques such as Stir Bar Sorptive Extraction and Gas Chromatography-Mass Spectrometry (GC-MS) to obtain qualitative and quantitative information about the compounds present in the samples. Jillian's research was performed in the Mass Spectrometry Facility at Indiana University under the direction of Dr. Jonathan Karty. She believes the experience improved her laboratory and professional skills, while helping her to further develop her future goals.

In addition to Cardinal Spirits, we were also approached by another local company, the Natural Products Analytics Group, who wants to provide internship experiences to IU chemistry students. With over 20 years of experience, the mission of the Natural Products Analytics Group is to raise the bar for the nutritional chemistry industry by providing these high quality quantitative analyses. We will be sending our first interns this fall. We are excited to continue working with both local businesses to provide real-world experiences for our students.

Chemistry Honor Roll:

Seniors:

Radhika Agarwal, Kyle Baugh, Donald Brake, Divya Chauhan, Ha Eun Cho, Alexander Chong, Nivan Chowattukunnel, Adam Coey, Matthew Coghlan, Caleb Cooper, Ryan DesCamp, Alexander Elias, Ian Emmons, Holly Epple, Liron Ganel, Robert Gassert, Adam Given, Jason Guinn, David Haak, Leslie Harman, Shannon Harvey, Robert Henderson, Taylor Hero, Kristin Hunter, An Huynh, Stephanie Iden, Evan Jameyfield, Y-Lan Khuong, Kevin Kuo, Luke Kurowski, Emilee Larson, Alex Lazar, Samantha Mayhew, Zachary Moon, Youbin Pan, Priya Parikh, Grace Park, Ajay Patel, Pooja Patel, Brooks Platt, Andjela Radmilovic, Samir Reddigari, Jonathon Rogers, Stephanie Rosa, Jeffrey Rytlewski, Jared Salisbury, Jonathan Schmidt, Molly Scripture, Eric Skorupa, Adam Spitz, Courtney Sullivan, Emily Tisma, Yueren Wang, Ethan Wappes, Audrey Welklin, Emma Winkler, Michael Wirey, Anirudh Yalamanchali, Michael Zimmerman, Madeline Zook

Continued on page 26

Continued from page 25

Juniors:
Tyler Barnes, Mariah Chambers, Lily Delalande, Christopher Dietrich, Kelsey Doyle, Hendrik Glauninger, Kaitlyn Goggins, Elizabeth Heath, Austin Hoke, Devin Jones, Alisa Klepach, Joseph McCann, Kyle O'Malley, Jay Parekh, Luke Kurowski, Matthew Payne, Michael Peng, Alexandra Roper, John Rose, Juan Serna, Lauren Wahle, Joseph Wendt, Sen Xiong, Max Zhou

Sophomore:
Emily Bentley, Carson Bickley, Connor Braeger, Ethan Brinkman, Alex Duckworth, Mark Hazelbaker, DohHyun Kim, Bryce Manifold, Christian McGill, Parth Patel, Nicholas Perry, Jonathan Rasio, Andrew Rejer, Paige Schultheis, Connor Singrey, Theresa Spech, Vinayak Vedantam, Alexander West, Rebecca Yeakey

Freshies:
Bryce Burton, Arthur Cross-Najafi, Michael Hartley, Joshua Mann, Joseph Storm, Wyatt Wright

G410: Chemical Research Capstone Symposium held at the 2014 Chemistry Honors Banquet.

Chemistry Honors Program:
Wenjing Cai, Caleb Cooper, Alexander Doran, Patrick Gamache, Anisha Joenathan, Paige Matthews, Logan Norrell, Andrea Patterson, Jonathan Schmidt, Adam Spitz, Ian Walker, Yueren Wang, Ethan Wappes

G410 Senior Research Thesis
Bethany Boris, Wenjing Cai, Caleb Cooper, Alexander Doran, Rosemary Easterday, Patrick Gamache, Anisha Joenathan Paige Matthews, Logan Norrell, Andrea Patterson, Jonathan Schmidt, Adam Spitz, Ian Walker, Yueren Wang, Ethan Wappes

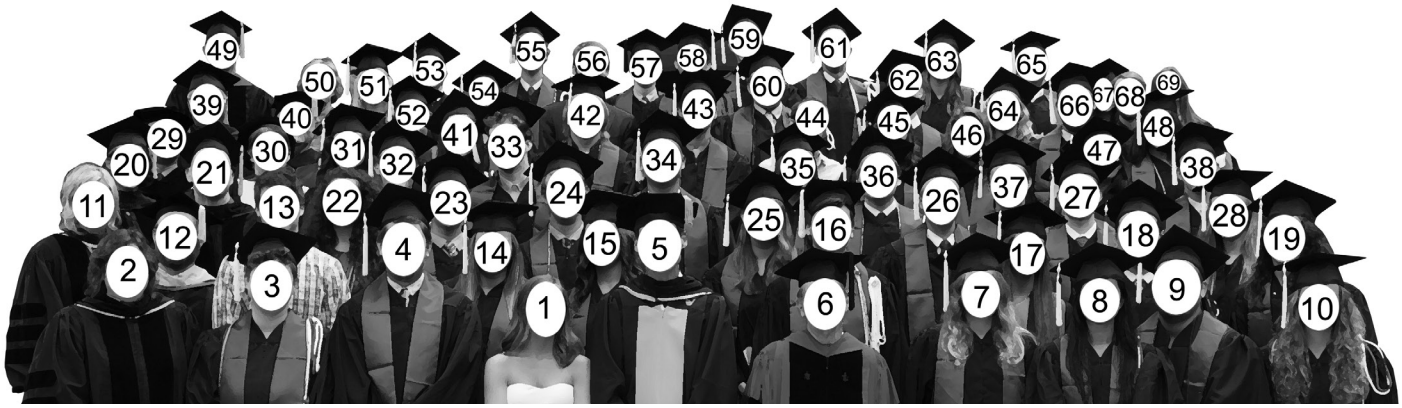
Phi Beta Kappas Spring 2014:
Wenjing Cai, Nivan Chowattukunnel, Matthew Coghlan, An Vinh Huynh, Chloe Mangas, Keerthana Mohankumar, Grace Park, Ajay Patel, Jeffrey Rytlewski, Jonathan Schmidt, Adam Spitz, Mykala Waldron, Ian Walker, Christine Wang, Emma Winkler, Michael Wirey, Lena Yu, Michael Zimmerman

Phi Beta Kappas Fall 2013:
Divya Chauhan, Holly Epple, Robert Gassert , Sam Hanger, Shannon Harvey, Stephanie Iden, Evan Jameyfield, Elizabeth Krizman, Y-Lan Khuong, Samantha Mayhew, Jonathon Rogers, Cody Scamacca, Emily Tisma, Yueren Wang, Ethan A Wappes, Audrey Welklin

Departmental Scholarships and Awards:
- C117: **Ethan Brinkman**, **Jessica Wade**
- S117: **David Burke**, **Hendrik Glauninger**
- Organic Chemistry Course Award: **Pooja Patel**
- American Chemical Society Award: **Leah Garvin**, **Evan Jameyfield**, **Paige Matthews**
- Keith Ault Scholarship: **Carson Bickley**
- William H. Bell Award: **Kenan Alibegovic**, **Spencer Brauchla**, **Olivia Sanchez-Felix**
- The John H. Billman Scholarship: **Spencer Brauchla**
- Harry G. Day Summer Research Scholarships: **Matt Acton**, **David Burke**, **Ian Emmons**, **Connor Hannon**, **Robert Henderson**, **Jonathan Man**, **Joseph McCann**
- Leroy Dugan Scholarship: **Ian Emmons**
- Harlan English Scholarship: **Joseph Anderson**, **Benjamin Ryan**
- Courson Greeves: **David Burke**
- Grim Scholarships: **Matthew Coghlan**, **Lily Delalande**, **Robert Henderson**, **Luke Kurowski**, **Grace Park**, **Andjela Radmilovic**
- Russell & Trula Sidwell Hardy Scholarship: **Parth Patel**
- Hypercube Award: **Alexander Doran**
- Ira E. Lee Summer Research Scholarships: **Austin Collins**, **Isaak Layman**
- Andrew Loh Scholarship: **Matt Acton**
- Robert & Marjorie Mann Scholarships: **Kyle Donelson**, **Jackson Fessenden**
- Frank Mathers Undergraduate Summer Research Scholarships: **Lily Delalande**, **Grant Schumacher**
- Dennis Peters Scholarships: **Corrine Karch**, **Isaak Layman**, **Jonathan Man**, **Laura Oehlman**
- William G. Roessler Scholarship: **John Rose**
- Joseph B. Schwartzkopf Award: **Ethan Wappes**
- Raymond Siedle Scholarship: **Rachel Kuczmanski**, **Michael Wirey**
- Sturdevant Summer Scholarships: **John Rose**
- Lee J. Todd Chemistry Memorial Scholarship: **Joseph Anderson**
- Enola Rentschler Van Valer Trafford Scholarship: **Samantha Mayhew**, **Elizabeth Schueth**
- Viola Scholarship in Nuclear Chemistry: **Austin Green**
- Votaw Undergraduate Summer Research Scholarship: **Laura Oehlman**
- Forrest L. Warner Scholarship: **Devin Jones**, **Juan Serna**
- Francis and Mildred (Eckerty) Whitacre Scholarship: **Connor Hannon**, **Joseph McCann**
- James C. White Award: **Caleb Cooper**
- Mary Frechtling White Memorial Chemistry Scholarship: **Yueren Wang**

GRADUATION 2014

Photograph courtesy William Unrue



Graduation "outline" made by William Unrue

1. Kylee Miller, 2. Professor Martha Oakley, 3. Emily Tisma, 4. Richard Freudenberg, 5. Professor David Giedroc, 6. Professor Dennis Peters, 7. Claire Cole, 8. Divya Chauhan, 9. Cristopher Allen, 10. Audrey Welkin, 11. Professor Jill Robinson, 12. Professor Ben Burlingham, 13. Caleb Kinsey, 14. Regan Delph, 15. Barbara Racich, 16. Alex Lazar, 17. Rebbeca Frettinger, 18. Evan Beall, 19. Kathleen Griebel, 20. Professor Laura Brown, 21. Professor Charles Dann III, 22. Emily Tisma, 23. Michael Zimmerman, 24. Patrick Gamache, 25. Emma Hatten, 26. Samuel Hanger, 27. Robert Gassert, 28. Hannah Kenninger, 29. Professor Mookie Baik, 30. Professor Norman Dean, 31. Courtney Severin, 32. Ethan Wappes, 33. Matthew Marzo, 34. Andrew Liao , 35. Christine Wang, 36. Caleb Cooper, 37. Morgan Burkhart, 38. Logan Norrell, 39. Professor Romualdo deSouza, 40. Professor Kate Reck, 41. Lily Wang, 42. Alexander Doran, 43. Ali Naderian, 44. Zachary Moon, 45. Rosemary Easterday, 46. Samantha Mayhew, 47. Leah Garvin, 48. Anisha Joenathan, 49. Professor Amar Flood, 50. Professor Lyuda Bronstein, 51. Holly Epple, 52. Bryan Duncan, 53. Jonathan Schmidt, 54. Meredith Brown , 55. Jeffery Rytlewski, 56. Adam Nichols, 57. Ian Walker, 58. Andrew Griebel, 59. Adam Spitz, 60. William Keown, 61. Evan Jameyfield, 62. Kevin Littrell, 63. Stephanie Iden, 64. Ellen Randall, 65. Christopher Sills, 66. Alexander Parker, 67. Shannon Harvey, 68. Chris Chatelain, 69. Taylor Mobley

LIBRARY NEWS

by Jennifer Laherty

This year we pay tribute to retiring Librarian, **Roger Beckman** (see page 17). Roger retired in April, and I was appointed to succeed him. Let me introduce myself to you this year. I graduated IUB in 1995 with my Masters in Library Science degree and went to California for a dozen years. I was a science librarian at California State University, East Bay (Hayward) from 1997-2007, managing chemistry along with other science funds as well as government publications. I was also the Head of Collection Development and Acquisitions my last five years. I was tenured in 2003.

I returned to Bloomington and IU Libraries in summer of 2007 with my husband and two children. I joined the Wells Library Reference Department and then became the Libraries' Open Access Publishing Librarian and spent my time managing the IUScholarWorks Services which includes the institutional repository and journal publishing. I was tenured at IUB this year and gratefully accepted the appointment to return to science librarianship. This includes managing the Chemistry Library, the Life Sciences Library, and the liaison relationships to the following departments: Biology, Chemistry, Medical Sciences, Molecular and Cellular Biochemistry, Nursing, and the School of Optometry.

I inherited wonderful staff and an impressively solid collection. **Tiea Julian** continues to manage the Chemistry Library as our Branch Coordinator. **Meg Knapke** continues as our Information and Library Science graduate assistant in the apprenticeship program. Both have contributed enormously to the major overhaul of the Libraries' web environment. I enjoy every minute learning from their experiences and appreciate their contributions to managing the Library, our services, and our collections. We've completed our review of the Reference Collection and have selected older editions to be moved to the Libraries' massive storage facility, the ALF (Auxiliary Library Facility) out on 10th and the Bypass.

Through negotiations in the CIC, the Committee on Institutional Cooperation, the Libraries' have been able to add the Springer e-book package Chemistry & Material Science to the collection. This includes the entire backfile of a variety of book series, some dating to the late 19th Century.

Plans for the coming year include:

- participation in ACS on Campus events October 9-10, including SciFinder training;
- participation in National Chemistry Week and the Department's open house on Saturday, October 25 - this year's theme is the Chemistry of Candy;
- Reaxys training in early November;
- and a review of the Materials Chemistry journal holdings with faculty with plans to adjust and perhaps add journal subscriptions.

In general, I will continue to meet faculty, researchers, and students to learn how they are using chemical information in the 21st Century so that services meet their needs. At the request of generous faculty, I have some dates lined up to work with chemistry students in the classroom on literature searches and teaching them about the structure and publication flow of that literature, and I will be auditing C117: Principles of Chemistry and Biochemistry, with over 700 chemistry students this fall.

If you are in the Bloomington area, please stop in to chat with me or send me an email: jlaherty@indiana.edu. I look forward to my involvement with the IUB Chemistry Department. ■

NECROLOGY 2013–2014

We remember all those in the IU Chemistry family who have passed away. Included here are deaths of which we learned this year.

Richard A. Awl, MS '63, August 22, 2013
Helen B. Barnes, MD '42, May 11, 2013
Horace R. Baxman, BS '43, February 5, 2013
Ram Dev Bedi, PhD '60, February 21, 2013
Paul F. Bente, Jr., BA '39, January 22, 2013
Elizabeth A. Bond, BA '63, July 16, 2013
Hsieh-Fu Cheng, PhD '57, August 4, 2013
O. Michael Colvin, BA '57, March 16, 2013
Joseph G. Corey, BA '60, October 13, 2013
Joan Creech, '54, August 26, 2013
Robert Degeilh, PhD '56, August 13, 2013
Homer R. Dorrell, BA '47, October 19, 2013
Michael E. Durkalski, BA '09, March 8, 2013
Morris Green, MD '44, August 6, 2013
Michael E. Haney, Jr., BA '51, October 28, 2013
Gene R. Hay, MD '52, March 5, 2013
Jack Horowitz, PhD '57, October 8, 2013
Wayne F. Hower, MA '39, September 6, 2013
Wilbur H. Huber, MA '48, November 2, 2013
Claudia J. Kalish, MS.ED '89, September 21, 2013
Frank W. Kidd, Jr., MA '64, July 3, 2013
Challis A. King, BA '49, January 17, 2013
Bonnie L. Koch, MA '79, August 28, 2013
Marilyn A. LaPlante, MA '63, April 12, 2013
Angelo P. Lobo, PhD '66, January 22, 2013
Patrick J. Madigan, BA '78, April 19, 2013
Donna J. Meade, MD '68, February 11, 2013
Edward A. Merchen, BS '42, February 11, 2013
Jerome A. Moede, MA '42, June 2, 2013
William L. Moore, Jr., BA '42, April 1, 2013
Thomas P. Moriarty, DJur '69, January 17, 2013
Reginald C. Morris, BA '78, October 25, 2013
Robert A. Morris, MD '43, February 5, 2013
Ramon A. Mulholland, MA '42, August 7, 2013
Haskell Pierce, BA '56, November 28, 2013
Larry W. Rampy, BA '61, March 22, 2013
Robert D. Raney, MD '64, July 13, 2013
Douglas A. Rausch, BS '50, September 19, 2013
Luther S. Roehm, MA '34, February 27, 2013
Leon H. Schmidt, MD '52, July 31, 2013
Jerry K. Sieron, BS '58, February 4, 2013
David J. Smith, MD '42, August 31, 2013
Robert S. Smith, BS '75, June 13, 2013
Margaret J. Stevenson, BS '40, March 8, 2013
Robert L. Stoddard, BA '50, October 19, 2013
Robert M. Summers, PhD '55, December 26, 2013
Robert E. Switzer, MD '42, January 22, 2013
James A. Tolzmann, PhD '55, February 21, 2013
Victor J. Vollrath, MD '42, November 10, 2013
Carrol L. Wade, DDS '56, September 11, 2013
M. Robert Warden, BA '50, April 3, 2013
Richard F. Weddleton, PhD '65, August 2, 2013
Harold J. Wesselman, BA '40, January 25, 2013
James C. White, BS '43, November 28, 2013
Wymond B. Wilson, MD '53, June 2, 2013
Harris J. Wolbert, MA '50, September 16, 2013
James A. Work, III, BA '38, January 22, 2013
Cora V. Zaser, BA '49, August 26, 2013

Arnab De, MS'07, is a research scientist in the Department of Microbiology and Immunology at Columbia University Medical Center in New York City. His research on developing once-a-week, non-insulin-based drugs for diabetes and obesity has been well received by a number of international publications, including *The Times of India*, *The Economic Times*, and *The Financial Express*. De lives in New York City.

In September, physician **Gregg A. Dickerson**, BA'80, MD'84, of Lone Tree, Colo., received a commendation from the Colorado State House of Representatives for his two-and-a-half year fight to convince the state's Medicare administrator to cover a treatment procedure for prostate cancer patients. The lawmaker who presented him with the award is also an IU alum. Rep. Lori Smith Saine, BS'00, presented Dickerson with an official plaque on the steps of the Colorado State Capitol. Saine lives in Firestone, Colo.

In April, **Richard D. DiMarchi**, PhD'79, received the IU College of Arts and Sciences' Distinguished Faculty Award during the College's Annual Alumni Awards dinner. DiMarchi is Standiford H. Cox Distinguished Professor of Chemistry and Linda and Jack Gill Chair in Biomolecular Sciences at IU Bloomington.

Ray E. Drasga, '80, who completed an internal residency at the IU School of Medicine, retired in 2012 after practicing oncology in northwest Indiana for 30 years. In 1995, Drasga helped establish St. Clare Health Clinic in Crown Point, Ind., which provides free, non-emergency primary health care for uninsured clients in a six-county area. In January, he and **Lawrence H. Einhorn**, BA'65, published an article in the *Journal of Oncology Practice*, "Why Oncologists Should Support Single-Payer National Health Insurance."

Elizabeth "Betsy" Thomas Guthrie, GN'49, writes that her family's long connection to Indiana University has spurred a legacy that will assist IU students for generations to come. A gift from the estate of Guthrie's sister, Margaret "Peggy" McIntire Graves, BA'44, provides additional support for a scholarship fund for physically handicapped students, which she established in 1987. Peggy's original gift was made in honor and memory of her late husband, **Clarence R. McIntire**, BS'44, MD'46. A separate gift to the IU Bloomington Office of Disability Services for Students, from the estate of Anne Gurecki — the mother of Rebecca, BS'71, MAT'72 — will provide scholarship support for disadvantaged students with a special emphasis on students with substantial speech, language, or hearing impairments. The gifts from Graves and Gurecki nearly double the amount of available scholarship support the office distributes annually.

In June, the Woodrow Wilson National Fellowship Foundation named **Taylor M. Mobley**, BA'14, a 2014 Woodrow Wilson Teaching Fellow. Teaching Fellows receive a $30,000 stipend to complete a special intensive master's degree that will prepare them to teach math and/or science in Indiana's urban and rural public schools. While at IU she was a dean's list student, an undergraduate research assistant in molecular fieldwork, softball team captain and assistant coach, and academic office assistant in biology. A sports and nutrition enthusiast, Mobley will attend IUPUI for her master's degree.

John E. Moenning Jr., BA'79, DDS'83, MS'88, is an oral and maxillofacial surgeon at Indiana Oral/Maxillofacial Surgery in Fishers, Ind. He has published more than 20 journal articles regarding various aspects of oral and maxillofacial surgery, has written and lectured on the use of nitrous oxide in dentistry, and was awarded a patent for a new nitrous oxide delivery mask system called the Safe Sedate Mask. Moenning also has three additional patents and helped in the development of the ISO-Guard Mask from Teleflex Medical used in post anesthetic care in hospitals.

Jerome L. Reckart, BS'98, is the author of *The Cognitive Classroom: Using Brain and Cognitive Science to Optimize Student Success*, published in August 2013 by Rowman and Littlefield Education. The book describes how cutting-edge research from the fields of brain science and cognitive psychology may be applied to classroom teaching. Reckart is associate professor of education and psychology and is director of the behavioral science laboratory at Rivier University in Nashua, N.H. Trained as a learning researcher, his current research examines how emotions influence information storage in humans, how cognitive psychological and brain research findings can be implemented in classroom settings, and ways to increase involvement of educators in researching their own practice.

Kaci Alexander Smith, BA/BS'10, lives in Akron, Ohio, with her husband, Matt. She is finishing her third year of medical school at A.T. Still University/Kirksville College of Osteopathy, with a specialty in obstetrics/gynecology. She will graduate in 2015. ■

From Bleach to Bees –
One Chemist's Path to the Sweet Life

by Esther Tristani

Navigating your life after graduation can be a difficult thing. Trying to find where you belong and what to do with your life can seem daunting. But, the best thing to remember is that life is about opportunities. In order to make the most of it you have to take each one.

Where do you see yourself in 10 years?

One of the most hated questions of graduating seniors is "what are you plans after graduation?" By my junior year I had narrowed my choices down to careers in teaching, government or industry (which is not really narrowing it down at all). But, based on these choices for me the next step was simple: graduate school. Teaching was my top choice, so I tried to take as many opportunities in this area as I could.

While at IU I took the opportunity to teach a science Freshman Interest Group (FIG). I worked as a FIG instructor for two semesters helping incoming freshmen decide if a major in the sciences was for them. This experience taught me a few things: I was terrible at teaching freshman, but I loved the experience of creating a class.

While a Ph.D. candidate at Duke University I had the opportunity to create and teach a class on The Chemistry of Art & Archaeology. This was again an opportunity to create something from scratch in a topic that really interested me. Again I learned a few things: maybe teaching was not so bad, but creating was definitely better.

Ode to the commode

Having decided not to pursue the teaching route, I looked to industry as my second option. My on-site interview at The Clorox Company was memorable. During the first five minutes of my research presentation, the fire alarms went off and the building was evacuated. Maybe not a great start to the day.

Later on, I took a tour of the facilities. To me Clorox seemed something straight out of Willie Wonka and the Chocolate Factory with my favorite room being "The Toilet Rig." Four scientists stood around a row of toilets discussing the consumer acceptance of the blue hue of the toilet water after a Clorox toilet puck was used.

I knew right then that this was the job for me. Clorox seemed the perfect place to explore my creative side and use my knowledge of chemistry in a fun way.

During my years at Clorox I took every opportunity that was offered. For example, I led the Latino Employee Resource Group, headed the development team on the Pine Sol Deep Clean Diva competition, represented Clorox on TV for the launch of Concentrated Bleach. My goal was to try as many things as possible, no matter how varied and I loved every minute of it.

Maybe bleach is not for me

No matter how much you love your job, doubts may creep in. Having doubts over a career choice is a completely normal thing. However, you hope these moments come at a time of reflection rather than of public scrutiny. My moment came the day of a performance review.

I was decked out in my professional finest and my review was in a few minutes. I had been making Clorox® Clean-Up® in lab that day and just had to pour it into containers. And pour it I did… all over myself five minutes before my review.

It's standard procedure to remove any contaminated clothing when you have a bleachable moment. But, it's also standard procedure to have a change of clothes in the lab for these types of events — which I did not. Needless to say, I walked bravely into my performance review in just my lab coat. Noticing that I was upset, my manager asked me if I was ok and the first words out of my mouth were "I don't have any pants on!" At that moment I started to realize that maybe bleach was not the field for me.

Wild for Bees

For the past year I have been working as a product developer for Burt's Bees. I get to create new and innovative personal care and cosmetic products in categories such as Lip & Face Care, Hair & Body and Color Cosmetics. My favorite product: the lip balm. My next opportunity: hopefully to meet Burt himself!

To say that one single event got me to where I am today would be inaccurate. It was truly the combination of opportunities and my willingness to try as many different things as possible that has led to my current successes. If you take advantage of each opportunity and learn the most you can, you have the best bet of finding what suits you and what suits your talents. ■

Dr. Tristani graduated from IU-Chemistry with a B.S. in Chemistry in 2005. She attended graduate school at Duke University where she earned her Ph.D. in 2010. Upon completion, she took a position at The Clorox Company. In 2013 she moved to Burt's Bees, where her creativity is flourishing.

WHAT'S NEW WITH YOU?

The IU Chemistry Department is now is charged with maintaining records for all IU alumni. Please print as much of the following information as you wish. Updates are used as class notes and help keep IU's alumni records accurate and up to date. Attach additional pages if necessary. Mail to the IU Chemistry Department or update online by visiting **http://whatsnewwithyou.chem.indiana.edu**.

Publication carrying this form: **IU • Chemistry** Date_____

Name _____

Preferred name _____

Last name while at IU _____ IU degree(s)/year(s) _____

Univ. ID # (PeopleSoft) or last four digits of Soc. Sec. #_____

Home address _____ Phone _____

City _____ State _____ Zip_____

Business title _____ Company/institution _____

Company address _____ Phone _____

City _____ State _____ Zip _____

E-mail _____ Home page URL _____

Mailing address preference: ❒ Home ❒ Business

Spouse name _____ Last name while at IU _____

IU degree(s)/year(s) _____

Your news: _____

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CHEMISTRY HONOR ROLL 2013

The Indiana University Department of Chemistry thanks and honors the alumni, friends and companies who supported the Department of Chemistry with financial contributions from January 1, 2013 through December 31, 2013.

Aleyamma Abraham
Robert Ake and Joyce Neff
Kent Alleman
Robert Anders
Mark and Ann Anderson
David Andrews Jr.
Deon and Lisa Anex
Michael and Vivian Aronson
Timothy and Irene Ayers
B. L. Mylari
Ann Bailey
Donald Ball
Thomas Bannister
Richard and Janice Barber
John and Mary Bart
Thomas Basso
Thomas Beck
Larry and Karen Becker
Jean Beckman
Ram & Uma Bedi
James and Nancy Beeson
Mohammad and Nancy Behforouz
Nicholas Bensko
Genia Berk
Vidya Bhandiwad
Lawrence and Cheryl Black
Holly Bone
Arthur and Martha Boot
J.P and Vicki Bowinkel
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Ludwig and Sheila Brand
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James and Kelly Corning
Joan Coveleskie
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Arnold Crelier
Charles Davis and Debora Shaw
Dwight Davis
Robert and Josette Degeilh
Anthony and Jill DeHoff
Alan Dickinson
Arthur and Carolyn Diesing
Michael and Barbara DiPierro
Michael and Mary Doherty
Patrick Dolan
Linneaus and Phae Dorman
Melvin and Judy Druelinger
Ronald Dykstra
Dorythe Earl
Mark Eaton
Richard Ebeling
Keith Edmonson
Kirk and Susan Eggebrecht
Dustin England
David and Lorna Estes
George and Maya Feliciano
Jeffrey and Cheryl Ferguson
James Ferris
James Fields
Rebecca Folkerth
Michael and Susan Forney
Geraldine Fouts
Robert French
Forest Gager
Paul Galley
Hugh and Suzanne Gardner
Alexander Gashti
Mary Kratz Gasser
Frank Gay
Vernon Geiss
Gregory and Catherine Georgiadis
Taxiarchis and Millie Georgiadis
David Ginger and Van Huynh
Mary Glasson
C. Thomas and Julie Gnewuch
Stephen Jr. and Carole Godomsky
Alan Goldhammer
Patricia and Carl Golgart
Raymond Grant
Rachel and Conrad Gratz
Christopher Growcock and Martha Kapitz-Growcock
Charles and Catherine Gwaltney
Ronald and Elinor Hackler
Robert Hamilton
Vernon and Sue Hammersley
Daniel Handschu
Russell and Nancy Harrison
Larry Hartman
David and Mary Hauber
Scott and Claudia Hein
John Hemperly
Stephen and Nancy Hensley
Albert Jr. and Wilma Hensley
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Richard Hively
William Hodes
Zachary and Judy Hodes
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Bernard Holman
Alexandra Hoogestraat
Mansoor and Naseema Hoosein
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Jerry Keilsohn
Charles Kelley
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John and Wendy Kindig
David Kirkpatrick
Robert Klute and Carol Schoeffel
Jay and Jean Kochell
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Paul Kovach and Susan Chintis-Kovach
Stanley Jr. and Jane Krauhs
William and Carolyn Kreighbaum
David Bushinsky and Nancy Sue Krieger
Paul and Barbara Krieger
James Krom and Katy Georgiadis
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Robert Letsinger
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Larry and Ricki Lewis
Reuben Lidster
James and Nina Light
Eric and Rebecca Lightcap
Luan-Ho & Cheyeh Lin
James and Carolyn Lindsay
Edwin Linz
Yu-Sheng Victor Liu
Jonathan and Vida Trafford Lohnes
Gary Madding
Wayne Mahoney
Mary Mahony
Spencer Marcus
Bruce Marks
Bruce and Donna Marks
Peggy McCann
Amy McDonald
Gordon III and Cheryl McLaughlin
Kevin McLeish
Jon and Rose Meek
Jordan Merz
Fred and Judith Metz
Yinglong Miao
Leslie Michael
Michelle Kovarik
Kenneth Mickelson
Max and Eva Middendorf
Jeffrey and Sara Milbourn
Donald Miles
Dawn Miller
Kenneth Miller
Patrick and Frances Mitchell
Kei Miyake
William and Katherine Moore
Herbert Moss
George Muser
Stephen and Deanna Nash
Mark and Lea Ann Neff
Deanna Nelson
Raymond Ng
Seiichi and Kimberly Noda
Philip and Jennifer Nubel
William and Susan Nugent
Hazel O'Connor
Gerald Olson
Peter Ortoleva
C.J. Osier
Greg Oster
Martin Osterhout
Andrew Overhiser
Kevin Owens and Judith Edliing-Owens
Mary and Brian Pack
Charles Paget
Lynne Parker
James Pasterczyk
Bruce and Maggie Paterson
Frank Patterson
Donald and Elizabeth Paulson
Richard and Sandra Paur
John and Laura Pedersen
Mark Pellerite
Rex and Margaret Pendley
J. Greg Perkins
Dennis Peters
David Peterson
Stephen Peterson
Gregory and Angela Pfister
Terry and Marga Pletcher
Stephen Ponnampalam
Orlando Driver and Paula Potratz-Driver
Christopher and Jennifer Powell
Paul Prather
Christine Price
James Qualkinbush and Brenda Barker
Joe and Elisa Rambo
Larry Rampy
Michael and Sharon Rapp
C. Royce Rasmussen
Richard and Carmen Raths
William Unrue and Cathrine Reck
Gerald Reisz and Suellen Bowersock
Herbert Reller
Jean Rhodes
Robert Jr. and Jennifer Rinker
Frank Rishe

Jose Rodriguez
Wendell Roelofs
Irving Rosen
Robert and Deborah Rosenfeld
Paul and Sheila Ryan
Mark Rzepnicki
Nancy Sachs
Sharad and Usha Sathe
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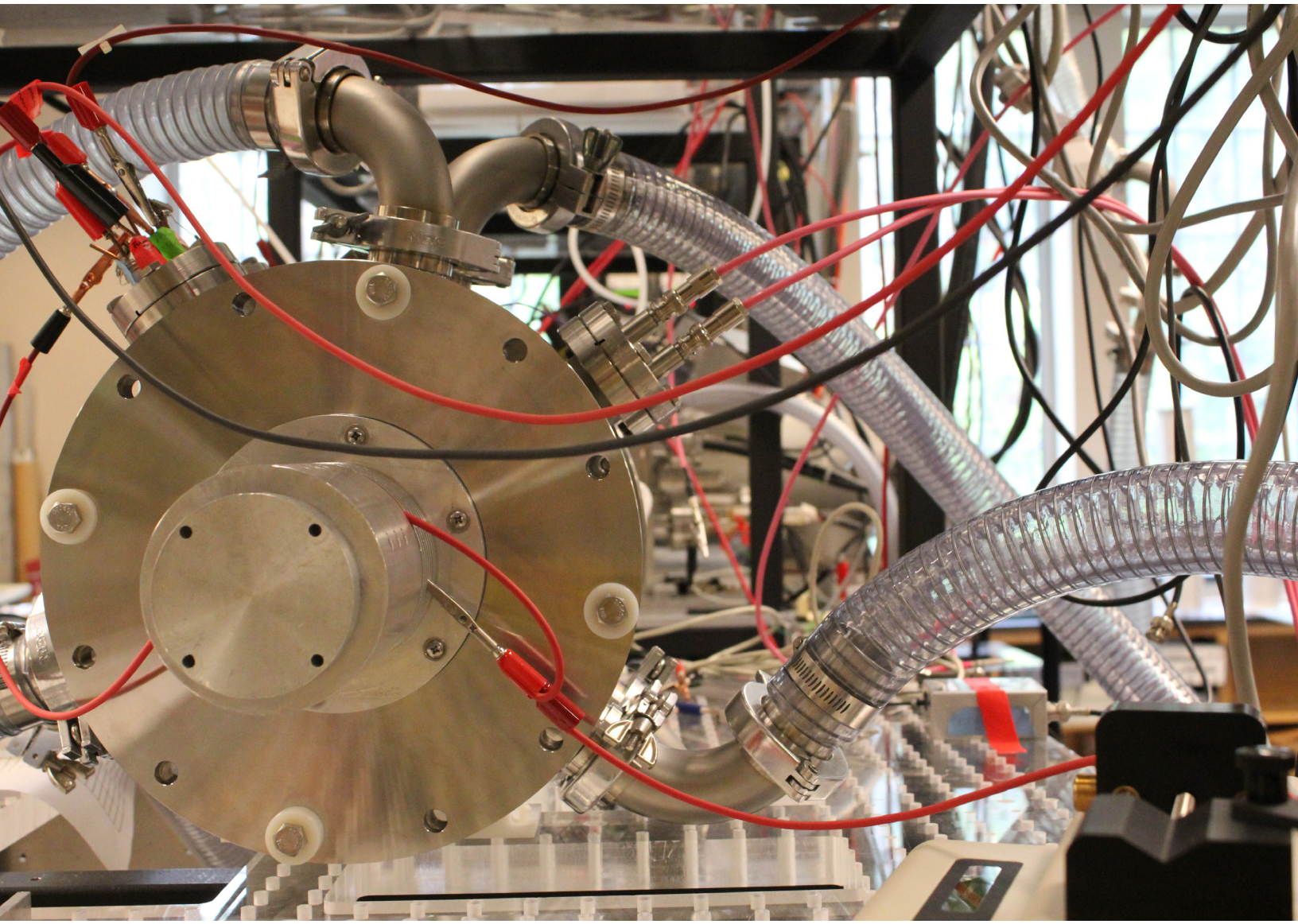

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