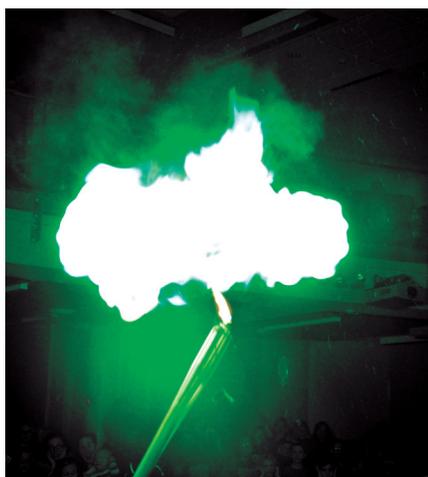


IU•CHEMISTRY

Association of Indiana University Chemists Alumni Journal

Vol. 60 • College of Arts and Sciences • Fall 2015



Get ready for a day of
educational fun with science!

2nd annual

IU
SCIENCE FEST

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extravaganza!



In this issue:

Aspiring Toward A Flexible Curriculum

Using Technology to Facilitate Active Learning In The Chemistry Curriculum

Science Turns Up The Fun On Campus: ScienceFest

IU • Chemistry

Association of Indiana University
Chemists Alumni Journal

Vol. 60 • College of Arts and Sciences • Fall 2015

College of Arts and Sciences

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Aulaire Schmitz engages the audience during the IU Science Fest

This magazine is published annually for graduate 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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Small Changes Making Large Differences

Our chemistry curriculum saw a redesign in 2007, and it's been eight years since we introduced a new four-semester sequence called 1:2:1 curriculum. A 1:2:1 curriculum entails that students take one semester of foundational general chemistry, followed by the usual two-semester sequence of organic, culminating their sophomore year with an intermediate inorganic chemistry taught with a background of organic. Both lectures and labs were completely redesigned by a committee comprised of both research and teaching faculty. This curriculum has allowed us to raise the standards for our students, to be challenged earlier in their academic career, students take higher level chemistry courses sooner, and overall getting students excited about our discipline better than our previous curriculum.

Usually after a curricular redesign, a department sits back, and then goes about their teaching. However, we are constantly reflecting and improving on the curriculum every year. We have been adding more upper level electives and service courses to help students be better prepared for their career goals, some of these have been highlighted in the article on page 6. We have been rejuvenating our labs, replacing equipment as we go. We have redone our Chemistry Computer Lab (CH006), upped the connectivity with increasing the number of routers, increased the number of electrical outlets so more students can be plugged in (literally), redone our Chemistry Resource Center (CH046), and soon the Chemistry Undergraduate Office (CH021) will have a facelift. We have beautiful new wooden benches in the hallways so fewer students have to sit on the floors (*who really wants to sit on the floor in a chemistry building?*).

Although it's been difficult for us to assess numerically how our students are benefitting, we see the benefits in small ways. More students are studying in chemistry into the wee hours of the night; more group studying surrounding the numerous white boards that line the walls in Chemistry Resource Center; the computers are constantly in use; and there is an overall buzz when you walk through the building. Our number of majors has risen from about 250 to nearly 500, and we consistently graduate around 100 majors each year. Students get to their upper level electives earlier, allowing more students to take graduate classes, better preparing them for their life goals. You can read about three of our 2015 graduates and their health professions aspirations after college on page 28.

We believe these small changes are making large differences in the edification of our students, while striving for student satisfaction.

Small is the New Big

Almost thirty years ago, a Bangladeshi economist, Muhammad Yunus, initiated a new kind of banking: *microloans*. Few thought much of it in the beginning, but it started a revolution in giving, earning him the Nobel Peace Prize in 2006. From this initial idea, thousands of peoples' lives have been transformed through the new phase of micro-giving that has seen an explosion on the in-

ternet. Sites such as microgiving.com and givology.org make it easy for the browsing public to search thousands of concepts and donate \$10 (or more) to something that interests them.

We could do the same thing in our department, but let's call it **quantum dots**. *What are quantum dots?* Quantum dots are nanoparticles made from semiconductor materials. Quantum dots range typically from 5 – 50 nm in size. When they self-assemble as a colloidal solution, they exhibit properties similar to bulk material. Interestingly, quantum dots of the same material, but with different sizes, can emit light of different colors. Some quantum dots emit red light due to a small band (lower energy), and some emit blue light due to a larger band gap (higher in energy). But these small particles work together to make a large, evident effect, similar to the bulk properties of a semiconductor.

Become a Quantum Dot

Many alumni think they have to give big to make a difference; that's simply not true. *Making small donations are akin to the quantum dot phenomenon*. Small donations, even in amounts of \$10, \$20, and \$50 all add up to make large, evident effects happen. Donations from alumni continue to make our on-going improvements possible over the years.

Just imagine what we can continue to improve with your help. You can either earmark your donation for a specific idea in mind: *infrastructure improvements* (e.g., benches, equipment, or new study spaces), *students scholarships* (e.g., research, to promote diversity, or for those with specific financial needs), or perhaps you have an idea in mind.

I want to thank many of our chemistry alumni for their generous and continuous support of our department. For those of you have yet to give back, *consider becoming a quantum dot today; you choose your color.*



As I begin my first year as the chair of the Department, I am pleased to bring you some of the highlights from the past year. For all of the latest news, please check the Department's website (<http://www.chem.indiana.edu/>) and the periodic news releases from the IU Newsroom that promote the accomplishments of Chemistry faculty, staff, and students (<http://www.chem.indiana.edu/news-events/index.asp>).

This past year, we had several successful tenures and promotions to celebrate. Profs. **Charles Dann, III** and **Steven Tait** earned promotion to associate professor with tenure, and Profs. **Amar Flood** and **Martha Oakley** received promotions to full professor. Also, **Yaroslav Lozovjy** was promoted to the rank of associate scientist in the Department. In fall 2015, we hired a new Lecturer, **Meghan Porter**. She joins us from our own department, earning her PhD in the Zaleski group. She has been a Briscoe Teaching Scholar and has taught in our department for two years as an instructor before accepting a full-time position.

Since our last issue of IU Chemistry, our faculty have received a number of prestigious awards and honors. Prof. **Kevin Brown** received a Sloan Fellowship in recognition of distinguished performance and potential to make an impact in his field. **Silas Cook** won the Amgen Young Investigator Award to support his pursuit of natural products synthesis. Prof. **Sara Skrabalak** garnered yet another award with the Leo Hendrick Baekeland Award from the North New Jersey Section of the American Chemical Society for her accomplishments in nanoscale particle synthesis. Distinguished Professor **Richard DiMarchi** received two important honors, the Meienhofer Award for Excellence in Peptide Sciences and the Patient Impact Legacy Award sponsored by Cures Within Reach, that recognize his long-standing efforts to find therapies for diabetes and related metabolic disorders. Prof. **David Giedroc** received the Diversity Catalyst Lecturer Award by OXIDE (Open Chemistry Collaborative in Diversity Equity) for his contributions to leveling the playing field in the sciences. In addition, Adjunct Professor **Jonathan Raff** received an Early Career Research Award from the Department of Energy to study soil fluxes of reactive nitrogen to the atmosphere. In the realm of teaching, Profs. **David Williams** and **Charles Dann, III** were honored with IU Trustee Teaching Awards, which highlight their efforts in the classroom. Our faculty continue to garner top awards locally and at the national and international levels. These achievements speak volumes about the quality of research and teaching ongoing in the Department.

In a University-wide competition, Prof. **Amar Flood** was named the Luther Dana Waterman Professor, which is a new professorship from the well-established Waterman endowment and was initiated specifically to recognize an outstanding early career, visionary scientist. Prof. **David Giedroc** is now the holder of the Lilly Chemistry Alumni Chair, which provides ongoing support of his activities as scholar and teacher. I have been named the inaugural Bair Chair in Chemistry. As many of you know, Prof. **Edward Bair** was a physical chemist and spectroscopist, who joined our faculty in 1954 and retired in 1989. Prof. Bair was largely responsible for the establishing our highly regarded Mechanical Instrument Services (MIS) Facility. Edward and Dorothy Bair established this endowed chair to honor an individual who will "pursue research that advances the general fields of instrumentation and measurement science."

On the administrative front, Prof. **Jeffrey Zaleski** was selected to be the Associate Vice Provost for the Sciences in the Office of the Vice Provost for Research (OVPR). Jeff will oversee a number of activities within OVPR and will work to develop greater collaborative, interdisciplinary research opportunities for the Bloomington campus.

We are also delighted to have a number of very prominent scientists visit our Department and present seminars as part of endowed lecture series. In spring 2015, **Stephen L. Buchwald** from MIT presented the V.J. Shiner Distinguished Lecture and Prof. **Shunichi Fukuzumi** from Osaka University (Japan) delivered the Raymond Siedle Distinguished Lecture. In fall 2015, we are looking for-



ward to visits from **Michael T. Bowers** from the University of California at Santa Barbara to present the Frank Mathers Distinguished Lecture and **Prof. Brian Chait** from The Rockefeller University to give the Harry G. Day Distinguished Lecture.

Our department and broader campus community also hosted a number of important symposia during the fall 2015 semester. Our annual 25th *Inorganic Alumni Symposium* was held on Friday, September 25. Invited speakers included **Eyal H. Barash** from Barash Law, LLC, **Alison R. Fout** from the University of Illinois at Urbana-Champaign, **Timothy P. Hanusa** from Vanderbilt University, and **Tim Nadasdi** from ExxonMobil. Our 6th annual *Watanabe Symposium in Chemical Biology* was held on Saturday, October 10. Guest speakers included Prof. Marvin H. Caruthers from the University of Colorado, Prof. Samuel H. Gellman from the University of Wisconsin-Madison, Prof. Chad M. Rienstra from the University of Illinois at Urbana-Champaign, and Prof. James R. Williamson from The Scripps Research Institute. Lastly, the Linda and Jack Gill Center for Biomolecular Science hosted the *Gill Symposium & Awards* on September 30 with featured speakers Prof. Loren Parsons, The Scripps Research Institute, Prof. Mary Kay Lobo, University of Maryland School of Medicine, and Prof. Marina E. Wolf, Rosalind Franklin University of Medicine and Science. This Symposium honored Dr. George F. Koob, National Institutes of Health, with the 2015 Gill Distinguished Scientist Award and Prof. Garret D. Stuber, University of North Carolina at Chapel Hill, with the 2015 Gill Transformative Investigator Award.

Unfortunately, after 12 years at IU, inorganic chemist Prof. **Mu-Hyun (Mookie) Baik** has decided to leave the Department to join the Chemistry Department at the Korea Advanced Institute of Science and Technology (KAIST) and the Institute for Basic Science – Center for Catalytic Hydrocarbon Functionalization. We wish Mookie the best in his new position.

In closing, I want to thank you for your continued and generous support of the Department. Without the contributions of our alumni, friends, and colleagues, we would not be able to support our educational and research mission. If you are in Bloomington, please stop by to say hello, and let us show you the latest happenings in the Department – **Stephen Jacobson**



SCIENCE ⁱⁿ a SNAP

Will a bowling ball float in water?

How many sugar molecules are in a single gumdrop?

These were among many questions discussed at the “Science in a Snap!” workshop provided for 3rd, 4th and 5th grade teachers at the 2015 WonderLab Summer Science Institute in Bloomington. One day was devoted to chemistry and energy science presentations by IU Chemistry Profs. **Laura Brown**, **Jill Robinson**, and **Steve Tait**. Highlights included hands-on density experiments “Will it float?” by Jill, lemon-powered LED lights by Steve, and a sampling of fragrant organic compounds by Laura. The group was dazzled by rainbow solutions and floating coins and actively discussed ideas about communicating essential aspects of chemical bonding, molecular structure, density, and energy to grade-school students in a fun and engaging way. The material presented was based on the Indiana Department of Education science standards and teachers planned to implement one new activity in the upcoming year. Teachers were provided with worksheets to use with each activity and lists of materials (all available from grocery stores or in a kit available for check-out). The teachers were enthusiastic about the workshop activities – even the butyric acid vomit smell – and expressed excitement to share these ideas with their students.

Aspiring Toward a Dynamic and Flexible Curriculum

Students entering college today need to have the flexibility to take courses that meet their needs in a rapidly changing world. Our hope is to continue to morph a traditional, rigid course structure to a more flexible, adaptable and dynamic structure to help students of all majors meet their needs. Both teaching faculty and research faculty are participating in the improvements. Below is a sample of what's new in the department.

C383: Chemistry of Living Systems

A strong foundational understanding of biochemistry has long been recognized as important for pre-medical, pre-dental, and other pre-health professions students. When the Association of American Medical Colleges-Howard Hughes Medical Institute released their "Scientific Foundations for Future Physicians" report in 2009, biochemistry for undergraduate pre-med students went from "important" to "essential." Over the past six years, medical schools (along with other health professions schools) have moved to make competencies in biochemistry required for admission, and the revised MCAT exam now includes a new emphasis in biochemistry.



Changes such as these have created a need to offer biochemistry to an increasingly diverse set of students. Developed by Prof. Ben Burlingham, C383: *Chemistry of Living Systems* will join the existing C483: *Biological Chemistry* and C484: *Biomolecules and Catabolism* courses in offering a range of classes to best meet the needs of all our students. C383 covers traditional content of a

one semester biochemistry course, including biomolecular structure and function, enzyme mechanism and kinetics, and integrated metabolism, and the course is accepted as the biochemistry pre-requisite at IU Medical School and IU Dental School (as well as many other institutions).

C383 is distinctive in its approach to its target audience: non-chemistry majors. C383 is designed for students with a more limited experience in chemistry, allowing a broader range of majors to take the course earlier in their degree sequence. Discussion sections use a variation of "Just-in-Time" teaching pedagogy to introduce chemical skills and problem solving strategies vital to understanding course material. Focused discussion exercises enable non-chemists to qualitatively predict the thermodynamics of a biological reaction, recognize metabolic pathways motifs, and determine which, if any, cofactor would be used in an enzyme catalyzed reaction based on substrate structure pattern recognition. In this way, non-chemistry majors can build a conceptual framework necessary for a rigorous

course in biochemistry that prepares them for applications in their own fields of study.

Offered for the first time in Fall 2015, the course is already popular, with over 120 students enrolled.

C420: Advanced & Nanoscale Materials

Spring 2015 marked the debut of C420: *Advanced and Nanoscale Materials*, an elective course for juniors and seniors. This course was co-developed and taught by Professor Trevor Douglas and Professor Sara Skrabalak in response to growing interest and need for student training in materials chemistry. This area is focused on understanding the relationships between atoms and molecules that comprise materials and how their order at different length scales influence chemical and physical properties. The importance of structure-function relationships hold regardless of whether a material is biological, organic, or inorganic in origin.

Douglas and Skrabalak organized the class to highlight this unifying theme and build connections between different classes of materials



and different areas of the chemical sciences more broadly. The class began with a discussion of how translational symmetry can be used to describe the order of solids composed of millions of atoms. With this foundation, current literature was used to introduce students to gold nanoparticles as platforms for photothermal therapy, metal oxide materials for new battery technologies, cadmium selenide quantum dots for flat-panel displays, and more. These hard, inorganic solids are often interfaced with soft, organic materials to bring new function through hybrid materials.

These examples transitioned the class to an investigation of hybrid materials comprising both hard (inorganic) materials and soft (organic) materials and exemplified by the biomineral structures of bones, teeth and seashells. The semester progressed to an investigation of the structure-function relationships of surfactants, polymers, colloids, and liquid crystals. The class was well-received by students and will be offered again in Spring 2016. A longer-term goal is to develop an accompanying laboratory course where students will gain experience in synthesizing and characterizing important examples of diverse material classes.

C446: Organic Chemistry III

Developed by Prof. Laura Brown, *C446: Organic Chemistry 3* was introduced as a new upper level chemistry course in the spring of 2014. This course covers the universal effects in organic chemistry (steric, electronic, and stereoelectronic effects), kinetics and thermodynamics, acid/base theory, models for determining stereoselectivity in additions to alkenes and carbonyls and reactions involving enolates and organometallic chemistry.

After teaching this course twice, Prof. Brown has determined that the aspect of the course that the students appear to enjoy the most is how much the course is focused on the question: "Why?" Students are reminded of concepts they learned in Organic Chemistry I and II and are consistently challenged to ask themselves this important question. Prof. Brown and her students have enjoyed incredibly rewarding classroom discussions and problem-solving sessions as a result.



B486: Gene Expression & Physiology

Historically, biochemistry in chemistry departments has been taught as a two-semester sequence that covers metabolism, enzymology, and macromolecular synthesis (transcription, translation and replication). While this class structure has persisted for decades, our understanding of macromolecular structures and machines has exploded. It is no longer possible to describe modern biochemistry credibly within a two-semester sequence.

The new *B486: Gene Expression and Physiology* now focuses on the structures, mechanism, regulation and logic of macromolecular synthesis.

Prof. Jim Drummond, Associate Professor in the Molecular and Cellular Biology Department, developed the course and he is only professor to teach this course since its inception in spring 2012. There are three objectives for B486. First, students are introduced to the literature sources as part of the knowledge base for the course. Historical textbooks such as Stryer's Biochemistry are woefully inadequate and often misinform on macromolecular topics.

Second, students are immersed into emerging fields and perspectives that inform the core material. For example, we re-think how macromolecules such as DNA, RNA and protein interact with each other through the lens of disordered protein structure. In short, protein flexibility supports weak but selective binding interactions. These are ideal for transient interactions and exchanges. We also revisit macromolecular machines such as the transcription and translation complexes through the lens of structural biology. Advances in crystallography have allowed structural determination of the ribosome and transcription machinery. Visualizing where substrates bind and how the enzyme manipulates them to affect catalysis reveals powerful new mechanistic and spatial insights into these megadalton complexes.



Finally, students are taught to consider regulatory strategies that are not commonly discussed in other undergraduate classes. For example, we discuss the 'codes' built around covalent protein modifications that alter shape and charge. These control, for example, cellular regulation via nucleosomes and transcription at the carboxy-terminal domain of RNA polymerase. Here, reversible and often transient modifications inform spatial and temporal regulation in ways that are accessible to the student.

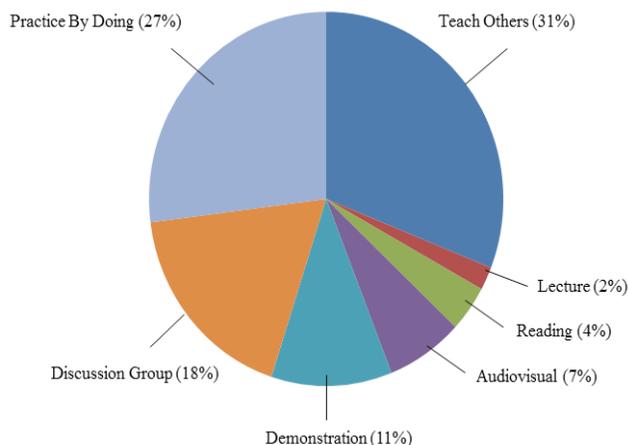
Prof. Drummond brings a lot of energy to his lectures, as this course has been received warmly by our majors. He does an excellent job of recognizing that his audience is largely pre-medical and pre-professional students, and he provides them a rich and interactive experience in Biochemistry. For example, students get acclimated to using discipline-specific language in class, every day. There are regular stopping points during each lecture where students are forced to consult with their peers to solve problems or build real-world analogies to the macromolecular setting we're investigating. Prof. Drummond is known for learning the names of all my students and enjoys exploring the group identity of each class cohort. B486 students represent the best life science students on campus, nearing the end of their careers on campus. Prof. Drummond is an excellent mentor and coach to help them find navigate into the next stages of their professional careers.

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Using Technology to Facilitate Active Learning in the Chemistry Curriculum

by Jill K. Robinson

Visualize a typical college classroom in which a professor is enthusiastically explaining a concept and students are dutifully transcribing notes. This familiar scenario is best described as a “traditional lecture which consists of continuous exposition of the teacher and student activity is limited to taking notes and asking occasional or unprompted questions of the instructor.”¹ Although a lecture is an efficient means of transmitting information that cannot be obtained in other sources, research shows that the amount of retention corresponds to the degree to which a student is dynamically participating in the learning activity. Figure 1 shows the impact of various teaching methods on the average retention rate after a 24 hour period when knowledge is in longer term storage.² The lowest amount of retention occurs when students are passively listening, but retention increases if the lesson is supplemented with visual information such as slides or a demonstration. When the students themselves are discussing the concept or teaching others, retention dramatically increases. This data does not imply that lectures should not be



used as they are important in explaining difficult concepts to students. Similarly, methods that have high levels of retention such as teaching others cannot be used at all times because students must learn the content themselves first. Rather, research indicates that students will retain more if they are given opportunities to participate in a variety of problem solving activities that help them to make sense of the information.

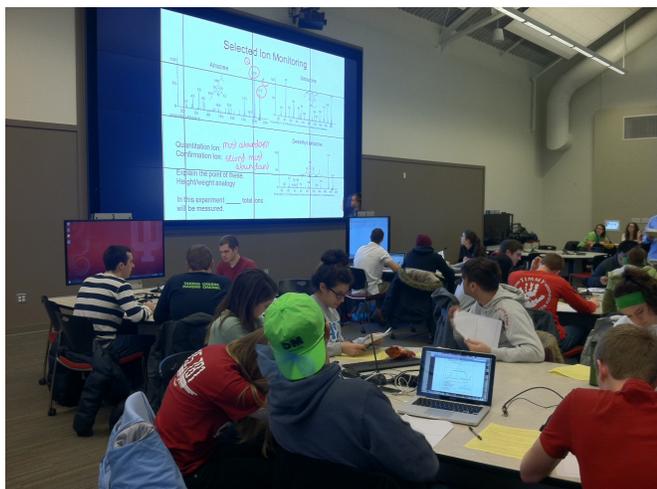
Figure 1: Pie chart showing average retention rate after a 24 hour period from different teaching methods. (Reproduced from Elizabeth F. Barkley, *Student Engagement Techniques: A Hand-*

book for College Faculty, 2010 John Wiley and Sons, Inc.)

In contrast to lecture, “active learning engages students in the process of learning through activities and/or discussion in class, as opposed to passive listening to an expert. It emphasizes higher order thinking and often involves group work.”¹ The active learning problems that I use in my classes meet the following criteria:

- Students work in teams and are given a question or problem to solve.
- Students have prior knowledge that informs their initial response to the problem.
- Students are given time free of instructional input to discuss the problem within their group.
- Solving the problem involves a back-and-forth exchange between the students and the instructor.
- Students are informed whether they are on the right track with their responses.

There are several different technologies on campus that promote active learning in the classroom. For example, in large classes students bring personal response devices (also called “clickers”) and answer questions posed throughout the class. This method provides opportunities for critical thinking and discussion. It also gives feedback to the instructor about how well students are grasping a concept. In addition, several classroom renovations now have physical space and technology conducive to active learning. The old swimming pool in the Student Building was remodeled to create the “Collaborative Learning Studio” where students can discuss concepts and easily share their ideas with the whole class. The room has sixteen tables; each equipped with a computer, large monitor, connections for three laptops, document cameras, and two push-to-talk microphones. Portable white boards allow students to sketch out solutions to problems posed as part of learning activities. Most importantly there is a twenty-foot wide video wall that is used to share student work with the whole class. Multiple student answers can be displayed at one time allowing for comparison and immediate feedback from the professor.



In my analytical chemistry class in the Collaborative Learning Studio, students are assigned pre-class work based on a short reading in the book. The answers are collected through the course management system the night before class. I can quickly see which concepts are not well understood and typically begin class by correcting (or having student groups correct) mistakes on the pre-class assignment. During class, short lectures are alternated with periods when students work in groups to solve problems. Students also work collaboratively on laboratory projects and use the technology in the classroom to propose and defend project ideas as well as peer review papers and posters. In Spring 2015, 92% of the analytical chemistry student strongly agreed or agreed that working in groups helped them to better understand course material. Some of the reasons given by the students are:

“In a lot of instances students relate better to each other and can explain some things in a way for students to understand.”

“Group work is also helpful because it is less intimidating to ask a peer for help than an instructor and this is a perfect opportunity to seek that help. Last but not least a group keeps you motivated to do work as opposed to working alone.”

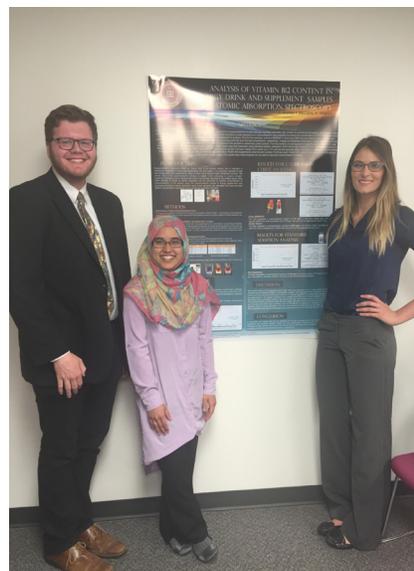
“Working in groups pushes me to articulate ideas that can sometimes be difficult. I can ask questions and get immediate feedback.”

“I think that sharing answers across the whole class is actually what brings the greatest benefit.”

The increase in student performance that I observed in my own classes using active learning strategies has also been demonstrated on a larger scale. A study published in the Proceedings of the National Academy of Sciences metaanalyzed 225 studies comparing student performance in undergraduate science, technology, engineering and mathematics (STEM) courses using traditional lecturing versus active learning. “The results indicate that average examination scores improved by about 6% in active learning sections and students in classes with traditional lecturing were 1.5 times more likely to fail than were students in classes with active learning.”¹ I have also found that using active learning strategies breaks down the barrier between professor and student. I get to know students much better personally and academically and we all have more fun!

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1. Freeman S., Eddy, S.L. McDonough, M., Smith M.K., Okporofor H., Jordt, H., Weneroth, M.P., Active Learning Increases Student Performance in Science, Engineering, and Mathematics, Proceedings of the National Academies of Science, 2014, www.pnas.org/cgi/doi/10.1073/pnas.1319030111
2. Elizabeth F. Barkley, Student Engagement Techniques: A Handbook for College Faculty, 2010 John Wiley and Sons, Inc.



Sam Higgins, Nurmissa Ahmad, and Ali Roper present their poster on the analysis of vitamin B12 in energy drinks.



IU Science Fest

by Norman Dean

College of Arts and Sciences Steps up its Community Outreach with College Wide Event

by Norman Dean

As long as there has been a National Chemistry Week, there has been an Open House in the Chemistry Department to help celebrate it... until last year. Recently the Departments of Physics and Astronomy and the Department of Chemistry have been collaborating on their respective open houses. There just weren't enough weekends in October free from home football games some years for each department to have its own weekend. It could also be tough on the families who enjoy these events to dedicate two weekends to visit campus, particularly if they ended up on back-to-back weekends. The collaboration proved extremely successful with both events drawing large numbers of visitors. By 2012 the Departments of Geophysics and Mathematics had decided to join in this annual effort to reach out to the community and engage them in hands on science activities and demonstrations. So what happened last year? In 2014, with the backing of the College and Arts and Sciences Office of Science Outreach the events grew to new proportions with the participation of all the science departments in the college; Astronomy, Biology, Chemistry, Environmental Science, Geography, Geological Sciences, Mathematics, Physics, and Psychological and Brain Sciences. This much larger event deserved a new name and IU Science Fest was born. Also participating in the Science Fest was the Indiana Geological Survey and Wonderlab, our local science museum.

This much larger event deserved a new name and IU Science Fest was born.

The day's activities took place across campus from the Student Building to Jordan Hall and many points in between. Some of the events sponsored by other departments included tours of the Kirkwood observatory and the Jordan Hall greenhouses as well as microscope stations to observe, plants, animals, bacteria and fungi. The Environmental Science Department gave tours of their Preserve Field lab while the Indiana Geological Survey set up their always popular earthquake simulator. The Department of Geological Sciences let guests investigate their collection of gems, try to drive a planetary rover on "Mars" or dig for a fossil,

while the Mathematics Department had geometric origami activities as well as presenting a selection of puzzles from the Slocum Puzzle Collection. The Physics Department presented their full slate of hands on activities as well as their annual Demonstration show that this year was called CSI Swain.

For the Chemistry Department the Science Fest will always be tied to the American Chemical Society's National Chemistry Week. That made the Chemistry Building a very popular destination during the day as the theme last year was *The Sweet Side of Chemistry - Candy!* Having a theme centered on food was exciting, but it was also unusually challenging to host. How could you fill the building with activities about candy and not allow the guests, and particularly the children, to sample some of the results. With some creative use of the atrium and the faculty lounge for the edible experiments, and the chemistry labs for the non-edible ones,

we managed to fill the day with activities. This incredible event wouldn't be possible without the help of some great organizations.

The Indiana University Chapter of Alpha Chi Sigma created a room with the title *Consumable Chemistry* where visitors could help make liquid nitrogen ice cream or an edible slime, they could also sample a bubbling witches brew while talking about how heat (or lack of heat) changed substances.

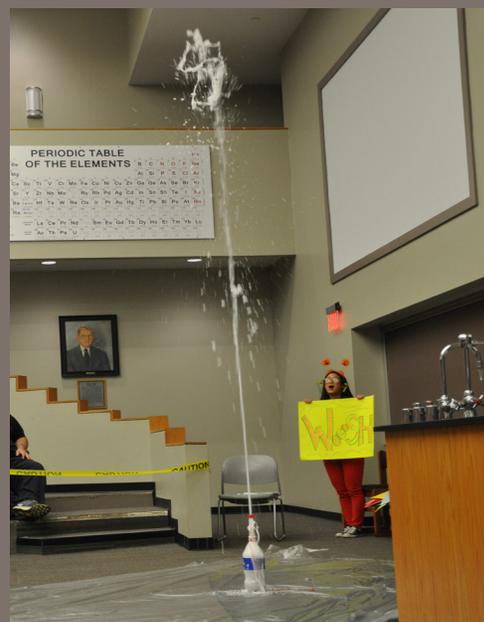
The IU chapter of the National Organization for Professional Advancement of Black Chemists and Chemical Engineers put together a room titled *Sweet Science* where guests did hands on activities involving everyone's favorite candy – Pop Rocks as well as looking at the reaction of Mentos in Diet Coke.

Graduate students from Professor **Nicola Pohl's** research group created the room *The Chemistry of Sugar* with the activities: What Makes Candy Sweet, Sugar in Soda, and Gas from Sugar? While the graduate students in the Electrochemical Society's room *Chemist's Corner* featured the activities: Building (salt) Bridges [did you know Playdough conducts?], Potato or Battery, and a Minute-to-Win-It style activity about redox chemistry.

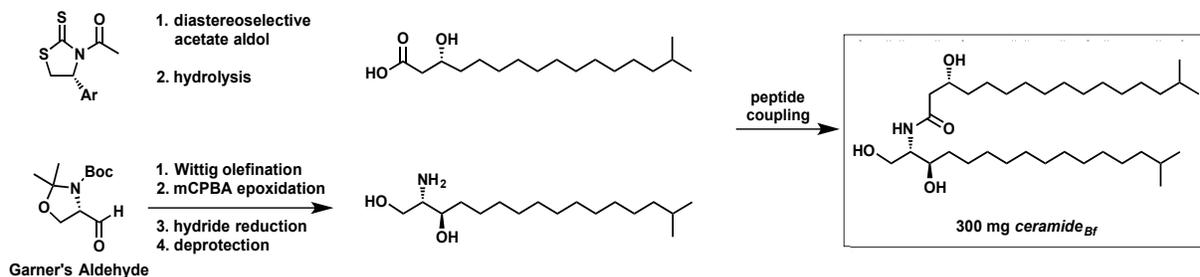
In the atrium the undergraduate students who work in the Chemistry Prep Lab hosted activities on How to Make the Perfect Chocolate, Liquid Skittles, and a challenge activity called Sink the Marshmallow. Also in the Atrium and ensuring that all the visitors knew what was in store for them as they walked in was the departments Popcorn Popper, demonstrating what can happen when a liquid is converted into a gas, and thanks to a gift from the Southern Indiana Chapter of the American Chemical Society, a professional grade Cotton Candy Machine showing the edible fun you can have when you convert a solid to a liquid and back again.

No visit to the open house would be the same without a Chemistry Demonstration Show and both shows had the lecture hall packed with guests. This year's show had demonstrators presenting both new chemistry demonstrations and old favorites to the audience as if they were new ideas for magical "candy" and "drinks" for Willy Wonka's company. Two gasses (sulfur hexafluoride and helium) were shown to raise or lower the demonstrators' voices when inhaled and ultra-fizzy soda was sprayed up to the ceiling by adding Mentos candy to sprite. Blue "Oompa-Loompa Juice" and "Coke-a-cola" that were created from clear liquids and a "Juice" that can be any flavor you tell it to become amazed the kids. A gummy bear was set on fire, marshmallows were launched across the stage and a broken beaker magically repaired itself. Enough toothpaste for an elephant was created, and, as is the tradition, the show ended with a few big bangs when hydrogen balloons were blown up. Special thanks go to Undergraduate Labs staff **Aulaire Schmitz, Caitlyn Cooper** and **Chris Chatelain**, graduate students **Jessica Amos, Meredith Hartley, Kellyn Patros, Trevor Gornick, Nicole De Gregorio, Daisy Vargas** and **Evan Rugen**, and IU alumna **Jennifer Babchuk** for all their time and effort to make the show such a huge hit.

One of the new events exclusive to IU Science Fest was a Science Slam. What's a Science Slam? Its four scientists, each given 12 minutes to impress the audience and win their vote that THEY do the coolest research! This past year the competitors were Liese van Zee from Astronomy, **Andrew P. Storey** from our own Department of Chemistry, Larry Moss from the Department of Mathematics and Susan Klein from the Department of Physics. The event was moderated, cowbell in hand, by Professor **Cate Reck** from Chemistry.



While the human gut microbiota are suspected to produce diffusible small molecules that modulate host signaling pathways, few of these molecules have been identified. Species of *Bacteroides* and their relatives, which often comprise >50% of the gut community, are unusual among bacteria in that their membrane is rich in sphingolipids, a class of signaling molecules that play a key role in inducing apoptosis and modulating the host immune response. Although known for more than three decades, the full repertoire of *Bacteroides* sphingolipids is only now being defined. These important molecules are difficult to isolate in the quantities that are required for biological characterization, and Professor **Laura Brown** and her undergraduate co-workers (including alumni **Michelle Gray** and **Laura Oehlman**) have worked out a stereoselective synthesis of a sphingolipid produced by *Bacteroides fragilis* (Figure 1). Starting with readily-available chiral starting materials, Laura and her students were able to synthesize over 300 mg of the desired molecule as a single stereoisomer. They will send this material to a collaborator at the University of California in San Francisco for biological studies.



Ken Caulton was on sabbatical leave in the fall, 2014 semester, in residence for four weeks at the van't Hoff Institute for Molecular Sciences at the University of Amsterdam, then six weeks at the University of Barcelona, affiliated with IU PhD alumni **Guillem Aromi** at their Group of Molecular Magnetism. Skype conferencing made it possible for Ken to actively direct his Bloomington research group during his absence and address manuscript progress. “Sustainable Chemistry” is the watchword across Europe, and finds special emphasis in the Amsterdam Institute, based on new catalyst discovery. In Europe, as in the US, there is a huge pressure to encourage large research “networks” in preference to individual investigator grants, and it was educational to see how such networks form, evolve and progress. Each of the groups visited have skills that advance the needs of Ken’s research group, and measurements are under way with results obtained. The city of Barcelona even furnished material for Ken’s teaching: one design from the architectural genius Antoni Gaudi, inlaid in sidewalks all over the high fashion Passeig de Gracia, now forms a part of Ken’s teaching of symmetry.....in chemistry (see photo below).



While about half of the elements are synthesized in stellar cores, the origin of many others is less certain. Radioactive beam facilities, both existing and underway, usher in a new era to address this topic. The **deSouza** group continued their quest to understand the synthesis of the elements and in particular the reactions proposed to fuel X-ray superbursts. It has been proposed that fusion of neutron-rich light nuclei in the outer crust of an accreting neutron star triggers an X-ray superburst. In just a few hours the superburst releases more energy than our sun does in a decade. To test the hypothesis that fusion of neutron-rich nuclei is enhanced relative to the fusion of beta-stable nuclei, the group conducted an experiment at Florida State University (FSU). This February found the group at FSU measuring the fusion of $^{18}\text{O} + ^{12}\text{C}$. Then in June they returned to measure fusion of $^{19}\text{O} + ^{12}\text{C}$ and the experiment with the radioactive beam was a success. Already from the preliminary data a difference between fusion of ^{18}O and ^{19}O with ^{12}C is observed. Florida in February was a welcome change from the Indiana winter and in stark contrast to running an experiment in Michigan during February as in previous years!

deSouza’s group also collaborated with colleagues on experiments conducted at Texas A&M’s cyclotron and at Notre Dame’s new high intensity accelerator. The experiment in Texas was a fascinating one which probes whether certain nuclei such as ^{16}O , ^{20}Ne , ^{24}Mg , etc. can be thought of as condensates of alpha particles rather than an ensemble of protons and neutrons. While this behavior in ^{12}C is well established (crucial to the production of ^{12}C in stars), it has never been observed for heavier nuclei. Unfortunately, the experiment had technical difficulties so the verdict is still out and a follow-up experiment is in the planning stages. Aside from conducting experiments and analyzing the resulting data the group engaged in the other staples of academic life – giving seminars, attending conferences, preparing

for PhD qualifying exams and of course publishing results.

The **Douglas lab** continues to focus on Biomimetic Materials Chemistry, designing synthetic approaches to new materials based on our understanding of, and inspiration from, biological materials. Inspiration comes from hard inorganic materials such as the biominerals found in bones, seashells, and magnetotactic bacteria and soft materials such as the self-assembly of virus particles and the catalytic enzyme sequestration in sub-cellular compartments exemplified by the carboxysome. Work in the lab includes the use of protein cage architectures as templates for the synthesis of new biomaterials for energy and biomedical applications using both synthetic and biological approaches.

The Douglas lab is designing and constructing synthetic hybrid catalysts from enzymes and small molecules to create coupled catalytic systems (metabolic pathway mimics). These new bio-synthetic hybrid materials can be incorporated into self-assembling supramolecular scaffolds that localizes co-catalysts in close proximity and which can be self-assembled into functional and sustainable materials. {This work is funded by NSF}

We are developing Magnetic Resonance Imaging (MRI) tools based on protein cage architectures that use the interior of the protein cage architectures to incorporate magnetic iron oxide nanoparticles, grown through a biomimetic mineralization process for enhanced T2 weighted imaging. Also we are using virus-like particles as nano-containers for the constrained synthesis of polymers that incorporate large number of Gd(III) chelates for high contrast T1 weighted imaging. In addition, the exterior of these protein cage architectures can be modified with tissue and cell specific targeting ligands to provide increased localization, which enhances the overall efficacy of the materials for clinical applications. {This work is funded by NIH}

This past year the **Flood Group** saw a number of developments in personnel, project maturation and conference activities. **Dr. Elisa Fatila** joined the group as a postdoctoral associate after a brief stint with Ken Raymond at Berkeley following the completion of her PhD with Kathryn Preuss at the University of Guelph. Elisa is working on the group's first industry-sponsored project, in this case supported by Thermo-Fisher. **Brandon Hirsch's** STM studies on surface self-assembly of anion receptors and their attendant anion-capture characteristics resulted in multiple papers. Together with Professor **Steve Tait**, funding for Brandon's project was recently granted from the ACS Petroleum Research Fund (PRF). The Flood Group also won a grant from Indiana University's Institute of Advanced Studies to start a collaboration with Professor Bo Laursen at the University of Copenhagen. To fuel the project, Brandon Hirsch and **Bo Qiao** had scientific visits in the Denmark laboratory and they now have two papers in preparation. It has been a busy year for conferences with Amar involved in organizing and chairing an NSF Workshop on Aqueous Supramolecular Chemistry and serving as vice chair for a GRC on Artificial Molecular Switches and Motors; he will be the GRC Chair in 2017. To top off the year's activities, Amar got promoted to full professor and also named the second of Indiana University's Luther Dena Waterman Professors.

The **Hieftje Research Group** has been concentrating recent-

ly on six project areas: distance-of-flight mass spectrometry, zoom-time-of-flight mass spectrometry, the solution-cathode glow discharge, a flowing atmospheric-pressure afterglow used for ambient desorption/ionization mass spectrometry, overcoming matrix interferences in ICP emission and mass spectrometry, and a new microwave-induced inductively coupled atmospheric-pressure plasma (MICAP) employed for elemental analysis. This brief summary will emphasize the last of these areas, since it is the newest. However, information about the other areas can be found on our website: <http://www.indiana.edu/~gmhlab/>

Unlike a conventional inductively coupled plasma (ICP, which operates at 27 or 40 MHz at roughly 1.5 kW of power), the MICAP is driven at the microwave frequency of 2.45 GHz, the same as common microwave ovens. As importantly, it operates with a low-cost magnetron source at 1 kW, the same as those ovens, and can be powered at 115 volts from a household outlet. Moreover, the MICAP can be sustained in either nitrogen or air, unlike the ICP, which requires a high flow (~20 L/min) of high-purity argon. As a result, the MICAP appears particularly suited to miniaturization or field applications. Yet, it provides detection limits that equal or rival those of the argon ICP. This work is being pursued by **Andy Schwartz**, **Yan Cheung**, and **Steve Ray** in collaboration with Radom Corporation, with sponsorship of the National Science Foundation under a Small Business Innovation Research (SBIR) grant.

Prof. Ron Hites had a productive year. His grant for \$6,000,000 from the United States Environmental Protection Agency's Great Lakes National Program Office was renewed for another five years. This project measures the atmospheric concentrations of about 200 compounds -- such as polychlorinated biphenyls (PCBs), chlorinated pesticides, and brominated flame retardants. His staff takes samples at 6 sites on the shores of the lakes once every 12 days and makes the measurements. Prof. Hites was also among the charter Fellows elected to the Society of Environmental Toxicology and Chemistry. That give him a hat-trick in fellows (SETAC, ACS, and AAAS). He was also very pleased that about 60 of his former students and post-docs gathered in Bloomington last June to re-live old times, to up-date everyone on their careers, and to tell a few stories. Prof. Hites claims he will retire only after Prof. Hieftje does.

The 2014-2015 academic year has been an exciting year for the Skrabalak group. **Professor Skrabalak** was named a Rudy Professor by the Provost of Indiana University; this title is one of the most distinguished and oldest on campus. The group continues to develop new synthetic methods toward nanocrystals, which are characterized by their small dimensions and size-dependent properties. The group is especially interested in visualizing how these structures assemble from atoms or small clusters. To achieve this goal, graduate students **Rebecca Weiner** and **Dennis Chen** have been working with scientists at Oak Ridge National Laboratory to monitor nanocrystal formation by liquid cell transmission electron microscopy. This technique is really new and provides a means of viewing nanoscale crystallization processes in real-time! The past year also brought good fortune to many in the Skrabalak group, with **Chris DeSantis** graduating with his PhD and beginning a postdoctoral position at Rice University. Also,

Moitree Laskar completed her PhD and is currently working as Coordinator of Undergraduate Research and Outreach for the group. This position involves oversight of the currently five undergraduates in the group, assisting in *Science Ambassador Trips* to regional high schools to introduce nanoscience concepts, and coordinating activities at Wonderlab, Bloomington's Children Science Museum. Last year, the group participated in *Real Life Science: Nanoscience* at Wonderlab by creating a hands on activity where children used metal nanoparticles to stain a piece of glass artwork and create their own nanoparticle sun catcher! We are now working to create a colorful demonstration that involves nanoparticle assembly.

This past year has seen many personnel changes in the **Smith Group**. Among those leaving are former postdoc **Wei-Tsung Lee** to take up a new faculty position at Loyola-Chicago and **Salvador Muñoz**, who is the final PhD student from the Smith group's time in New Mexico. Wei-Tsung and Salvador have provided important insights into the mechanism of alkene aziridination by iron nitride complexes. In this reaction, a nitrogen atom is transferred from an [Fe≡N] unit to a C=C double bond, creating a three-membered aziridine ring. Since aziridines are useful for the synthesis of complex organic molecules, there is much interest in developing efficient ways for their synthesis.

The Smith group continues its forays into the world of molecule-based magnetic materials, aided by excellent collaborators. Former student **Hsiu-Jung Lin** is first author on a recent paper in *J. Am. Chem. Soc.* that provides quantitative insight into manipulating the spin state of four-coordinate iron complexes. Her work is being extended by postdoc **Mei Ding**, whose efforts include the synthesis of bimetallic complexes for magnetic applications. Prof. Smith strengthened some of these collaborations through a month-long stay in the labs of Rodolphe Clérac at the CNRS (Bordeaux, France).

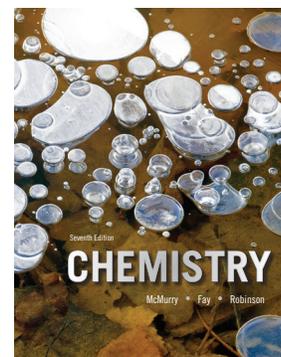
Dennis Peters' group continues to carry out research in two broad areas: (1) environmental electrochemistry and (2) mechanistic and synthetic organic electrochemistry. **Caitlyn McGuire** (third-year graduate student) published a significant paper (McGuire, C. M.; Peters, D. G. *Electrochim. Acta* **2015**, *137*, 423–430) concerning the reductive dechlorination of DDT (4,4'-(2,2,2-trichloroethane-1,1-diyl)bis(chlorobenzene) at silver cathodes. Although the electrochemistry of DDT has been investigated, in the past, with many different electrode materials and in a variety of media, the reductive cleavage of the two aryl carbon–chlorine bonds was never accomplished in any previous investigation. However, we discovered that reduction of DDT at silver in dimethylformamide (containing 1.0 M H₂O) affords totally dechlorinated 1,1'-ethylidenebisbenzene in almost quantitative yield. In more recent work that involved collaboration of **Erick Pasciak** (fifth-year graduate student) with both the **VanNieuwenhze** group and the X-ray crystallographic facility (Pasciak, E. M.; Rittichier, J. T.; Chen, C.-H.; Mubarak, M. S.; VanNieuwenhze, M. S.; Peters, D. G. *J. Org. Chem.* **2015**, *80*, 274–280), the electrochemical reduction of coumarin and several substituted (methyl, methoxy, and dimethoxy) coumarins was examined

with the aid of vitreous carbon cathodes in dimethylformamide containing tetra-*n*-butylammonium tetrafluoroborate. We found that bulk electrolyses of the various coumarins afford hydrodimers (mixtures of *dl* and *meso* diastereomers); the mechanistic scheme, developed to account for the electrochemical formation of the products, was buttressed with ¹H and ¹³C NMR spectra as well as X-ray crystallographic data.

Cate Reck continues as the Faculty Advisor for the Women in STIM (Science, Technology, Informatics, and Mathematics) Living Learning Community in Forest Residential Hall. The WISTIM, LLC provides an academically enhanced living and learning environment for undergraduate women studying in the STIM areas, providing the benefit of living together with peers with similar academic interests and goals. In fall 2015, we welcomed 35 incoming (plus 13 returning) students who take a one-credit professional development seminar in the fall. This summer Cate starting working with the Groups Scholars Program teaching their chemistry elective class, helping prepare first generation students for college life. After obtaining a Cottrell Scholars TA Improvement Grant with **Meghan Porter**, she is in the second year of teaching the new iteration of *C500: Professional Development Seminar* for our incoming graduate students collaborating with Profs. **Amar Flood** and **Meghan Porter**. This new course redesign helps our incoming graduate students improve their skills in teaching, research, professional goals, and ultimately culminating in becoming a stronger independent scientist.

She continues to work with **Jon Karty** and Cardinal Spirits, a local Bloomington distillery, on a project analyzing their spirits by GC/MS and comparing and assessing their chemical components. Undergraduates **Jill Williams**, **Alisa Klepach**, and **Tyler Blensdorf** collectively have made progress on this project over the last 18 months. Lastly, she and her student group *Timmy Global Health – Water Project* received a Metz Grant for \$5,000 to help install water purification filters in the Dominican Republic in collaboration with Wine to Water (using FilterPure Technology) for spring 2016. She continues to chaperone the medically-based Timmy Global Health IU chapter trip to Guatemala, celebrating its fourteenth year. One of her student groups, Minority Association for Pre-Medical Students (MAPS) won the *Leadership Development Award*, given by the Division of Student Affairs. Additionally, the President of Timmy Global Health and Biochemistry B.S. major, **Elizabeth Schueth**, was awarded *Student Organization Leader of the Year*. Cate was awarded the *2014-2015 Student Organization Advisor of the Year*.

Jill Robinson became lead author on the textbook, McMurry, Fay, and Robinson, *Chemistry 7th Edition*, Pearson Education, 2015. The book will be used in General Chemistry I and II courses around the country. She was a participant in a National Science Foundation Transforming Undergraduate Education grant to develop active



learning materials for the analytical sciences digital library (<http://community.asdlib.org/activelearningmaterials/>). To promote the use of active learning in college classrooms, she served as a lead facilitator in a workshop for thirty faculty members from minority serving institutions. The workshop was held at Spelman University in Atlanta, Georgia.

The research group of Associate Professor **Steve Tait** is studying the interaction of small organic molecules at solid surfaces to create functional supramolecular layers. They use scanning tunneling microscopy to create real space images with sub-molecular resolution that allows for detailed structural characterization of the architectures that result from the cooperative combination of non-covalent interactions. Photoelectron spectroscopy and electron energy loss spectroscopy characterize the chemical state of the system at various stages of surface reactions. They are also using a flow reactor to study alkane catalysis at surfaces. An ongoing collaboration with the **Caulton Group** has resulted in a new *JACS* paper demonstrating control over the oxidation state of single-site vanadium centers at a metal surface by modification of the organic ligand field surrounding the metal; this level of control at a surface interface had not been previously achieved. Collaboration with the group of Prof. **Amar Flood** has led to publications regarding two-dimensional and three-dimensional thin film packing at the solution—solid interface, a dynamic environment that allows for significant responsive properties. Ongoing work with metal porphyrin systems has led to new insights into dehydrocyclization reactions on relatively inert surfaces by reactant stabilization through non-covalent interactions.

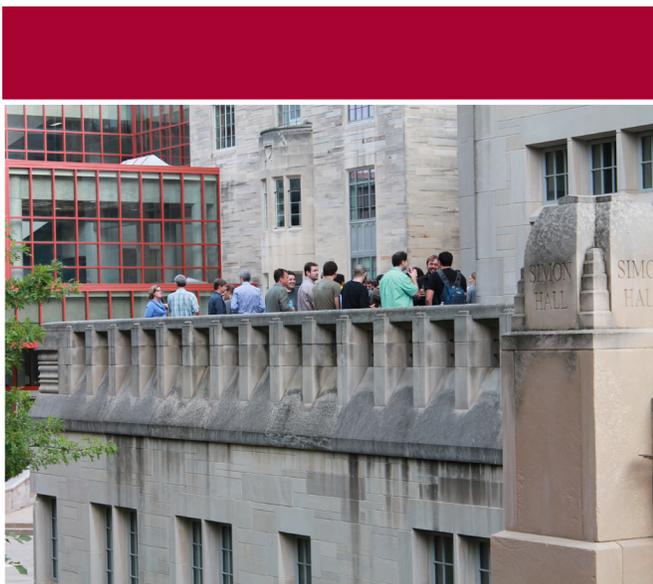


Chemistry Green Team Finally Wins the Last Two Competitions

Since the inception of the Department of Chemistry's Green Team in 2010, many people have asked: *What's a Green Team?*

A Green Team is an informal group of faculty, staff, and students from a particular campus unit who work collectively to promote environmentally, socially, and economically friendly practices within that unit. These goals include reducing the environmental impact of a building while also helping Indiana University become a more sustainable institution. During the fall and spring semesters, buildings work to reduce electricity and water consumption over a four-week period of time. For the last two competition periods in 2014 – 2015, Chemistry reduced its electrical and water consumption (compared to its own baseline values) the most compared to other laboratory buildings.

We now boast displaying a HUGE rotating award in the atrium display case, and we won two water bottle filling station that were installed on the first and second floors of the building. I hope to report that we have obtained SEED Certification from the Office of Sustainability after working harder to improve our sustainability habits in the building in the next newsletter.



Scintillating Scents

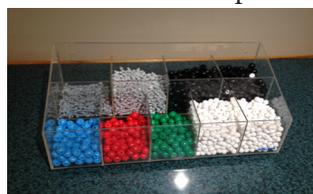
In general, chemistry is a subject that is often underrepresented in science museums, due to the focus on demonstration-oriented exhibits. Chemistry demonstrations generally require a trained individual to handle chemicals in a controlled environment, which is counter to the interactive nature of the other exhibits. **Kevin and Laura Brown** collaborated with *WonderLab Museum of Science, Health and Technology* in downtown Bloomington to create a new organic chemistry themed museum exhibit that is appropriate for all ages.

The goal of the exhibit is to introduce the general public to the concept of molecular structure by relating structure to scent. The first part of the exhibit presents the concept of molecular structure (an abstract concept for most museumgoers) in the context of scent (a much more comprehensible concept). Museumgoers are first invited to experience scent compounds without knowing what they are by smelling the contents of a "Scent Bottle". The scent bottles have a small amount of pure compound in them (absorbed on to a piece of cotton), and can be squeezed to release the scent through a small opening with a filter on it. After smelling a compound, the museumgoer then tries to identify what it is, and choose the appropriate puzzle piece to fit on the sign below the scent bottle. The completed puzzle for each scent includes the name and structure of the compound, and some "fun facts" about it.



Wonderlab Science Museum display highlighting scent molecule structures and scents.

Finally, there is an assembled molecular model of each of the scent compounds that the museumgoers can look at. The second part of the exhibit is a molecular models table. Here, museumgoers can build their own



Molecular model pieces visitors use to build their own model.

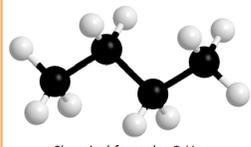
organic molecules. Laminated handouts that have detailed instructions on how to build specific molecules, as well as problems to challenge the museumgoers are included on the table.



Difficulty Level 2

Let's Make: BUTANE

Butane is an extremely flammable gas. It is compressed into a liquid for use in butane lighters.



Chemical formula: C₄H₁₀

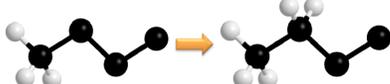
What you'll need:

- 4 Carbon
- 10 Hydrogen
- 13 Single bonds

Step 1: Assemble the carbon backbone in a line, like this:



Step 2: Add the hydrogen atoms until all of the carbons have four atoms bonded to them.



Challenge: Make isobutane. There is one more molecule that you can make with these exact materials. What does it look like? The answer is on the back!

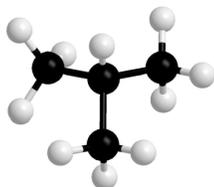
Answer to Challenge

Isobutane (or *i*-butane) is an **isomer** of butane (which is also called *n*-butane). Isomers have the same chemical formula, but the atoms are arranged in a different way.

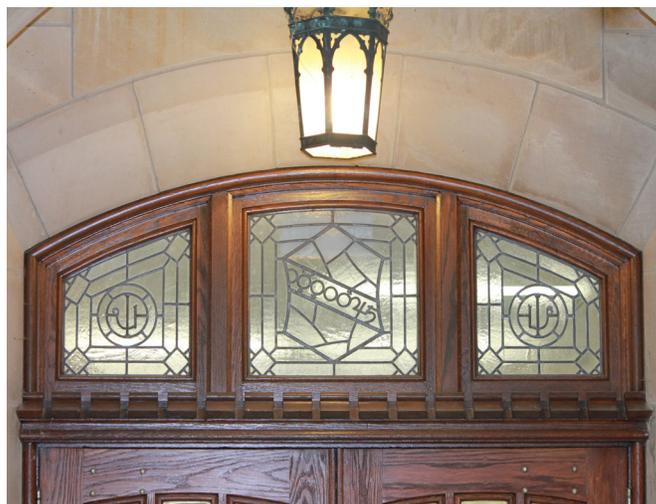
Step 1: assemble the carbon backbone. You will need the same materials, but you will assemble them differently:



Step 2: Add the hydrogen atoms. Your model should look like the picture below!



Isomers, such as butane and isobutane, have different **physical properties**. For example, the boiling point of butane is approximately 32 °F (the freezing point of water), while the boiling point of isobutane is approximately 12 °F.



WHAT'S NEW WITH YOU?

The IU Chemistry Department is now 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. You can mail the information to the Chemistry Department, email chemalum@indiana.edu, or update online by visiting <http://whatsnewwithyou.chem.indiana.edu>

Publication carrying this form: IU • Chemistry

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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: _____

Breakthroughs in Theoretical Nanoscience Enable Computer-Aided Vaccine Discovery

Peter Ortoleva, Distinguished Professor of Chemistry, IUB

The Ortoleva group has developed a protocol for the computer-aided design of vaccines and is extending it to cancer. The protocol starts with a model of a nanoparticle described at atomic resolution (Fig. 1). The strategy is to make the nanoparticle appear to the immune cells to be the target pathogen. Several of the Group's recent breakthroughs underlie the protocol. First, a computational software package (DMS) enables nanoparticle structural simulation at atomic resolution but with over an order of magnitude computational efficiency beyond conventional methods. This allows for the efficient surveying of a number of putative nanoparticles to identify those that are most stable as physiological conditions. The stable nanoparticles are then evaluated via a bioinformatics approach to assess their likely immunogenicity. This assessment is based on a second breakthrough on the properties of "epitopes". In the present context, epitopes are protein segments which are read by the immune system to initiate a pathogen-specific antibody response. The breakthrough includes the discovery that, among other molecular properties, the dynamic fluctuations of epitope structure is

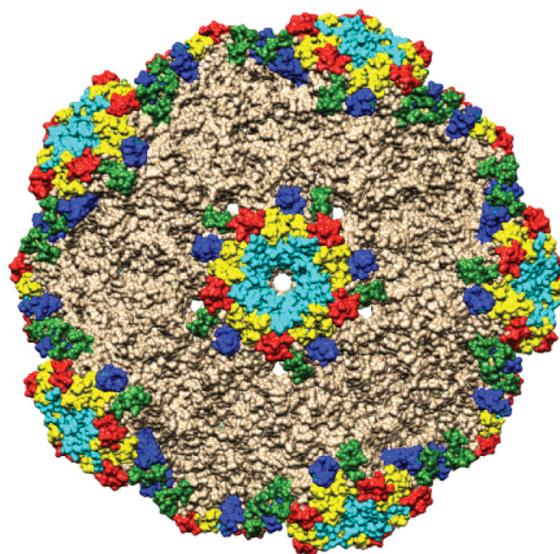


Figure 1. The all-atom structure of Human papillomavirus protein shell. Epitopes are highlighted in different colors.

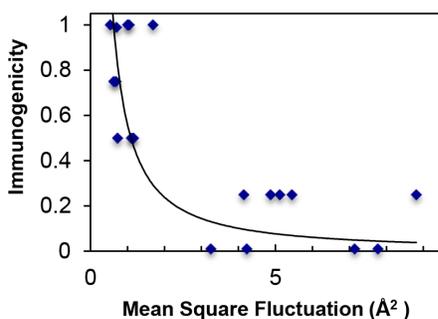


Figure 2. Experimentally determined immunogenicity is inversely correlated with calculated mean square fluctuation, a measure of epitope flexibility.

correlated with immunogenicity. Other properties (e.g., peptide sequence, average epitope structure, and ability to induce clustering of immune cell surface receptors (believed otherwise to be the key factor)) are not sufficient to distinguish between nanoparticles known to be successful and failed vaccines. The epitope structural fluctuation-immunogenicity correlation was shown for a spectrum of nanoparticles (short peptides to supra-molecular assemblies using data on five different viruses (enterovirus, human papillomavirus, hepatitis E, and polio virus (and several strains thereof) (See Fig. 2). Extensions of the approach to complex viruses (HIV, dengue, flu, and metastatic cancer cells) are under investigation.

The motivation of the project is not only to achieve cost effective vaccines that are stable under a range of thermal and other clinical conditions. Rather, it is to achieve vaccine discovery on the timeframe of an unfolding epidemic. Over the past three decades a new microbial threat emerged about once a year (e.g., HIV, Ebola, Dengue virus, etc.) so that efficiency in vaccine discovery is a critical world health issue. The vaccine design protocol discovered by Ortoleva Group and his students has the potential to address this critical issue. These breakthroughs illustrate how fundamental chemical physics and chemical biology at IUB Department of Chemistry is pioneering the use of new relationships between molecular biophysics and applied microbiology to solve pressing needs for world health and economy.

Emily Russ was hired as the *Student Services Specialist* in the Undergraduate Office (replacing Shelly Dodson). Emily received a B.S. in Agricultural Education from Purdue University in 2011. Her previous work experience includes: Agricultural Educator and FFA Advisor at Clinton Prairie Jr/Sr High School in Frankfort, Indiana, and Adjunct Faculty of Agriculture at Ivy Tech Community College in Lafayette, Indiana.

Caitlyn Cooper was hired as a *Lecture Demo Technician* in the undergraduate teaching labs (replacing Chris Chatelain). Caitlyn received a BS in Environmental Science from Indiana University in May 2014. She worked in the IU Department of Chemistry as a prep lab assistant beginning August 2010 through December 2013, then as a teaching assistant in SPEA in August 2013 through May 2014. During the summer of 2014, she was a Wildlife Field Technician in the San Francisco Bay area of California.

Ankit Gupta was hired as an *Electronics Engineer Specialist* in the Chemistry Department. Ankit came to Bloomington from Dartmouth College in Hanover, New Hampshire. He received a Bachelor of Engineering in Biomedical Engineering from Visvesvaraya Technological University in Belgaum, India, and a MS in Electrical & Computer Engineering from Tufts University in Medford, Massachusetts.

Matt Kovach was hired as the *Senior Project Engineer* (replacing Jack Baker). Matt received his BS in Mechanical Engineering Technology from Purdue University in 2004. His previous experiences include Manufacturing Engineer/Scientist-Coating at MonoSol Rx, LLC in Portage, Indiana, Project Engineer at Barry-Wehmiller Design Group, Inc, in Carmel, Indiana, and most recently a Senior Technical Services Engineer at BioPharma Solutions of Baxter International in Bloomington, Indiana.

Service Recognition

20 years – Susie DuMond

30 years – Toni Lady

2014 Staff Award Recipient

Kristina McReynolds



Library News

by Jennifer Laherty

The Chemistry Library continues to be a well-used space for study and inquiry in the lives of chemists and students. During the fall and spring terms, an average of 8,000 people come into this space per month. Over the course of the last year, we added seating for fourteen more students, bringing the total to ninety.

In collections news, I was able to purchase the back files of the American Chemical Society's *Chemical and Engineering News (C&EN)* from 1923-1997. This gives us access to the entire journal. Last fall I surveyed faculty needs for new journal subscriptions, and this summer I will be swapping in new titles while letting go of a few little-used titles. Interlibrary loan continues to be highly valued, and we will be able to obtain access to those articles in need through our library networks.

The Chemistry Library has given all of its society journal print publications to the Shared Print Repository (SPR) of the Committee on Institutional Cooperation (CIC). The CIC SPR is funded to provide a shared collection of print journal backfiles for the purposes of preservation and access (<https://www.cic.net/projects/library/shared-print-repository/introduction>). We are fortunate that the CIC SPR is actually housed at IU Libraries Auxiliary Library Facility (ALF), our world-class high density storage facility at 10th and the Bypass (<https://libraries.iub.edu/libalf>). We are also in the process of sending most of the remaining print journal collection to the ALF as we have these publications available fully online from their first volume to the present-day.

We gave our last graduate student, Meg (Margaret) Knapke, a very fond farewell as she graduated from IU's Department of Information and Library Science (ILS) in the School of Informatics and Computing (SoIC) with her Master of Library Science degree. Meg was immediately snatched up by the University of Dayton, Ohio, as their new Life and Health Sciences Librarian / Assistant Professor. Meg was with us for two years and was hugely helpful to me my first year in the Chemistry Library. She worked on innovative projects like the tweeting of new research on the Department's Twitter account (<https://twitter.com/iubchemistry>) and developing a prototype web interface for historically important chemistry texts. She spruced up our bulletin board with a colorful display of intriguing and new chemistry books. She also collected the data we needed to make the changes to our journal subscriptions. Meg is the last in a long lineage of highly successful Chemistry Library GAs as SoIC has opted to forgo future funding to support these positions in the Libraries. I am hopeful that I will find a graduate student to hire this fall who will walk in their shoes.

None of the above work would be possible, and certainly not as much fun, without the support we all receive from Tiea Julian, our branch coordinator.

continued on page 39

The Department of Chemistry is always fortunate to have a large number of seminars throughout the year. The 2014 – 2015 academic year was no different as we had over 125 seminars throughout the school year. Below are just the highlights of our distinguished invited speakers and symposia held on campus.

Special Seminars

January 21, 2015 *Vernon J. Shiner, Jr. Distinguished Lecture:*



Stephen Buchwald, Camille Dreyfus Professor of Chemistry, Department of Chemistry, Massachusetts Institute of Technology (Cambridge), "*Palladium-catalyzed Carbon-Heteroatom Bond Formation: Progress, Applications and Mechanistic Details*"

April 15, 2015 - *Raymond Siedle Lecture: Shunichi Fukuzui*



Distinguished Professor, Osaka University (Japan) "*New Strategy of Artificial Photosynthesis*"

April 22, 2015 ACS *Chemistry of Everyday Life Seminar:*



Andrew Jorgensen, Associate Professor, Department of Chemistry & Environmental Sciences, University of Toledo (Ohio), "*Climate Change Disruption: How Do We Know? What Can We Do?*"

BCChE Research Symposium,

September 27, 2014

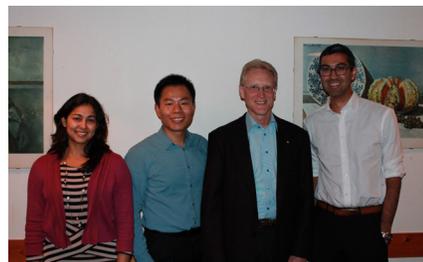
A breakfast, poster session, lunch culminated in a keynote speaker, Professor Lisa Jones, Assistant Professor, Department of Chemistry, IUPUI, "*Protein Footprinting Coupled with Mass Spectrometry for the Structural Analysis of Proteins*"

24th Inorganic Annual Alumni Symposium,

October 3 – 4, 2014

This long-held symposium had successful attendance at the seminars on Friday, culminating in the picnic at Brown County State Park.

- Dr. Aalo Gupta, Associate Scientist, Phillips 66 Company (Bartlesville, OK), "*From Bioinorganic to Biofuels*"
- Dr. Yogita Mantri, Senior Scientist, The Proctor and Gamble Company (Cincinnati, OH), "*Surprising Les-*



sons Learnt at a Consumer Products Company"

- Dr. Xuan Jiang, Senior Research Chemist, 3M Center, Corporate Research Material Lab (St. Paul, MN), "*Simple Solutions for Performance Coating: My Continuous Research Life at 3M Company*"
- Dr. David Clark, Laboratory Fellow & Program Director, Los Alamos National Laboratory (Los Alamos, NM) "*Life after IU: A Journey in Science, Leadership, and Shaping the National Agenda*"

5th Annual August M. Watanabe Symposium in Chemical Biology, October 11, 2014

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. The list of invited speakers is below:

- Professor Philip Low, Purdue University, "*Ligand-targeted Drugs for Cancer, Autoimmune and Infectious Diseases*"
- Professor Yan Yu, Indiana University, "*Spatial Organization at Cell-materials Interfaces: From Single-molecule Imaging to Immunoengineering*"
- Professor Catherine Drennan, Massachusetts Institute of Technology, "*Shake, Rattle, & Roll: Capturing Snapshots of Metalloenzymes in Action*"
- Professor Michael Weiss, Case Western Reserve University, "*How Insulin Binds: from Micro-receptor Structures to Next-generation Insulin Analogs*"
- Professor Daniel Kearns, Indiana University, "*CsrA and the Homeostatic Control of Flagella Structure*"
- Professor Xiaowei Zhuang, Harvard University, "*Illuminating Biology at the Nanoscale with Super-resolution Imaging*"

2014 Gill Symposium: “CNS Control of Metabolism”, October 15, 2014

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. The Gill Center is located in the new Multidisciplinary Science Building which provides the headquarters and scientific research laboratories for the Gill Chairs, students, post-doctorates and fellows.

The 2014 invited speakers included:

- **Dr. Matthias Tschöp**, Alexander-von-Humboldt Professor, Research Director, Helmholtz Diabetes Center, Chair, Division of Metabolic Diseases, Department of Medicine, Technische Universität München, 2014 Gill Distinguished Scientist Award recipient, “*The Metabolic Syndrome: A Brain Disease?*”
- **Dr. Scott Sternson**, Howard Hughes Medical Institute, Group Leader, Janelia Farm Research Campus, 2014 Gill Transformative Investigator Award recipient, “*The Neurobiology of Need*”
- **Dr. Sabrina Diano**, Professor of Obstetrics, Gynecology, and Reproductive Sciences, of Comparative Medicine and of Neurobiology; Director, Reproductive Neurosciences Group, Yale University School of Medicine, “*Free Radicals in the Central Regulation of Metabolism*”
- **Dr. Tony K.T. Lam**, Senior Scientist, Toronto General Research Institute (TGRI), University of Toronto, “*CNS Control of Hepatic Lipid and Glucose Metabolism*”
- **Dr. Randy Seeley**, Professor of Surgery, University of Michigan, “*Bariatric Surgery: It's not what you think it is. Molecular targets for the effects of surgery on behavior and metabolism*”

Following their presentations the speakers participated in a round table discussion (with audience questions) on CNS control of metabolism, how the relationship between the CNS and metabolism should shape our view of obesity and its treatment, and their general perspectives on Science. Following the panel discussion, a poster session and reception was in the IMU Solarium.

2014 PINDU, November 1, 2014

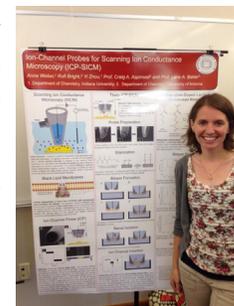
The students and faculty of Indiana University planned and executed 2014 Annual PINDU (PINDU = Purdue, Indiana, and Notre Dame Universities) Inorganic Symposium at Indiana University on Saturday November 1, 2014. The conference was held in the Chemistry Building from 8:30am - 4:30pm, including a welcome reception, nine oral presentations and forty-eight poster presentations.

Three graduate students from each university are invited speakers. The three graduate speakers from IU were:

- **Daniel Ashley** (Mookie Baik Lab), “*Unraveling the Electronic Structure of High – Valent Manganese Oxos: What is the Relationship between Radical Character and Physical Oxidation State?*”
- **Sarah E. Lindahl** (Jeffrey Zaleski Lab), “*Redox-Mediated Bergman Cyclization: Thermal and Photochemical Ene-diyne Activation*”
- **Anne K. Hickey** (Jeremy M. Smith lab), “*Four- and Five-Coordinate Low-Valent Iron Carbonyl Complexes*”

2nd Annual Symposium on Materials Chemistry, May 28, 2015

The Second Annual IU Symposium was organized by a committee of six chemistry graduate students: Dennis Chen, Jared Kafader, Bo Qiao, Emily Rhude, Lucy Sanchez, and Chris Williams, with Prof. Steve Tait as faculty advisor. The program was designed by these students to build on the highly successful symposium in 2014 by adding more student oral presentations and a keynote address by an external invited speaker, Dr. Thomas Wood of the 3M Corporation. In addition to his presentation on current research at 3M, Dr. Wood spent the lunch hour discussing his career path with students. Seven chemistry graduate students and one physics graduate student presented their work in oral presentations at the symposium and another 28 students presented posters in the afternoon. A dinner and evening social hour at Bryan Park allowed the 88 participants (and friends) time to discuss the events of the day and an opportunity to mix with other research groups under the very broadly defined materials theme of the meeting. Prizes were awarded to chemistry graduate students Anumita Saha-Shah (advised by Prof. Lane Baker), Kwahun Lee (Prof. Yan Yu), and Yun Liu (Prof. Amar Flood) for outstanding research presentations at the symposium.

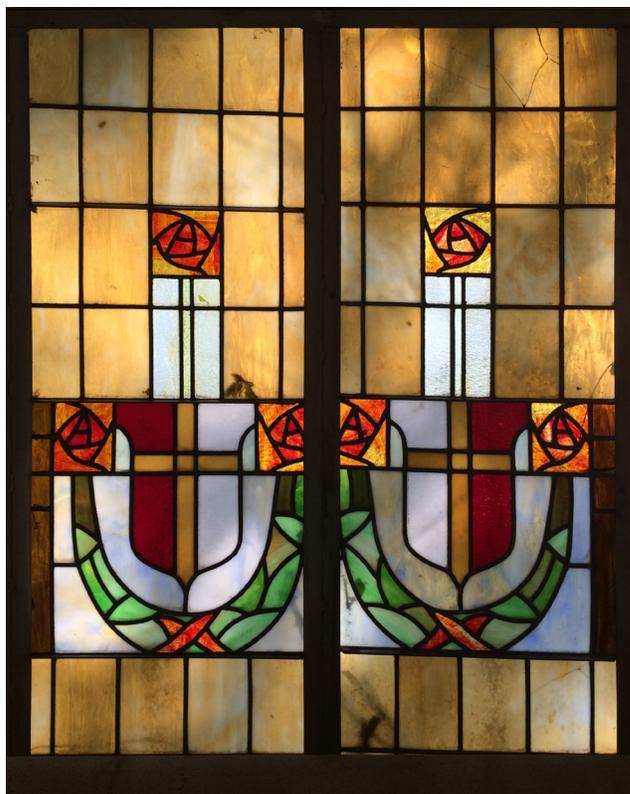


CONFERENCES, SPECIAL LECTURES, AND SYMPOSIA

IU Chemistry Holds Inaugural Career Development Symposium, August 5, 2015

In August 2015, the inaugural Career Development Symposium (CDS) was held on campus. Over 100 graduate students and faculty attended the CDS representing the departments of Chemistry, Biology, Physics and Biochemistry. Industry and career scientists were also present. Some of them participated in a discussion on potential career paths and others were involved in poster sessions and other recruiting activities.

This year's symposium focused on the role of communication in the sciences with a keynote presentation from NPR Science Correspondent Joe Palca on "*Describing the Universe in 2 Minutes or Less*". The panelists included a variety of professionals including some alumni: **Nick Grossoehme** (Giedroc Group) is a professor in the Department of Chemistry, Physics and Geology at Winthrop; **Leigh Krietsch Boerner** (Zaleski Group) is a freelance science writer and editor based in Bloomington, Indiana; **Nancy Ortiz** (Skrabalak Group) is an Advanced Researcher at ExxonMobil Research & Engineering in Paulsboro, NJ where she joined the Mobil 1 team as a formulator to design and optimize innovative lubricants that support the business objectives of ExxonMobil; and Joel Schneider is currently with the National Cancer Institute (NCI) as laboratory Chief of the newly established Chemical Biology Laboratory.



Participants included, from left to right: Leigh Krietsch Boerner, Keynote speaker: Joe Palca, Nick Grossoehme, Nancy Ortiz, and Joel Schneider.

Students also met with visiting companies interested in hiring PhD-level scientists leading to contacts and interviews. Among the visiting companies were Eli Lilly and Company, Exxon, Phillips 66, the Cincinnati Children's Hospital, Sigma, and Tesa. The sentiment from the event was that it was well received by the visitors and participants, and that it was a highly professional event. The IU Chemistry CDS planning committee is to be thanked for a wonderful success: **Ben Draper**, **Erin Fruchey**, **Aaron Lee**, **Justin Luebke**, **Chris Rasik**, **Benji Schwarz** and **Becca Weiner**.



Do you remember sitting in your general chemistry course while the professor performed an amazing demonstration? If you took that course in the last 20 years the chances are good that behind the scenes, the materials for that demo were prepared and tested by one of the department's demonstration technicians. This fall for the alumni magazine we would like to profile the chemistry department's two demonstration technicians **Aulaire Schmitz** and **Caitlyn Cooper**.

Aulaire Schmitz has been working for the department for six years. In addition to preparing demonstrations, she oversees the organic chemistry prep lab and is intimately involved in the department's outreach activities. Aulaire is from Minneota, MN, and earned a B.A. in Chemistry (ACS Certified) from Gustavus Adolphus College in St. Peter, Minnesota. One of two children she has an older brother Garrett, who lives in Wyoming. Outside of the chemistry department, Aulaire enjoys knitting and crocheting. She enjoys experimenting in the kitchen as much as in the laboratory, and she regularly tries out her creations with the undergraduate office staff before taking them to food swaps in Bloomington or Indianapolis. She enjoys hiking, which often gets combined with mushroom hunting. The mushrooms often end up being a part of some of her kitchen creations. She also enjoys gardening and in 2013 she won a salsa recipe contest at the Bloomington Farmers Market. Her favorite demo is the methanol cannon, followed closely by any other demo that involves an explosion (*do we see a trend?*). Her least favorite demo is the catalytic decomposition of hydrogen peroxide by a liver enzyme, which involves making a liver "milkshake" to access the enzyme.



Aulaire is lighting her favorite demonstration, the methanol cannon.



Light refractions help Caitlyn with her favorite demo, the reassembling beaker.

Caitlyn Cooper has been a staff member of the chemistry department for one year, but she started as an undergraduate employee in the prep lab her first year at IU in 2010. Caitlyn now oversees the general chemistry prep lab as well as working on outreach activities for the department. Although her family moved to Ellettsville, IN when she was older and she graduated from Edgewood High School, Caitlyn was born in Nashville and considers Mt. Juliet, TN her hometown. Caitlyn earned a B.S. degree in Environmental Science from IU. She also has one sibling, an older sister Elizabeth, who is rotating through naval hospitals across the US. Outside of work Caitlyn has a passion for working with animals and has interned at Wildcare, Inc. in Bloomington where she is still a volunteer. She is an accomplished amateur photographer and often takes photographs of our outreach activities (see the article on IU science fest in this issue for some of her photography). On Sundays she participates in her Coffee and Canoeing Club which involves Starbucks and canoeing with any of her friends she can convince to go along on one of the area lakes. She also enjoys fishing at Griffy Lake. Her favorite demo is one from last year's Science Fest Demo Show called the Self-Assembling Beaker, even though it did draw blood while she was learning how to do it. Her least favorite demo is any demo requested at the last minute that she doesn't get a chance to test before sending to a classroom.

We could not run our undergraduate lectures without both Aulaire and Caitlyn!

During the 2014-2015 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 Mu-Hyun Baik, Kevin Brown, Richard DiMarchi, Jeremy Smith, Tom Snaddon, Steven Tait, Megan Thielges, and Yan Yu.

Fellowship Award Winners for 2014-2015

Yan Cheung was awarded the Arts and Sciences Presidential Diversity Fellowship. Yan joined the lab of Prof. Gary Hieftje in the fall of 2010.

Michelle Lew was awarded the Arts and Sciences Presidential Diversity Fellowship. Michelle joined the lab of Prof. Phil Stevens in the fall of 2010.

Chris Rasik, was awarded the McCormick Science Fellowship, Chris joined the lab of Prof. Kevin Brown in the fall of 2011.

Anne Hickey was awarded the Chester Davis Inorganic Fellowship. Anne joined the lab of Prof. Jeremy Smith in the fall 2012.

Erin Fruchey was awarded the Chester Davis Organic Fellowship. Erin joined the lab of Prof. Kevin Brown in the fall 2011.

Rebecca Weiner was awarded the Raymond Siedle Inorganic Fellowship. Becca joined the lab of Prof. Sara Skrabalak in the fall 2011.

Dennis Chen was awarded the Raymond Siedle Materials Fellowship. Dennis joined the lab of Prof. Sara Skrabalak in the fall 2012.

Andrew AbiMansour was awarded the Kraft Fellowship. Andrew joined the lab of Prof. Peter Ortoleva in the fall 2011.

David Keifer was awarded the E.M. Kratz Fellowship. David joined the lab of Prof. Martin Jarrold in the fall 2011.

Daniel Haywood was awarded the E.M. Kratz Fellowship. Daniel joined the lab of Prof. Stephen Jacobson in the fall 2011.

Seth Bawel was awarded the Paget Organic Fellowship. Seth joined the lab of Prof. David Williams in the fall of 2012.

Arjun Saha was awarded the Robert & Marjorie Mann Fellowship. Arjun joined the lab of Prof. Krishnan Raghavachari in the fall 2011.

Justin Vadas was awarded the NSF Graduate Research Fellowship. Justin joined the lab of Prof. Roumaldo de Souza in the fall 2013.



Andrew AbiMansour



Seth Bawel



Dennis Chen



Erin Fruchey



Yuan Gao



Daniel Haywood



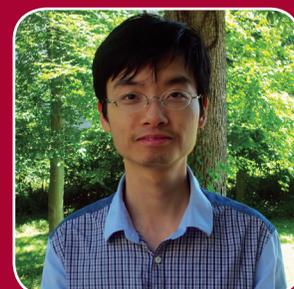
Anne Hickey



David Keifer



Aaron Lee



Yun Liu

GRADUATE NEWS

Edward Basom was awarded the QCB Fellowship. Edward joined the lab of Prof. Megan Thielges in the fall of 2012.

Paul Marcyk was awarded the QCB Fellowship. Paul joined the lab of Prof. Silas Cook in the fall of 2014.

Elizabeth Yuill was awarded the QCB Fellowship. Elizabeth joined the lab of Prof. Lane Baker in the fall of 2012.

Rachel Horness was awarded the QCB Fellowship. Rachel joined the lab of Prof. Megan Thielges in the fall of 2013.

Alison Vickman was awarded the QCB Fellowship. Alison joined the lab of Prof. Nicola Pohl in the fall of 2013.

Other Fellowship recipients were:

David Keifer, Briscoe Teaching Scholar Fellowship

Mame Meissa Gaye, Briscoe Teaching Scholar Fellowship

Erick Pasciak, Briscoe Teaching Scholar Fellowship

Erin Martin, Mann Fellowship

LaToya Rush, Theodore C. Mays Diversity Fellowship

Keevan Marion, Theodore C. Mays Diversity Fellowship

Benjamin Schwarz, National Defense Science of Engineering Fellowship

Ziran Li, Paget Recruiting Fellowship

Kevin Schwarz, Paget Recruiting Fellowship

Alison Vickman, Paget Recruiting Fellowship

Rebecca Weiner, Jewish Fellowship

Lucy Sanchez, Provost's Travel Fellowship

Anumita Saha, Provost's Travel Fellowship

Elizabeth Yuill, Provost's Travel Fellowship

Brittany Witherspoon, Provost's Travel Fellowship

Annual Chemistry Department Award Winners

At the Chemistry Honors Banquet in April 2015, the following students were honored:

E. Campaigne C500 Award: **Katie Logan**, Professor Kevin Brown lab

Jack K. Crandall Award: **Erin Fruchey**, Professor Silas Cook lab

Burton L. Appleton Award: **Chris Rasik**, Professor Kevin Brown lab

Wendell P. Metzner Memorial Award: **Seth Bawel**, Professor David Williams lab

William H. Nebergall Memorial Award: **Keith Searles**, Professor Dan Mindiola/Ken Caulton lab



Katie Logan



Nick Lytkey



Erin Martin



Meghan McCormick



Chris Rasik



Arjun Saha



Sarah Ward



Rebecca Weiner



Brittany Witherspoon



Wei You

Felix Haurowitz Award: **Wei You**, Professor Kevin Brown lab

Karlijn Keijzer Award: **Meghan McCormick**, Professor Mookie Baik lab

John and Dorothy McKenzie Award: **Yuan Gao**, Professor Yan Yu lab

Lynne L. Merritt Award: **Rebecca Weiner**, Professor Sara Skrabalak lab

David A Rothrock Award: **Yun Liu**, Professor Amar Flood lab

Associate Instructor Awards:

Aaron Lee, Professor David Giedroc lab

Nick Lytkey, Professor Stephen Jacobson lab

Erin Martin, Professor Dennis Peters lab

Sarah Ward, Professor David Williams lab

Brittany Witherspoon, Professor Kevin Brown lab

Congratulations to recent graduates!

Ph.D. Degree Recipients

Toolika Agrawal – Organic, May 2015, Professor Silas Cook

Feng-Ming Chang – Chemical Biology, August 2014, Professor David Giedroc

Christopher DeSantis – Materials, November 2014, Professor Sara Skrabalak

Benjamin Gamoke – Physical, April 2015, Professor Krishnan Raghavachari

Mame Meissa Gaye – Analytical, May 2015, Professor David Clemmer

Paul Gladen – Organic, August 2014, Professor David Williams

Zachary Harms – Analytical, November 2014, Professor Stephen Jacobson

Moitree Laskar – Inorganic, May 2015, Professor Sara Skrabalak

Semin Lee – Materials, August 2014, Professor Amar Flood

Justin Luebke – Chemical Biology, April 2015, Professor David Giedroc

Andrey Malyutin – Materials, November 2014, Professor Bogdan Dragnea

Brendan Monks – Organic, December 2014, Professor Silas Cook

Kirstin Morton – Analytical, August 2014, Professor Lane Baker

Erick Pasciak – Analytical, October 2014, Professor Dennis Peters

Elizabeth Pierson – Analytical, May 2015, Professor Martin Jarrold

Abhigna Polavarapu – Chemical Biology, April 2015, Professor Mookie Baik

Deven Shinholt – Analytical, December 2014, Professor Martin Jarrold

Srinivas Tekkam – Organic, November 2014, Professor Michael VanNieuwenhze

Nishad Thambanchandrika – Organic, March 2015, Professor Nicola Pohl

Sarah Waller – Physical, November 2014, Professor Caroline Jarrold

Kaelyn Wilke – Chemical Biology, January 2015, Professor Erin Carlson

Yi Zhou – Analytical, November 2015, Professor Lane Baker

Feifei Zhu – Analytical, December 2015, Professor David Clemmer

M.S. Degree Recipients

John Espinosa-Duran – Chemistry, March 2015, Professor Peter Ortoleva

Kendall Mayer – Chemical Biology, May 2015, Professor David Giedroc

MAT Degree Recipients

James Clark – May 2015



We added 95 new alumni to the IU-Chemistry family after 2014-2015 winter and spring graduation. The Department of Chemistry conferred 26 Chemistry BS degrees, 18 Biochemistry BS degrees, 39 Chemistry BA degrees, and 12 Biochemistry BA degrees to our students.

Consistently, we find that about one third of our graduates go on to graduate school, one third accept industry positions, and one third pursue careers in the health professions. This is true with our 2014-2015 graduates as well. Since Chemistry majors are curious, analytical, and self-starting leaders, they often go to become highly successful health professionals. We would like to highlight three of our students who will be working in the health professions. We would like to highlight three of our students who will pursuing health professions graduate programs in fall 2016: **Yoshitomo Masaki** (dental school), **Elizabeth Schueth** (medical school), and **Jennifer Sitko** (optometry school).



Yoshitomo Masaki graduated in May from the Department of Chemistry with a Bachelor of Science degree in Chemistry and minors in Biology, Psychology, and Japanese. Throughout his time on campus, Yoshi demonstrated high academic talent in chemistry, even teaching for our department as an Undergraduate Teaching Assistant in *C127: Fundamentals of Chemistry and Biochemistry Laboratory*. The dental profession appeals to him because he will be able to apply his creative and critical thinking skills using a hands-on approach. He is looking forward to the flexibility of owning a private practice where he can give high quality dental care. Because Yoshi knows that dental care is crucial to overall health, he plans to take frequent service trips to areas that may not have access to necessary care.

Elizabeth Schueth graduated in May with a Bachelor of Science degree in Biochemistry and a minor in Spanish. It was during freshman year that she identified her aptitude for and fascination with chemistry which later inspired her to teach an undergraduate laboratory class as an assistant instructor. A few challenging classes later, Elizabeth was captivated by the chemistry within human systems and learned that through hard work, she had the



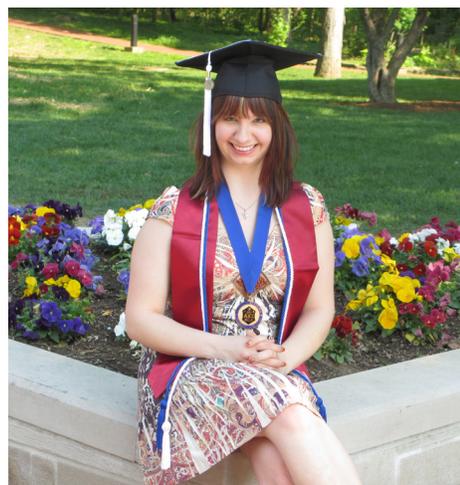
ability to excel even with a rigorous course load.

Outside the classroom, Elizabeth truly found her niche on campus when she joined the *Timmy Global Health* student organization. Her passion for global health flourished as she was fortunate enough to travel to Guatemala on two medical brigades, work as an intern in their office headquarters, and serve on IU's executive board as Community Relations Chair during her junior year and then President. For her efforts in this role, she

was recognized as *IU's Student Leader of the Year*.

Elizabeth attributes her major strides in her personal development and her confidence in her career choice to her involvement in the Department of Chemistry and *Timmy Global Health*. With her aptitude for science along with her compassion for others, Elizabeth believes becoming a physician is the career in which she can use her talents to have the greatest impact throughout her lifetime.

In the fall of 2015, she will be attending IU School of Medicine. She plans to continue to expand her global health knowledge and understanding of international healthcare equity throughout medical school. From these experiences, Elizabeth is committed to not only be a competent physician and leader among her peers, but also work toward eliminating health disparities into her future career in some capacity.



Jennifer Sitko graduated from Indiana University in May of 2015 with a Bachelor of Arts degree in Chemistry and a minor in Gender Studies. She is very humbled to have been not only the first person in her family to attend college but to go on to a professional graduate program. She found her first four years at IUB to be absolutely amazing with a beautiful campus and a friendly and welcoming faculty and staff. She loved it so much that she decided to attend the Indiana University School of Optometry beginning fall 2015 on the Bloomington campus.

Jennifer's passion for optometry began when she was a junior in high school and her mom had a horrible accident that ended up causing several eye problems. The optometrist and ophthalmologist were so attentive and comforting towards her in the time of need that she realized that was what she wanted to do with her life. She finds the work of optometrists to be fascinating. Because many people do not think it is important to visit the optometrist if their vision is fine, they do not realize that optometrists do so much more than prescribe glasses and contacts. They check the full health of the eye and can even see health problems, such as diabetes and high blood pressure, before general doctors can diagnose them. She is very excited to help people in this way and to achieve her dream of being the best vision care provider she can be. In the future, she hopes to join a family practice and genuinely get to know each and every one of her patients. Establishing the patient/provider connection is extremely important to Jennifer, and she hopes to make each of her patients to feel welcome at every appointment.

We wish Yoshi, Elizabeth, and Jennifer luck in their future health careers. We are confident that their undergraduate education will help them to be successful in their future careers!

Chemistry Honor Roll

The following chemistry and biochemistry majors attained an overall and in-major grade point average of 3.75 or better through the fall 2014 semester

Senior Honor Roll: Radhika Agarwal, Tyler Barnes, Kyle Baugh, Donald Brake, Vincent Campiti, Mariah Chambers, Ha Eun Cho, Nivan Chowattukunnel, Matthew Coghlan, Ryan DesCamp, Christopher Dietrich, Alexander Elias, Ian Emmons, Justine Galambus, Hendrik Glauninger, Kaitlyn Goggins, David Haak, Samantha Harvey, Robert Henderson, Taylor Hero, Kristin Hunter, Logan Keating, Hanui Kim, Alisa Klepach, Victoria Kneller, Kevin Kuo, Luke Kurowski, Emilee Larson, Boran Mao, Joseph McCann, Keerthana Mohankumar, Youbin Pan, Jay Parekh, Grace Park, Parth Patel, Matthew Payne, Michael Peng, Brooks Platt, Austin Portolese, Andjela Radmilovic, Samir Reddigari, Alexandra Roper, Stephanie Rosa, John Rose, Jared

Salisbury, Molly Scripture, Juan Serna, Hajeung Song, Chiang Teng Tan, Lauren Wahle, Emma Winkler, Sen Xiong, Anirudh Yalamanchali, Jason Zappia

Junior Honor Roll: Alec Bell, Ethan Brinkman, David Burke, Daniel Cox, Laura Daily, Alex Duckworth, Mark Hazelbaker, Corrine Kumar, Bryce Manifold, Joshua Mann, Molly McFadden, Brittany Olson, Andrew Rejer, Cari Rice, Mitchell Rice, Benjamin Richter, Alaina Roy, Paige Schultheis, Connor Singrey, Theresa Spech, Albin Vleck, Brett Walker, Alexander West

Sophomore Honor Roll: Arthur Cross-Naiafi, Jasper Dittmar, Stephen Feldhake, Sarah Harpring, Logan Hille, Christine Hustmyer, Samantha Lisy, Sophia McClain, Enze Miao, Catherine Morgan, Adam Nan, Matthew Pappas, Gina Roesch, LeeAnn Sager, Eda Shi, Andrew Stark, Jessica Tice, Wyatt Wright

Freshman Honor Roll: Peter Leonard

Chemistry Honors Program

The following students are BS majors in chemistry or biochemistry, have maintained a minimum grade point average of 3.3, and have completed a research project and thesis.

David Abraham, Kenan Alibegovic, Lily Delalande, Ian Emmons, Robert Henderson, Isaak Layman, Clara Leonard, Laura Oehlman, Brooks Platt, Andjela Radmilovic, Andrew Thiery, Anirudh Yalamanchali

Phi Beta Kappa Fall and Spring Inductees

Radhika Agarwal, Tyler Barnes, Kyle Baugh, Donald Brake, Maria Chambers, Lily Delalande, Ryan DesCamp, Jese Dority, Alexander Elias, Ian Emmons, Adam Given, David Haak, Robert Henderson, Taylor Hero, Logan Keating, Victoria Kneller, Kevin Kuo, Emilee Larson, Youbin Pan, Priya Parikh, Matthew Payne, Brooks Platt, Andjela Radmilovic, Samir Reddigari, Alexandra Roper, Stephanie Rosa, Elizabeth Schueth, Molly Scripture, Anirudh Yalamanchali, Jason Zappia, Sierra Ziska, Madelin Zook



Singing of the Alma Mater by our graduating seniors and Chemistry faculty closing the 2015 Chemistry Honors Banquet.

Departmental Scholarships and Awards

S117: **LeeAnn Sager**

Organic Chemistry: **Eric Pan**

American Chemical Society Award: **Grace Park, Brooks Platt**

Keith Ault Scholarship: **Anne Lietzke**

William H Bell Award: **Nicholas Baird, Samantha Harvey, Connor Hannon**

John H. Billman Scholarship: **Samuel Patterson**

Harry G. Day Summer Research Scholarship: **Nicholas Baird, John Belt, Mariah Chambers, Jonathan Ellefsen, Joseph McCann, LeeAnn Sager**

Leroy Dugan Scholarship: **Molly McFadden**

Harlan English Scholarship: **Emilee Larson, Luke Kurowski**

Courson Greeves Scholarship: **Patrick Gamache**

R.J. Grim Memorial Scholarship: **David Burke, Mariah Chambers, Ha Cho, Hendrik Glauning, Joseph McCann, Christine Yang**

Hypercube Scholar Award: **LeeAnn Sager**

Margaret C. & Anne Marie Kuzmitz Scholarship: **Anne Laughlin**

Russell & Trula Sidwell Hardy Scholarship: **Jasper Dittmar**

Ira E. Lee Summer Research Scholarship: **Connor Hannon, Alisa Klepach**

Andrew Loh Scholarship: **David Abraham**

Robert & Marjorie Mann Scholarship: **Joseph Anderson, David Burke, Austin Collins, Kara Osburn Frank Mathers**

Undergraduate Summer Research Scholarship: **Lucia Bracco, Adam Oldham**

Dennis Peters Scholarships: **Joseph Anderson, Clara Leonard, Paige Dausinas, Samuel Patterson** William G Roessler Scholarship: **Alisa Klepach**

Joseph B. Schwartzkopf Award: **Molly Scripture**

Raymond Siedle Scholarship: **Priscilla Choo, Samantha Harvey**

Sturdevant Summer Scholarship: **Molly McFadden**

Lee J. Todd Chemistry Memorial Scholarship: **Luke Schkeryantz**

Enola Rentschler Van Valer Trafford Scholarship: **Lauren Wahle, Andjela Radmilovic**

Viola Scholarship in Nuclear Chemistry: **Anirudh Yalamanchali**

Votaw Undergraduate Summer Research Scholarship: **Eleni Salyers**

Forest L. Warner Scholarship: **Devin Jones, Parth Patel**

Francis & Mildred (Eckerty) Whitacre Scholarship: **Joshua Mann, Brett Walker**

James C. White Memorial Chemistry Scholarship: **Ian Emmons**

Mary Frechtling White Memorial Chemistry Scholarship: **Lily Delalande**



2015 G410: Research Capstone participants from left to right: Andrew Thiery, Ian Emmons, David Abraham, Robert Henderson, Anirudh Yalamanchali, Brooks Platt, Isaak Layman, Clara Leonard, Kenan Alivegovic, Sarah Reifeis, Lily Delalande, Daivd Hak, Andjela Radmilovic, Maxwell Sterrett, and Laura Oehlman.

Minority Association of Pre-Medical Students (M.A.P.S.)

IUB-MAPS is dedicated to encouraging, retaining, and empowering minority students pursuing careers as healthcare professionals. We strive to break down barriers of inequity and develop leaders of change by engaging in community service and outreach, promoting academic excellence and acknowledging cultural accomplishments.

Although hundreds of MAPS chapters exist across the country to support minority undergraduate students pursuing careers in medicine, the Bloomington chapter is unique: IUB-MAPS promotes the needs of **all** pre-health students in the spirit of inclusion and advocates for students of all backgrounds.

MAPS is soliciting for undergraduate scholarships to help students offset costs toward professional school applications. Each year, we award two \$200 scholarships to two pre-health *minority* students chosen through an application process. If you have questions, would like to be a mentor or guest speaker, or would like to help support a student, please send your partial or full donation to the address below.

Minority Association of Pre-Medical Students

900 E. 7th St., Office No. 771

Bloomington, IN, 47408

iuamaps@indiana.edu; iuamaps.webs.com





1.) Professor Dennis Peters, 2.) Professor Romaldo DeSouza, 3.) Professor Jeff Zaleski, 4.) Professor Jill Robinson, 5.) Professor Michael Edwards, 6.) Professor Sara Skrabalak, 7.) Keerthana Mohankumar, 8.) Molly Scripture, 9.) Andjela Radmilovic, 10.) Sierra Ziska, 11.) Clara Leonard, 12.) Yoshitomo Masaki, 13.) Kyle Baugh, 14.) Corinne Karch, 15.) Emily Shay, 16.) Rikki Luebke, 17.) Ally Shambaugh, 18.) Mercedes Jung, 19.) Nivan Chowattukunnel, 20.) Jennifer Sitko, 21.) Timothy Cho, 22.) Rigoberto Hernandez, 23.) Beth Boris, 24.) Emma Winkler, 25.) Di Wu, 26.) Yifan Qi 27.) Juan Padilla-Arriaga, 28.) Rachel Wise, 29.) Professor Charles Dann III, 30.) Professor Laura Brown, 31.) Elizabeth Schueth, 32.) Gerel Richey, 33.) Isaak Layman, 34.) Taylor Hero, 35.) Stephanie Richards, 36.) Adam Given, 37.) Kayla Ballard, 38.) Alyssa Jones, 39.) Ryan DesCamp, 40.) Taylor Harmon, 41.) Sarah Cummins, 42.) Mary Troyer, 43.) Victoria Kneller, 44.) Toni Young, 45.) Brooks Platt, 46.) Kayla Clark, 47.) Christopher Parr, 48.) Matt Payne, 49.) Professor Benjamin Burlingham, 50.) Professor Steven Tait, 51.) Professor Norman Dean, 52.) Josh White, 53.) Jeremy Bowinkel, 54.) David Abraham, 55.) Mathew Coghlan, 56.) Amanda Garfield, 57.) Benjamin Bacon, 58.) Andrew Russell, 59.) Benjamin Ryan, 60.) Kenan Alivegovic, 61.) David Haak, 62.) Stephanie Rosa, 63.) Daniel Jayasuriya, 64.) Matthew Hodge, 65.) Laura Oehlman, 66.) Alexander Upwards, 67.) Lily Delalande, 68.) Ben Stivers, 69.) Maxwell Sterrett, 70.) Hayley Smith, 71.) Alexander Elias, 72.) Austin Portolese, 73.) Robert Henderson, 74.) Andrew Rusch, 75.) Jared Salisbury, 76.) Benton Huang, 77.) Ian Emmons, 78.) Anirudh Yalamanchali, 79.) Radhika Agarwal, 80.) Michael Julovich, 81.) Professor Ken Caulton, 82.) Professor Lyudmila Bronstein, 83.) Olivia Sanchez-Felix, 84.) Professor Cate Reck

Alumni profile, in memoriam: **William G. Mays**
(BS '70, MBA '73, ScD '00) Distinguished Entrepreneur,
Publisher and Community Citizen.

William G. Mays (Bill), was an entrepreneur, publisher and a community citizen. In the last few decades, Mays became recognized as Indiana's most successful African-American businessmen. Mays established Mays Chemical in 1980, and he developed it into one of the world's largest chemical distributors: a company recognized as a source for chemicals, related raw materials and chemical management expertise. At the time of his death on December 4, 2014, Mays Chemical was the sixteenth largest African-American owned Industrial/Service Company in the country, according to Black Enterprise Magazine.

Bill Mays was born in Evansville, Indiana on December 4, 1945. His parents, Joy J. Mays and Theodore C. Mays, Sr. were both teachers. Bill was the youngest of three, having two older brothers, Theodore, Jr. and Robert, who are twins.

Bill attended an all-black Evansville Lincoln High School until integration was implemented his senior year. He participated in football while demonstrating strong academic skills. Graduating in 1963, as the highest ranked male academically from Evansville Central High School, he started at Indiana University in Bloomington, majoring in Chemistry and receiving a Bachelor of Arts degree in 1970. His interest in chemistry was influenced and developed by his father, a college chemistry professor. He was initiated into the Alpha Chapter of Kappa Alpha Psi Fraternity in 1964, Bill Mays was an active participant holding several offices including president.

Early success came through accepting a Consortium Fellowship, citing the desire for more formal business training. Majoring in Marketing and Finance, he received a Master of Business Administration degree from Indiana University in 1973.

Bill Mays has received four Honorary Doctorates, a Doctor of Laws in 1995 from Martin University, Indianapolis, Indiana; a Doctor of Science from the University of Evansville in 1997; a Doctor of Science, Indiana University-Bloomington in 2000; and a Doctor of Science from Marion College, Indianapolis, IN May 2001.

Bill Mays had a series of early positions in industry which helped ready him for future success: test chemist at the Linkbelt Facility in Indianapolis; a sales position with Procter and Gamble (P&G) in Cincinnati, Ohio being promoted to Account Manager; market planning at Eli Lilly Company in Indianapolis; and Assistant to the President with Cummins Engine Company in Columbus, Indiana. At Cummins Engine Company, he moved into corpo-

rate planning with responsibilities for worldwide coordination of engine demand forecasting. This position married his training in marketing, finance and manufacturing.

After four years with Cummins, Mays was offered an opportunity to be president of a small chemical distributorship in Indianapolis. During his three years as president, sales of that company increased from \$300,000 to \$5 million. In 1980, he resigned from Specialty Chemicals, a division of Chemical Investors, due to a disagreement in philosophy and principle. He protested a change in the racial composition of Specialty's Board of Directors and refused to continue marketing the company as minority-run when it was not. He subsequently purchased what was left of the company in 1985.



Photo Credit: Tony Valains/Indianapolis Monthly

Mays Chemical Company, Inc.

In March 1980, Mays started Mays Chemical Company, Inc. He began as a one person operation who sold and processed orders himself. During the first year he doubled his \$1 million sales objective. By 1990 (10 years), the company grew to \$50 million and within the next five years, sales doubled to over \$100 million. Currently, Mays Chemical has over 180 employees and over \$180 million in sales. There are facilities in Indianapolis, Chicago, Detroit, New Jersey, Canada and Puerto Rico, with contract warehouses throughout the United

States. Though the company mainly serves clients in 50 states, Canada and Puerto Rico, sales are growing globally. Approximately five percent of the sales are outside of North America. The four main industries served are food, pharmaceutical, beverage and automotive. Major customers include General Motors, Ford, Daimler Chrysler, Delphi, Eli Lilly, Abbott, Pfizer-Pharmacia, Kellogg's, General Mills, Procter and Gamble, Phillip Morris Companies, Miller Brewing and Pepsico.

Mays Chemical Company has won numerous awards for excellence including the National Minority Supplier Development Council's Largest Sales Category Supplier of the Year, twice; and six times, the General Motors Outstanding Supplier of the Year Award that is given to the one percent of their top suppliers worldwide. Mays Chemical Company is listed as one of the 15 largest chemical distribution companies in North America and is ranked in the top 20 on Black Enterprise magazine's most successful Black-owned companies roster since 1995.

In 1990, Bill Mays purchased the Indianapolis Recorder, the nation's fourth oldest surviving black newspaper. Since becoming Publisher, the newspaper has received many awards including the National Newspaper Publishers Association's Merit Award for Best Youth Section, Best Editorial Cartoon, Best Use of Photographs and Best Special Section. The Indianapolis Recorder has a solid readership greater than 100,000. Mays was majority

ALUMNI PROFILE

owner of IBL, LLC, minority owner of Shirk, Inc., and a member of the Board of Directors of Hoosier Broadcasting Corporation from 1993 – 2000.

Locally, his many community achievements include being the first African-American to serve as Chairman of Campaign for the United Way of Central Indiana in 1991, Chairman of the Indianapolis Chamber of Commerce in 1993-94; and Chairman of the Annual Campaign for the Indianapolis Museum of Art in 1996. He was the first African-American appointed to chair the Indiana Hoosier Lottery Commission in 1991.

His list of honors and awards for Bill Mays is extremely lengthy, and he served on a wide variety of for-profit and non-profit boards and organizations.

Bill is survived by his wife, Dr. Rose Mays; daughters, Heather Mays-Wood and Kristin Mays-Corbitt; four grandchildren, 3 bonus grandchildren; brother, Robert Mays of Evansville; and a host of other relatives and close friends.

William Mays is recognized as Indiana's most successful African-American businessman. He had a charismatic, yet laid-back, easy manner about him, who likes to roll up his sleeves and get down to work. If one could translate his business sense into a mantra, it would be; substance is more important than color. He believes to be a successful entrepreneur you need education, experience and access to capital. You also must be able to sell yourself, build and maintain a strong banking relationship, plan strategically, control growth, attract and retain outstanding personnel, and balance family, business and community.

Donations in his recognition can be made to: Indiana University Foundation (Theodore C. Mays Chemistry Fellowship), Showalter House, 1500 N. State Road 46 Bypass, Bloomington, IN 47408 or Kappa Alpha Psi Foundation, 2322 N. Broad Street, Philadelphia, PA 19132.

This year's recipients of the **Theodore C. Mays Fellowship** are Department of Chemistry graduate students, **Keevan Marion** and **LaToya Rush**.



Toya Rush is from Albuquerque, NM. She is a second year organic chemistry graduate student working under Prof. Tom Snaddon. Toya is currently working on a natural product total synthesis project. After completing her Ph.D., Toya would either like to go back into the pharmaceutical industry or work for a law firm as a technical expert/patent agent.



Keevan Marion is a native of Cincinnati, Ohio where he received his Associate's degree from Cincinnati State Technical Community College in Chemical Technology (2009) and his Bachelor's degree from the University of Cincinnati in Chemistry (2012). While obtaining his Associate's and Bachelor's degree, he co-oped/interned with the Procter & Gamble Company at the Sharon Woods Innovation Center in Blue Ash, Ohio. During his time at P&G, he contributed and led projects in Head and Shoulders, Herbal Essences, Pantene and other shampoo/conditioner platforms. During his undergraduate studies at the University of Cincinnati, he obtained academic research experience by performing research in inorganic chemistry, focusing on synthesizing platinum complexes and generating fluorescent sensors sensitive to moisture. In 2012, Keevan joined Indiana University Department of Chemistry Doctoral Program working in the Pohl Research Group. His research focus is carbohydrate synthesis with one of his major projects investigating Human Milk Oligosaccharides. His future plans consist of industry and government research, as well as starting his own company.

Kristina (Stephenson) Munoz

During my sophomore year of high school we made timelines for our lives as part of an activity for class. Aside from lots of other interesting goals, I remember specifically how I said I would become the Director of Research and Development at Johnson and Johnson . . . by age 27. I had figured that that I was heading to college for a chemistry major; I'd graduate in four years, land a job at J&J, and then climb up in ladder there in another five. Needless to say that's not exactly how it panned out. No discredit to my high school, but I didn't really even know a Ph.D might be necessary for this career path, and how it would impact my timelines.



I was enjoying my chemistry degree classes at IU, got into a research group after my sophomore year and enjoyed that as well. I guess I finally just thought, well, I guess I'll pursue my Ph.D. That's what it seemed like everyone else was doing anyway. And it was going to be free, so what's the harm. I applied to Ph.D. programs all over the country. It really wasn't that hard to get accepted, even with my far from perfect transcript. I had a great time checking out the schools and meeting other perspective students on recruitment weekends.

I ended up choosing to go to UCSD. I liked the program, the applied-type research many groups were doing there, the people, and San Diego. If I was going to move somewhere for five years, I thought it couldn't hurt to love the location. The year started and I was loving it. I actually liked the classes, even though I expected to dread them.

After the first year, we started to choose our research groups. I started working for a great Inorganic professor with a solid reputation and plenty of funding. It, too, was fun at first. Learning something new, making new friends, and really feeling that this was the beginning of my career.

Unfortunately, for me, that feeling was short-lived. I soon came to dislike independent research. For me it was very lonely and I was quickly unmotivated. It was hard for me to work on a project by myself . . . for years . . . Sure, I had a very supportive group where everyone was happy to bounce ideas around, but it was different when we were not working toward the same goal. It was hard for me to only be focusing on the *one project* and to be the *only one* focusing on it.

So after my second year, after the exam that would qualify me for my Master's degree, I had a conversation with myself about how realistic the idea was of my getting a Ph.D. I arrived at the fact, that I could finish my PhD, I could just press forward, but that I didn't really want it badly enough. It was hard and very scary to leave the program. I didn't know what I was going to do. Graduate school had been the status-quo, easy answer.

Luckily, everyone, including my PI even, was really supportive. I was allowed to TA for the next semester while I looked for a job. San Diego is a great place for jobs in science. I ended up landing a job as a Research Associate at Illumina, one of the leading biotech's in the area, and I'm still here today. It has really been an awesome experience. The company has grown tremendously since I started and I've grown right along with them. I achieved a personal milestone two years ago: being promoted to the scientist level, the same starting level as a Ph.D. I also have my own group within the department. So it may have taken me two years longer to get here, but I was so much happier getting there. And my path has given me an excellent reputation and network within the company and, accordingly to my managers, a very promising future. I also managed to marry my husband and have two beautiful baby boys along the way.

So my life may not look exactly how I planned it in my sophomore year of high school, but it's perfect just the way it is.

Rich Facko

I'm a 2005 graduate of the biochemistry program, and I can say that my IU education prepared me well for dental school and beyond. With a strong foundation in many of the classes taught in dental school, I had a head start and actually found most of the repeat classes to have been more intense at IU than in dental school (although dental school was at a much faster pace). Overall I am very pleased with my choice of of majors at IU.



continued on page 39

We remember those in the IU Chemistry family who have passed away during 2014. Included here are deaths of which we learned this year.

**degree year shown is deceased alumni preferred class year*

Esther Adams, MA '31, March 6, 2014

Carl H. Ault, MD '41, February 25, 2014

Teresa A. Beckman, MD '81, October 13, 2014

John A. Bommann, PhD '58, October 20, 2014

Alan M. Bornstein, MD '54, June 23, 2014

Taylor G. Bowen, BS '51, February 7, 2014

Harold H. Burgess, BA '49, December 18, 2014

Mary K. Campbell, PhD '66, May 21, 2014

Robert L. Carpenter, BA '41, December 7, 2014

Woodrow W. Conover, PhD '73, December 7, 2014

Karl D. Coyner, MS '64, November 17, 2014

David A. Dalman, MS '67, July 5, 2014

W B. Davis, DDS '55, April 6, 2014

David L. DeVillez, MD '65, July 4, 2014

Paul B. Dorain, PhD '54, July 19, 2014

Richard A. Gard, MD '74, April 29, 2014

Ruth T. Hall, MA '67, June 6, 2014

Chester A. Jastremski, MD '63, May 3, 2014

Grant C. Kalivoda, BA '69, February 8, 2014

Ralph Karler, BA '50, December 2, 2014

Donald P. King, MD '43, April 26, 2014

Timothy J. Laughlin, BA '84, December 21, 2014

Dennis W. Lindle, BS '78, October 5, 2014

Jerry D. Martin, BA '66, August 30, 2014

Louis C. Mavis, BA '56, September 6, 2014

William G. Mays, MBA, Honorary PhD '70, December 4, 2014

Richard N. McCarty, PhD '72, March 9, 2014

Wayne R. Merriman, BS '52, December 11, 2014

Wendell S. Miller, MA '56, February 17, 2014

William A. Misch, MD '43, January 29, 2014

Minas Prodromos Georgiadis



Minas Prodromos Georgiadis, Professor Emeritus at the Agricultural University of Athens, Greece, died on May 14, 2015. Minas was born in Athens, Greece of Asia Minor refugee parents on February 2, 1925 and obtained his undergraduate degree in Chemistry at the University of Athens. He obtained his MS degree in Biochemistry from the University of Illinois, Champaign Urbana, followed by a PhD in Organic Chemistry at Indiana University, Bloomington completing his thesis with Dr. Ernest Campaigne. After postdoctoral studies with Dr. Carl Schaffner at the Institute of Microbiology, Rutgers University, Piscataway, NJ, he accepted a position as a research scientist with Ayerst, McKenna and Harrison in Montreal, Canada where he worked for 7 years before returning to Greece in 1972 to accept a position as Professor of Chemistry at the Agricultural University of Athens. Minas enjoyed a productive and creative academic career in Greece where his research focused primarily on the synthesis of sugars from furans using a modified Strecker reaction. He was a Visiting Professor of Chemistry at the University of Illinois at Urbana-Champaign, 1983, and at Wayne State University, Michigan, 1991-1992. After officially retiring, he continued to supervise research as a visiting Research Professor at the Institute of Organic and Pharmaceutical Chemistry, National Research Foundation (Athens, Greece) 1995-1997. He is survived by his wife, Vassiliki, whom he married in 1958, sons, Gregory and Taxiarchis, daughters Rosina and Katy, and seven grandchildren.

Roy L. Mosemiller, MA '42, February 14, 2014

Susan H. Muench, MS '84, October 6, 2014

Joseph W. Nemecek, MA '44, August 24, 2014

Robert S. Nickel, BA '51, March 15, 2014

Douglas L. North, MS '50, June 7, 2014

Martin W. Norton, BA '50, May 2, 2014

Donald E. Oljace, DDS '53, November 4, 2014

Raymond F. Parker, OD '49, August 8, 2014

Joe L. Parson, DDS '49, September 15, 2014

Raymond L. Reed, MD '48, February 24, 2014

Donald G. Rose, PhD '54, April 6, 2014

Hubert A. Seller, DDS '43, January 17, 2014

John A. Shively, MD '44, April 16, 2014

Blanche E. Skidmore, MA '42, June 26, 2014

Leota G. Smith, MS '41, April 16, 2014

Emery J. Spisak, DDS '62, January 9, 2014

James W. Stanway, MA '70, June 10, 2014

Joseph N. Tansey, MA '60, September 20, 2014

James E. Van Verth, PhD '57, August 19, 2014

Ralph L. White, PhD '67, September 25, 2014

John S. Wilson, MA '39, August 23, 2014

Phyllis K. Zerfas, MD '44, July 19, 2014



Ruhangiz Rezaaiyan



Ruhangiz (Ruhi) Rezaaiyan, regulatory manager at Syngenta Crop Protection, died on July 29 in Greensboro, N.C. Ruhi earned her B.S. in Chemistry at Sharif University of Technology, in Iran, 1976 and her Ph.D. in Analytical Chemistry at Indiana University in 1985. "Ruhi had a unique, collaborative, and trusted way of working and teaching. She was highly respected by Syngenta teams around the world and by regulatory staff at the Environmental Protection Agency. Ruhi was known for her regulatory/science knowledge and expertise, and her vivacious, generous, and gracious personality. Ruhi lived life to the fullest, and she relished spending time with family and friends. She was a fabulous cook and loved to travel, entertain, and share favorite dishes from her homeland along with wonderful cups of tea and conversation. We will deeply miss Ruhi and her friendship, smile, laughter, straightforwardness, wisdom, and passion," writes her husband, Jahangir Emrani. Ruhi is also survived by her son, Darius Emrani, and daughters Bitra and Gloria Emrani.

Thankfully adapted from Chemical and Engineering News.

If you would like to submit an obituary to be included in the next issue, please send the information and a photo to chemalum@indiana.edu

Aleyamma Abraham	John Chambers	Robert French	Christopher Hoham
Robert Ake and Joyce Neff	Andrew and Gloria Chmiel	Mark Fromhold	Bruce Holder
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Donald Ball	Jack and Judith Crandall	Gregory and Catherine Georgiadis	Judith Jass
Richard and Janice Barber	Arnold Crelier	Taxiarchis and Millie Georgiadis	Alex and Elaine Jeffcoat
John and Mary Bart	David Dai	Linda Gilman	Celia Jenkins
Larry and Karen Becker	Dwight Davis	David Ginger and Van Huynh	John Jewett
Jean Beckman	Vincent and Antoinette Davisson	C. Thomas and Julie Gnewuch	Chang Ji
Uma Bedi	Robert and Marilyn Day	Stephen Jr. and Carole Godomsky	Eric Johnson
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Mohammad and Nancy Behforouz	Romualdo and Kelly DeSouza	Patricia and Carl Golgart	Jurjus Jurayj
Nicholas Bensko	Alan Dickinson	Raymond Grant	"John Kagel, Jr."
Genia Berk	Kirsten Dickson	Christopher Growcock and Martha Kapitz-Growcock	Jerry Keilsohn
Rod Berman	Donald and Donna Dieball	Robert Guda	Charles Kelley
Vidya Bhandiwad	Arthur and Carolyn Dising	Charles and Catherine Gwaltney	Robert III and Judith Kelly
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"John Burks, Jr."	James Ferris	Zachary and Judy Hodes	Daniel and Leona La Perriere
John and Emily Canada	James Fields		
William Jr. and Mary Carroll	Sally Foley		
Kenneth and Lyuda Caulton	William Forgey		

2014-2015 HONOR ROLL

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			Allan Stoner	Yun Yu
			Robert Sydor	James Zabrecky
			Andrew Szumlas	Jeffrey Zaleski
			Chester Talbott	Zhong-Quan Zhao
			Loon-Seng and Katherine Tan	Morris Zimmerman
			Megan Thielges	
			Andrew Jr. and Martha Thieman	

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Bloomington, IN 47402

Continued from Rich Facko (Alumni Profile), pg 33.

While at IU, I was a member of the honors college. While many of the honors classes were more rigorous than others, this was in my opinion the greatest asset to my education. I benefited from very small class sizes, knew all of my professors (and they knew me!). This helped to keep me accountable for doing well in class. The small class size also ensured that many classes, year after year, were with most of the same classmates. Over the years we developed quite the camaraderie, and although not at the same level it still exists to this day. I'm grateful to IU, the Chemistry Department, and the Honors College for leading me along the path that I am on today.

While I don't have many regrets about my college education, if I could do it all over again there are a few things that I may have done differently. Some of my friends were involved in undergraduate research in Chemistry or in other departments. I did not think that it would be very exciting at the time, but looking back I think that being involved in the research process would have helped me a lot in the future. I now have a Master's in Oral Health and learned about the research process eventually, but a stronger background in college would have better prepared me for what was ahead. Finally, by the end of college, we had an outstanding group of friends to study with. Once our study group was firmly established, I noticed my grades improved, and I was



having a lot more fun too. Had I been more open to group study earlier in college maybe I would have seen the benefits throughout college, rather than only at the end.

One unexpected experience was with the guidance department within the chemistry department. I was not originally a biochemistry major. I remember on my first day of orientation meeting with an advisor from another department and feeling very disconnected from the advice and class schedule that was recommended. When I came to the chemistry department I found all of the staff and professors to be truly interested in my education. They served as mentors to me, and provided advice that not only got me through college, but that helped to make me a better person. I am very grateful to have had the many interactions within the department, and that everyone took the time to get to know me as a person. This really surprised me for such a large university.

In all, my education at IU was a great investment. I received an education that prepared me for professional school and a Master's degree, and I made some very good friends along the way. I also had the support around me while at IU to help me succeed academically and grow as a person. I'll always be grateful for the way that IU Chemistry has positively affected my life.



Continued from Libraby News, pg 19.

She is here year-round managing our technology, class reserves, corps of student employees, stacks, and the myriad questions we receive about collections.

I have been busy meeting with lab groups this spring to learn how students are using our libraries and where I can be of most help. I have arranged to start a monthly database workshop schedule to cover: SciFinder, Reaxys, Scopus, Web of Science, and EndNote. I continue to chair the Libraries' Data Management group as we build services to support researchers in complying with funder and publisher data sharing requirements.

The IU Libraries promoted me to the Head of Sciences this summer, and I am delighted to report that we are hiring a health sciences librarian who will take responsibility for several programs that I have been serving since Emeritus Chemistry Librarian **Roger Beckman's** retirement in April 2014. I'm looking forward to adding our new colleague to the other two librarians and four branch coordinators in our department. Please come by the Library to chat with us if you are in the area or send me email: jlaherty@indiana.edu.



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