



# Mudd In Your Eye

Newsletter of the Department of Chemistry, Lehigh University

Number 43 January 2015

*"Great importance is given to chemistry as an elementary branch of learning." — Lehigh Register 1866*

## FROM THE DEPARTMENT CHAIR - Professor Robert A. Flowers II

The 2013-2014 academic year was a busy and rewarding one for the department of chemistry. We continue to have unprecedented enrollments in our undergraduate courses. We've continued to add new sections to our general chemistry and organic courses. In addition, we now teach over 100 students in the Biochemistry 1 course and nearly 80 students in our undergraduate quantum course. We've continued to do our best to provide smaller lab and studio sessions in our lower level courses to provide the small class style and lab instruction important for our students since this is an important part of the Lehigh University experience. During the past two years we've been renovating the teaching labs on the second floor of the Seeley Mudd building to further facilitate instruction in modern laboratory techniques. Room 223 houses our advanced lab sequence and our upper level lab in biochemistry techniques. Room 227 houses our physical chemistry labs.

The renovations are now complete and pictures of the renovated labs are shown below. We are grateful to the Provost for supporting this initiative and now have modern teaching

Bonus Award. This award is given to employees who perform above and beyond what is normally expected by the University.

Marge Sawyers received a Tradition of Excellence Award for her outstanding contributions to the mission of the Department. Marge's award was recognized at a department gathering in October. Finally, Natalie Foster was selected as a 2014 ACS Fellow. The department is pleased with the hard work, and high level of scholarship of our students, faculty, and staff and we look forward to continued success in teaching and scholarship.

In addition to the news above, we welcome two new faculty members (**Mark Chen** and **Xiaoji Xu**) to the department. Mark is an organic chemist who focuses on the discovery and development of new electroactive organic materials. Please see page 3 for more details. Xiaoji's research focuses on studying the organization and interaction of molecules in heterogeneous functional materials with chemically sensitive, super-resolution imaging techniques. See page 3 for more info.



laboratories at all levels of our undergraduate curriculum.

Our students, faculty, and staff have continued to excel. Dr. Kimberly Choquette, Ph.D. '13 received a prestigious NIH postdoctoral fellowship for her work in the laboratory of Professor Abigail Doyle at Princeton University. Several of our staff have been recognized for their contributions to the University as well. Aliana Lungu received a Spot Bonus



Seeley Mudd 223 (on left) Mudd 227 (above)

These are very exciting times for the Department and I thank all of you for your letters containing updates and news. Your continued support of the department is greatly appreciated. Please don't hesitate to stop by if you are in the area and want to see the big changes occurring in the department.

## FACULTY NEWS

**Greg Ferguson** co-authored with Kevin Cook “Relative Lability of Gold-Oxide Thin Films in Contact with Air, Solvents, or Electrolyte Solutions,” in *J. Vac. Sci. & Technol.* Greg also published “Spatially Selective Formation of Hydrocarbon, Fluorocarbon, and Hydroxyl-Terminated Monolayers on a Microelectrode Array” with Kevin Cook and Daniel Nissley in *Langmuir*. Greg collaborated with C.-H. Lin, and Manoj Chaudhury of Chemical Engineering to publish “Electrokinetics of Polar Liquids in Contact with Non-polar Surfaces” in *Langmuir*.

**Robert Flowers** presented the ACS Chemistry week lecture at Washington College in October 2013. He was an invited speaker at PittCon in March 2014 and presented a lecture entitled: “Application of Back-Scattering Interferometry in the Study of Biomolecular Interactions and Interactions in Non-Aqueous Media”. He was also a keynote speaker at the IUPAC International Conference on Physical Organic Chemistry in August 2014. Bob’s lab was featured in the inaugural issue of *JoVE (Journal of Visualized Experiments)*. Research by post-doctoral fellow, Dhandapani Sadasivam and graduate student, Kimberly Choquette were featured. *JoVE: Chemistry* (established in February 2013) focuses on the methodology within chemistry and chemical preparation across multidisciplinary fields. His group also published four papers and a book chapter: “Uncovering the Mechanism of the Ag(I)/Persulfate-Catalyzed Cross-Coupling Reaction of Arylboronic Acids and Heteroarenes” in the *Journal of the American Chemical Society*, “Mechanistic studies on the CAN-mediated intramolecular cyclization of  $\delta$ -aryl- $\beta$ -dicarbonyl compounds” in the *Beilstein Journal of Organic Chemistry*, “Substrate-Directable Electron Transfer Reactions. Dramatic Rate Enhancement in the Chemoselective Reduction of Cyclic Esters using  $\text{SmI}_2\text{-H}_2\text{O}$ : Mechanism, Scope and Synthetic Utility” a collaborative work paper with the group of David Procter at the University of Manchester in the *Journal of the American Chemical Society*, “Substituent Effects and Supramolecular Stabilization of Titanocene(III): Implications for Catalysis in Single Electron Steps” in the *Journal of the American Chemical Society*, and “Sm and Yb Reagents” in *Comprehensive Organic Synthesis, 2<sup>nd</sup> Edition*.

**Jebrell Glover** presented a paper at the Frontiers in Structural Biology of Membrane Proteins Conference. He also presented invited lectures on caveolin at five colleges and universities. Jebrell was selected to receive the Class of 61 Professorship. This highly competitive Professorship recognizes faculty who have achieved the rank of associate professor and have shown excellence in teaching, research and service. He also received the Eleanor and Joseph F. Libsch Early Career Research Award, honoring a faculty member or members early in their research career demonstrating the potential for high-quality research and scholarship.

**Ned Heindel** presented papers at two conferences: the 7th Annual Conference on Counter Terrorism (DC), June 24-26 and the SHAC Conference on Important Chemistry Books (London, UK) Nov, 8-11. Ned also presented a Howard Hughes BioSciences Honors Seminar “Point of Care Testing” at Lehigh as well as a lecture on “Antidotes to Terrorist Toxins” at the University of Arkansas School of Medicine (Little Rock) and a “Burn and Blister Therapeutics” lecture at a Sigma Xi Chapter in Arkansas. Ned co-authored a journal article “Pharmacokinetics and Metabolism of SRX246” in *J. Pharm. Sci.*

**Heather Jaeger** presented a lecture on “First-Principle Exciton Dynamics in Nano-Scale Materials” at Indiana University of Pennsylvania.” Heather has acquired and configured a state-of-the-art computing cluster for research to be carried out by group members and collaborators. Heather co-authored “Decoherence Reduces Thermal Energy Loss in Graphene Quantum Dots” in *Appl. Phys. Lett.* and “Exciton Multiplication from First Principles” in *Acc. Chem. Res.*”

**Kai Landskron** co-authored two journal articles— “Investigation of High-Pressure and Temperature Behavior of Surfactant-Containing Periodic Mesostructured Silicas” in *Crystal Growth and Design* and “Synthetic Chemistry with Periodic Mesostructures at High Pressure” in *Acc. Chem. Res.* Kai recently co-authored “Large-pore periodic mesoporous silicas with crystalline channel walls and exceptional hydrothermal stability synthesized by a general high-pressure nanocasting route” in *Crystal Growth and Design*.

**David Moore**, along with two of his graduate students, Nina Jarrah and Angela Smith, presented papers and talks at the Fall 2013 National Meeting of the ACS (Indianapolis, IN). David and graduate student Ryan Ludwig contributed a poster for the 2013 National Meeting of the ASMS (Minneapolis, MN). In addition, David and Nina Jarrah presented a talk at the March 2013 National Meeting of the APS (Baltimore, MD). David presented a lecture on “Using cryogenic spectroscopy to elucidate interactions of reactant molecules with nanocatalyst materials” at Tufts University on April 23. He presented lectures on “Matrix isolation FTIR spectroscopy of anionic complexes stabilized via co-deposition of explicit counter-cations: opening up new avenues of inquiry using an old technique” in October at the University of Florida and the University of Georgia. David co-authored “Formation of ionic complexes in cryogenic matrices: A case study using co-deposition of Cu- with rare gas cations in solid argon” in *J. Chem. Phys.*

**Marcos Pires** presented a poster at the American Peptide Society in July 2013 and was Session Organizer for the ACS Fall 2013 Session on “Modulating the Epigenome.” Marcos gave lectures on “Metal-triggered Assembly of Collagen-like Peptides” at SUNY–Albany and at

Lebanon Valley College. Marcos recently published a paper in *ACS*

(continued from page 2)

*Chemical Biology* that was featured in the June 16, 2014 issue of *C&E News*. His group published in *JoVE*. Marcos presented a poster at the Bacterial Cell Surfaces Gordon Conference and he presented at a special MEDI session at ACS San Francisco.

**Steven Regen** presented a paper on “Gas Transport Across Hyperthin Membranes” at the Department of Energy Meeting on Hydrogen Formation. Steve co-authored “Towards Squalamine Mimics: Synthesis and Antibacterial Activities of Head-to-Tail Dimeric Sterol-Polyamine Conjugates”

in *Chemistry and Biodiversity*. He also co-authored “Unexpected Barrier Properties of Structurally Matched and Unmatched Polyelectrolyte Multilayers” in *Chemical Communications*. Another article Steve co-authored was “Yield Strength of Structurally Similar Langmuir-Blodgett Determined by Friction Force Microscopy” which was published in *Phys. Chem. Chem. Phys.* Three more articles which Steve co-authored were “Surface Occupancy Plays a Major Role in Cholesterol’s Condensing Effect in *Langmuir*” and “A 7 nm Thick Polymeric Membrane with H<sub>2</sub>/CO<sub>2</sub> Selectivity of 200 That Reaches the Upper Bound” in *Chem. of Mater.* and “Gas Transport Across Hyper-Thin Membranes” in *Accounts of Chemical Research*.

**Jim Roberts** received the Student Organization Advisor of the Year Award for his work as Faculty Advisor to Alpha Phi Omega, a coed, nonresidential service fraternity. The fraternity was founded on the principles of the Boy Scouts, and is officially recognized by the Boy Scouts of America. Lydia Hunt (the current President) nominated Jim for the award. Jim has completed the development of the Advanced Laboratory Class (CHM 334/335) with its completely modified laboratory space and upgrading of experiments. This advanced series began Fall 2013 in its new location in Mudd 223. Jim continues in his role as Head Usher for Lehigh.

**Keith Schray** served on seven Lehigh committees this year and was original founder and current chair of the Undergraduate Research Symposium held in April. He was assisted in presenting the symposium by the AXE chemistry fraternity.

**Damien Thévenin** presented a poster “Delivery of Therapeutic Peptides to Cancer Cells Using pHLIP” in Waikoloa, Hawaii in June at the 23rd American Peptide Symposium, gave an invited talk at the FASEB Summer Conference on Molecular Biophysics of Cellular Membranes in July, and was Session Chair at the University of Delaware Membrane Symposium in May. He received an NIH-NCI grant in June.

**Dmitri Vezenov** presented an invited lecture at Dalhousie University in Canada on “How to Sequence Genomes by Pulling on DNA Molecules.” He also presented a poster at the Biophysical Society. Dmitri co-authored “Brownian Dynamics Simulation of Peeling a Strongly-Adsorbed Polymer Molecule from a Frictionless Substrate” in *Langmuir* and “Yield Strength of Glued Langmuir-Blodgett Films De-

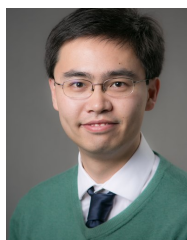
a lecture in November sponsored by LTS. Confluence enables research groups to maintain electronic laboratory notebooks (ELNs), to manage the flow of research into manuscripts conveniently, and to post and share literature, experimental protocols, computer code, instructions and scheduling, chemical inventory, and other research-related resources.

**David Vivic** has given a plenary lecture at the International Workshop on Organofluorine Chemistry in Nanjing, China. He has also given invited talks at the Shanghai Institute of Organic Chemistry, Donghua University, the Bordeaux Fluorine Days Conference, and the Telluride meeting on Accelerating Reaction Discovery. He also presented work at the 2014 ACS Meetings in Dallas and San Francisco, and chaired the session “Organometallic Chemistry—Applications to Organic Transformations” at Dallas. The Vivic lab published four papers: “Organometallic Aspects of Fluoroalkylation Reactions with Copper and Nickel” in *Synlett*, “Electrochemical *Ortho*-Functionalization of Phenylpyridine with Perfluorocarboxylic Acids Catalyzed by Palladium in Higher Oxidation States” in *Organometallics*, “Mild, Safe, and Versatile Reagents for (CF<sub>2</sub>)<sub>n</sub> Transfer and the Construction of Fluoroalkyl-Containing Rings” in *Organometallics*, and “Improved Synthesis, Structure, and Reactivity of 1,4-Bis(trimethylsilyl)octafluorobutane” in the *Journal of Fluorine Chemistry*. One patent was also applied for regarding new fluorinating reagents developed in the Vivic lab.

## NEW FACULTY FACES



**Dr. Mark Chen** joined the department in the Fall of 2014. Mark’s research focuses on the discovery and development of new electroactive organic materials. Specifically, he is pursuing unique design strategies for constructing conjugated molecules and polymers with tailored physical properties. Towards this end, he looks to pioneer new catalytic reaction methodologies to facilitate complex molecule synthesis. Ultimately he aims to study how these novel materials perform in electronic devices and improve upon current benchmarks in organic field-effect transistor and solar cell technologies.



**Dr. Xiaoji Xu** joined the department in the Fall of 2014. His research focuses on studying the organization and interaction of molecules in heterogeneous functional materials with chemically sensitive, super-resolution imaging techniques. Specifically, he uses scattering-type near-field optical microscopy with suitable combinations of visible and infrared lasers to match electronic and vibrational levels of the molecules to investigate composition, distribution and interaction of nano-domains at the material interface. The scattering-type near field technique provides <15 nm spatial resolution, far exceeding the diffraction limit, and enables sub-ensemble studies not previously accessible by traditional spectroscopic methods. His interests lie in energy-related materials, as well as technique development.



## ALUMNI NEWS

**Melanie Rudnick** (BS 2009) graduated from New York Medical College, earning an MD in pediatrics. Rudnick studied pre-medicine at Lehigh University, earning a BS in Chemistry. Rudnick has accepted a three-year residency as a pediatrician at the Connecticut Children's Medical Center in Hartford, CT. Rudnick resides in West Hartford, CT.

**Trevor Daly** (MS 2010; PhD 2012), formerly Visiting Instructor at the Department of Chemistry, Muhlenberg College, has taken a position as Preceptor in the Interdisciplinary Science Learning Laboratories of the University of Delaware.

**Alexander Szewczak** (BA 1987; BS 1987) was named Director, Pharmacology and Assay Operations Site Lead at Merck Research Laboratories, Boston/Cambridge. After Lehigh Alex obtained a PhD in Biochem/Biophysics from Yale and an MBA from MIT.

**Seema Agarwal** (PhD 1995) has accepted an Associate Professorship in the Department of Pathology of Georgetown University School of Medicine.

**Hasnain Malik** PhD (LU BS 2005 ) has a new position as Research Investigator II at Novartis Institutes for BioMedical Research.

**John Spaltro** (PhD 1985) has been named Director, Global Regulatory Strategy - Oncology, Ophthalmology & Digital Medicine at Otsuka Pharmaceutical Companies (U.S.)

**Craig D. Boyle** PhD (LU BS 1989) has accepted a position as an Intellectual Property Legal Intern at Jones-Day Law, a patent and intellectual property law firm in New York City.

**Robert Roache** (MS in Pharm Chem 2008) has been named Scientific Coordinator for the NeuroAIDS Project at Temple University.

**Joseph Karpinski** (MS in Pharm Chem 2002) completed 20 years of research, departing at the rank of Principal Investigator in Medicinal Chemistry from GlaxoSmithKline. Joe is treasurer of the Philadelphia Organic Chemists Club, adjunct professor at Immaculata University, and Chemistry Lab Manager at Eastern University.

**Sherry Rohn Clancy** (MS 1994) worked ten years as a Research Chemist with the Specialty Vinyls Technology Group of Occidental Chemical in Pottstown, PA. The production facility was shuttered in 2005, and the technology group that supported it as well. Her husband Don Clancy, an MS chemical engineer out of Texas Tech, is an Investigator with GlaxoSmithKline and currently leading one of GSK's two mathematical modeling teams. Sherry is fortunate and thankful to be a stay-at-home mom to 3 young children; her future professional career path is uncertain. However, with three hopefully budding STEM scholars, it is certain that re-

**Karl Rahenkamp** (BS 2002) reports that he has just started making use of his chemistry degree this year for the first time since graduation. Upon graduation from Lehigh, Karl moved to Japan and taught English for six years. This year he was given the opportunity to use his chemistry degree again as he's begun working part time as a 10<sup>th</sup> grade elementary chemistry teacher in Keio. He reports that it's been a little slow and strange getting back into chemistry after more than 10 years, but he is definitely enjoying every minute of it.

**David Carrick** (PhD 1983) is Senior Analytical and Catalysis Chemist at Primus Green Energy Co., Hillsborough, NJ. David was formerly with Lloyd Pharmaceutical and American Cyanamid. His current position is in R&D on catalytic processes for the production of liquid fuels from cellulosic waste and natural gas. David also develops methods for the analysis of in-process and final product streams.

## RICK MERRITT OBITUARY

Richard ("Rick") F. Merritt, former Fellow in Lehigh's Center for Emeritus Scientists in Academic Research (CESAR) passed away in Gwynedd, Pennsylvania, on June 30th at the age of 79. Rick was a doctoral graduate of MIT (1962) who retired in 1999 as Senior Research Fellow at Rohm and Haas and joined Lehigh's Chemistry Department to provide mentorship to undergraduate researchers. He ran the department's Summer Undergraduate Research Program from 2001 to 2005. Rick engaged more than a dozen students in his research areas of cyclodextrin chemistry and synthesis of acrylate polymers. He left Lehigh in 2007 to enjoy retirement with his family and hiking with his Labrador retriever Daisy.

**DID YOU KNOW?** **Kaitlyn Hess**, a senior Biochemistry major, was chosen to sing the national anthem at Commencement day May 14, 2014. Kaitlyn also managed to graduate from Lehigh in three years.

Emeritus Professor **James Sturm** sent an interesting letter to the editor of *C&EN* in the June 2 issue.

After Prof. Sturm read about "An Ant's Acid Antidote" concerning chemical aspects of ants' body fluids as self-protection (*C&EN*, March 3, p. 44), he quoted one of Ogden Nash's fairly well-known poems and sent it to the editor.

"The Ant"

*The ant has made himself illustrious  
Through constant industry industrious.  
So What?*

*Would you be calm, would you be placid  
If you were full of formic acid?*

Since this ditty was penned more than 40 years ago it suggests that the formic acid content of ants' body fluids has been known for several decades. Sturm expects that other chemists thought the *C&EN* article should have cited Nash. Anyone who has ever spoken with Sturm would know that he

## SPOTLIGHT ON ALUMNI—JAMES FEEMAN

### A Career in Dye Chemistry

**James F. Feeman (LU PhD 1949)** who spent a 39-year career in dye chemistry with the Althouse Chemical Company and its successor firm, Crompton and Knowles (C&K) in Reading, agreed to be interviewed for this issue. It is thought that Dr. Feeman may be the oldest living Lehigh Chemistry PhD.

First a bit of background on the dye industry.

William Henry Perkin (1838-1907) was an English chemist best known for his accidental discovery at the age of 18 of the world's first synthetic dye, *Mauve*. Perkin had been working in his private lab on a total synthesis of the anti-malarial drug, quinine, when he stumbled onto this brilliant fuchsia-colored dye. He commercialized his discovery and thereby launched the British dye industry. England, however, did not long remain the center of the dyestuff manufacturing. Germany soon took that distinction. August Wilhelm von Hofmann (1818-1892), was a famous German chemist who served as director of the prestigious Royal College of Chemistry (London) for two-decades. Hofmann had been Perkin's teacher but had also independently developed his own interest in dyes. He left England in 1864 and took his research back to Germany. Over the next five decades Hofmann and other German chemists synthesized over 300 unique colors and transformed Germany into the world's dyestuff capitol.

By 1914 Germany companies supplied more than 75% of the dyes in global commerce. Only seven small companies in the US made dyes (several of them in Reading, PA) and their entire output was a tiny percentage of what America needed. At the start of World War I approximately 90% of America's colorants were imported from Germany.

The American dye industry mushroomed rapidly after German imported dyes were blockaded during World War I. Dye research became an attractive career opportunity for many young chemists and the proximity of Lehigh University to Reading (PA) – which quickly became a local dye-research center – meant job prospects for Lehigh graduates and occasional consulting opportunities for Lehigh professors.

#### **How did you end up at Lehigh and eventually end up in the dye business?**

Well I was a Muhlenberg undergrad (BS 1945) so I was acquainted with nearby Lehigh and its graduate program. I was interested in organic chemistry and Professor Edward Amstutz had some interesting synthetic research going. First, however, I took my MS (1947) with Prof. Jud Smull on drying oils for paints, and then I transferred to Amstutz's group for my PhD (1949). Under his direction, I



***Prof. Edward Amstutz (circa 1958). A rare picture since he usually wore a bolo string tie. He was department chair (1960-1968) and started the Althouse Fellowship.***

synthesized and characterized some chloro- and methoxy-analogs of 3-phenyl-indenone. Professor Amstutz had an idea that insecticide (DDT-like) activity might be found in some substituted indanones and thiophenes. I got three papers out of my Lehigh research with Dr. Amstutz in *Journal of American Chemical Society*, one in 1948 and two in 1950.

After my PhD I worked as a postdoctoral research associate on an Office of Naval Research project at Ohio State University involving aliphatic nitro compounds as rocket propellants. I came back to Reading in August 1950 and joined Althouse Chemical. I advanced from bench chemist to Director of R&D (1974-1980) to Vice President and Director of R&D (1980-1986). I left that post to serve the company as Senior Scientist from 1980 to 1989.

After retirement I became an active consultant. I consulted for Lawrence-Livermore National Labs in Livermore, CA for three winters. They had a project on the use of laser dyes for isotope separation that I was able to contribute to. Lexmark International (which had formerly been IBM) used me from 1991 to 2005 as a consultant on dyes for colored ink for inkjet cartridges. Overall, I am the inventor of 42 patents and many corresponding foreign patents as well as the author of 10 publications.

#### **How did Lehigh's Chemistry Department develop a link with Althouse/Crompton & Knowles which eventually led to our Althouse Fellowship?**

Ed Amstutz was the only Lehigh chemistry professor who consulted for Althouse but he gave advice with no remittance for himself. In the time I was away from the area as a Research Associate at Ohio State, Ed became friendly with Scott Althouse, Otto Putman, and George Garcelon

(the top people running Althouse's dye business). Althouse sponsored some literature research at Lehigh – I recall that we had a report written by a Lehigh grad student on wash and wear treatments of cotton or rayon fabric. I think there was a second student involved and later – initiated by our chemical engineers – we sponsored some chemistry research at Lehigh concerned with finding a method for continuous diazotization. [Editor's Note: This work was carried out by Prof. John Larsen]. Over many years Althouse Chemical made annual donations to Lehigh, perhaps in recognition of my having come to them via a recommendation from Ed Amstutz. I think the Althouse Fellowship was created by Ed Amstutz from those donations. [Editor's Note: In 1967 Amstutz pooled \$26K from Althouse and \$4K of Department money to create the Althouse Fellowship which today is worth \$384K].

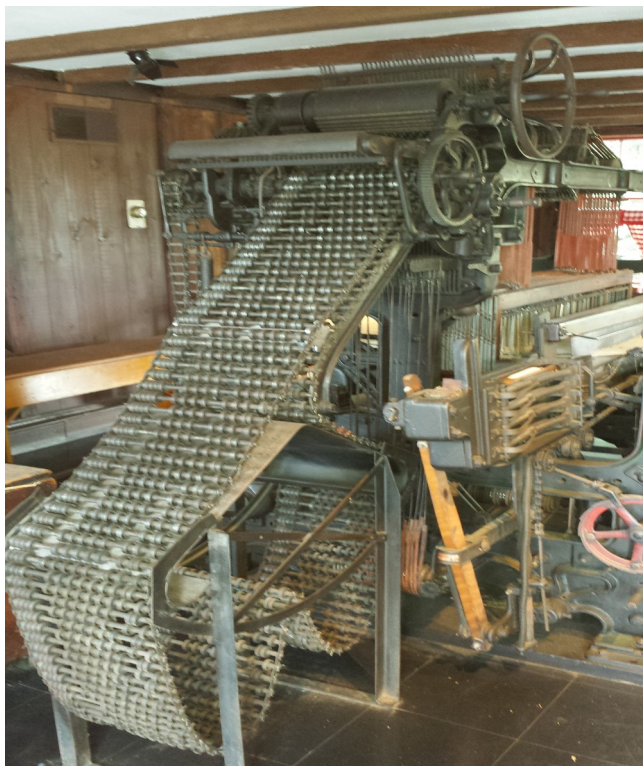
### **Did Professor Amstutz ever benefit personally from his interactions with Althouse?**

On one visit Ed made to our Reading Lab in the 1950s, Otto Putman, who managed the plant and the research laboratory for Scott Althouse, presented Ed with an outboard motor for his fishing boat. Otto remarked that the gift was because Ed had not received remuneration for his technical advice. He was interested only in acquiring financial support for his graduate students. That was typical Amstutz. He believed it would be unethical to be paid twice to do his job.

### **What has happened to the dye R&D and manufacturing in Reading?**

There have been many changes. The Althouse family had originally formed the Neversink Dye Works (1900) and later during World War I (1917) the Althouse Chemical Company. The dyeing of fabrics ceased during the depression (1934) and Althouse Chemical became the surviving company dedicated to dyes manufacturing. At his retirement (1954), Scott Althouse sold the business to the C&K Loom Works of Worcester, MA, the world's largest manufacturer of multi-colored looms. Under C&K the company became the leading producer of textile dyes in North America, at the time producing about 50 million pounds of dyes at plants in Reading, Gibraltar, and Newark, NJ.

But times changed. Inexpensive dyes from Asia increasingly captured US market share and in 1999 C&K sold its textile dye line to Yorkshire. C&K retained the Industrial Division dyes (for paper, ink-jets, coatings, leather, food plastics) until 2001 when these were sold to Sensient Technologies. The Reading-area labs and plants were closed with the loss of 130 jobs in 2003.



*Crompton and Knowles produced many varieties of looms capable of weaving multiple colored fibers. To C&K the purchase of a dye manufacturer such as Althouse was viewed as complementary to their core loom machinery business. This is a C&K Loom, custom designed to weave floor mats and seat covers for Ford Model T cars. It is on display in the Ford Museum, Dearborn, MI. By buying Althouse Chemical, C&K could now sell weaving machinery and the colors with which to dye the fabrics.*

### **What have you been doing since then?**

After the closing of our site, I was pleased to find a home for some of the company memorabilia and help preserve it from destruction at the Chemical Heritage Foundation (CHF) in Philadelphia. I wrote and published a study, "A Colorful Reading Company," in *Historical Review of Berks County*, Vol. 69 (No. 2), pp. 84-89. I also wrote my own autobiography, "Recollections and Reflections," primarily for the family but Dave Alcorn asked me to give a copy to the CHF Library. At 92 I'm enjoying retirement at The Highlands, an active retirement community in Wyomissing, PA.

Besides Jim Feeman a number of other Lehigh chemists and chemical engineers worked as summer interns or regular employees for Althouse/C&K. Some of the LU grads who made their careers with the company were Martin C. Eby (BS 1934), Jay E. Rowe (PhD 1973), and Lee A. Schaeffer (BS 1934, PhD 1972).

—Ned D. Heindel, Interviewer

## NEW ALUMNI—CLASS OF 2013-14

**PhD Chemistry:** Peng Cheng, Kevin M. Cook and Monica D. Rieth.

**PhD Polymer Science & Engineering:** Minghui Wang.

**MS Chemistry:** Roseanne E. Anderson, Danielle Chung, Jaime A. Colon Marrero, Michael DePasquale, Elizabeth Driscoll, Jean Grabowski, Mary A. Hagerman, David J. Hayes, Jonathan A. Hayes, John P. Hoskins, Jolene M. Jarrett, Charissa L. Lewis, Michelle L. Mathe, David A. Morgan, Jr., Pawel P. Pirog, Vanessa L. Rada, Elizabeth Sander, Daniel J. Schneck and Rebecca Stevens.

**BS Chemistry:** Emily E. Hollander and Randi L. Strauss.

**BS Pharmaceutical Chemistry:** Cody Okafor, Paul O. Oyefesobi and Ciera M. Rosario.

**BS Biochemistry:** James P. Bowen, Kaitlyn E. Hess, Joshua B. Kent, Peggy A. Lai, Joseph J. Munier, Danica M. Palacio, Eamon A. Toolan-Rogers and Kyaw Min Tun.

## STUDENT AWARDS—2014

**Jennifer B. Shah**—American Chemical Society Award presented to the outstanding senior major in chemistry.

**Maxwell B. Watkins**—American Institute of Chemists Award to an outstanding senior majoring in chemistry or biochemistry.

**Michael J. Kerner**—received both the ACS Inorganic Chemistry Award and the ACS Organic Chemistry Award for the outstanding senior in both of these chemistry disciplines.

**Erika L. Bettermann**—Alpha A. Diefenderfer Analytical Award presented to the highest ranking junior in analytical chemistry, sponsored by the ACS Division of Analytical Chemistry.

**Emily E. Hollander**—Merck Index Award presented to an outstanding senior in Chemistry who has been active in student society affairs, and who, in the judgment of the faculty of the chemistry department, has promise of a successful career in chemistry.

**James P. Bowen**—Harry M. Ullmann Chemistry Prize which is awarded to the highest-ranking senior in chemistry.

**Samantha R. Sokoloff**—William H. Chandler Senior Prize, established in 1920 by Mrs. Chandler, presented to the highest-ranking senior in the chemistry department.

**Morgan Birabaharan**—William H. Chandler Junior Prize

department.

**Mengzhao (Lucy) Xue**—William H. Chandler Sophomore Prize presented to the highest-ranking sophomore in the chemistry department.

**Douglas Solowey**, an undergraduate student in the Vivic lab, was awarded a prestigious 2014 Moissan Summer Undergraduate Research Fellowship in Fluorine Chemistry. This program is sponsored by the Fluorine Division of the American Chemical Society and provides funds for a student's summer salary and supplies. It is awarded directly to faculty members conducting research in any area of fluorine chemistry at colleges or universities on the basis of competitively judged applications. In addition, a limited stipend will be available for Douglas to present his research results at an ACS sponsored meeting.

## GRADUATE STUDENT AWARDS—2014

**Kelly Burns** was awarded a College of Arts and Sciences Summer Research Fellowship.

**Rachel Guia Giron** was awarded a Horner Fellowship for the 2014-2015 academic year.

**Kiran Khadka** was awarded a University Teaching Assistant Award. This award honors excellence by graduate teaching assistants.

Congratulations to the following chemistry graduate students who were awarded departmental fellowships for 2014-2015: **Jon Fura**, (Pires Group), **Ryan Ludwig** (Moore Group), and **Niki Patel** (Flowers Group).

## A prestigious invitation for Niki Patel, graduate student in Flowers' lab

Niki Patel, a Ph.D. candidate in organic chemistry, was selected to present her research at a symposium of the American Chemical Society in Irvine, CA. Patel gave a talk titled "On the Mechanism of Silver-Catalyzed Decarboxylative Fluorination" at the Graduate Research Symposium of ACS's Division of Organic Chemistry. The prestigious honor is typically awarded to students from top graduate programs, say Patel's adviser, Robert Flowers.

"I am extremely fortunate to have been chosen to participate in the conference," Patel says. "I learned so much about the different areas of research currently going on in the field, and I was able to discuss career goals with professionals in the industrial and academic fields." Patel and her colleagues in the department of chemistry are trying to gain a better understanding of how metals affect chemical reactions. The products of these reactions are used in pharmaceuticals and agrochemicals. By understanding how the chemical reactions work the researchers believe that a variety of existing chemical processes can be improved and





**Niki Patel in her lab**

new ones created. Patel's research focuses on silver-catalyzed reactions. By adding a step to these reactions, she has been able to increase their efficiency and output.

The research by Patel, says Flowers, who co-authored Patel's conference presentation, could help lead to the development of more efficient approaches for the synthesis of fluorine-containing pharmaceuticals. "Fluorinated molecules are becoming quite important in the development of new pharmaceuticals," Flowers says, "but the number of methods for introducing fluorine into molecules is limited."

Flowers' group is investigating compounds that can be used to carry out electron transfer reactions to produce free radicals. Niki works on processes that form free radicals through single-electron oxidation to form carbon-carbon and carbon-fluorine bonds. Her present work is a collaboration with Professor Chaozhong Li at the Shanghai Institute of Organic Chemistry.

A Philadelphia native who earned a B.S. in chemistry from Temple University, Patel was drawn to Lehigh for graduate studies because of its population size and academic strength.

The aspect of Lehigh that attracted her the most is the high quality of education maintained in a small setting. In addition, Patel notes that the chemistry department at Lehigh is a cohesive unit that welcomes collaboration, allowing students to pursue interdisciplinary research, as well as to gain exposure to the scientific community.

"The environment in Lehigh's chemistry department is both friendly and supportive," she adds. "There is not competition between other graduate students, but rather a sense of teamwork and camaraderie. Along with being good advisers to their graduate students, professors in this department are also excellent lecturers."

Patel is especially grateful for the encouragement she has been given by Flowers. "Dr. Flowers has been nothing but a great boss," she says. "He is a fantastic adviser and has taught me so much about kinetics, reaction mechanisms and the field of chemistry in general. While being extremely supportive, he pushes us to be the best chemists we can be." After she completes her PhD, Patel hopes to work in industry as a process chemist.

*Excerpts from article by Kurt Pfitzer on August 13, 2014*



**Natalie Foster named Fellow of American Chemical Society**

**Natalie Foster** has made countless contributions to the field of chemistry and beyond. As a recipient of the Christian R. and Mary F. Lindback Foundation Award for distinguished teaching, Foster has inspired others to look for ways to improve the education process. The 2014 Fellows were recognized at the ACS Fellows Ceremony and Reception on August 11 during the Society's 248th National Meeting & Exposition in San Francisco.

Foster was always quick to use available technologies to enhance teaching. As a Faculty fellow in the LTS-based Lehigh Lab, Foster motivated other Lehigh faculty to incorporate technology. She was also a participant in Lehigh's Clipper Project, an early foray into online learning at Lehigh that saw her turn an introductory chemistry lecture into a modular class using text, audio and video materials as well as embedded quizzes that could be used asynchronously over the web by students on or off campus.

At the graduate level, she taught classes in spectral analysis and conducted experiments using combinations of satellite TV, streaming video, web-mounted materials and podcasts to deliver graduate level education to on- and off-campus students.

Foster, now emeritus, is perhaps best known in the world of chemistry for collaborating with other authors to write *Chemistry: An Atoms-Focused Approach* and *Chemistry: The Science in Context*, two texts published by W. W. Norton and currently in use in colleges and universities nationwide.

Foster made chemistry accessible using popular culture. A 1997 *Morning Call* article, "Lehigh U. Chemist Boldly Goes On Science-fiction Lecture Circuit" recounts how Foster used the television series "Star Trek" to spur interest in chemistry. A fan of the show, she used plotlines to examine scientific issues such as organ transplants, biodiversity, genetic engineering and viral epidemics by analyzing how they were portrayed in the series.

*Thanks to Jordan Reese for allowing excerpts of his LU posting of August 19, 2014.*





## Foiling bugs that foil drugs

**Marcos Pires**, assistant professor of chemistry, hopes to develop alternative treatments for bacteria that are resistant to antibiotics. By stimulating the immune system to destroy pathogens, Pires hopes to develop alternative treatments for bacteria that are resistant to antibiotics.

Every week, faculty members in the department of chemistry meet over lunch to discuss current literature in the field. The conversation at one of these meetings led Pires to what he calls a “crazy little idea.” Pires connected studies about a unique characteristic of bacteria with other studies of immune systems that had been trained to attack cancer cells. Then he wondered: What would happen if the immune system itself could be trained to attack bacteria?

In theory, the immune system should do this on its own. However, bacteria are adept at hiding. They can lie dormant, obscured from detection by the immune system. Antibiotics work because they attack a large population of dividing bacteria. They don’t work when the bacteria are hidden.

“Unfortunately, a lot of the antibiotics we use now were discovered 20, 30, 40 years ago,” says Pires. “Back then we were coming up with new drugs and the bugs didn’t have time to evolve [and develop] resistance. When we stopped making new drugs, the bugs found ways around the drugs. This has been getting worse and worse, and without new drugs coming, it’s projected that it could lead to some really bad scenarios.”

Rather than developing a classic antibiotic that will attack the bacteria itself, Pires is looking to stimulate the immune system to do what it’s supposed to do in the first place—find and destroy pathogens. Bacteria are made up of amino acids, the building blocks of all living organisms. Pires’ research capitalizes on the discovery of bacteria’s unique use of a particular type of amino acids called D-amino acids. For reasons that are still unknown, bacteria that are contained inside a flask will replace their D-amino acids with unnatural ones that

are added to that flask. The bacteria will then incorporate the unnatural D-amino acids onto their peptidoglycan, or cell wall.

In the lab, Pires and his students made unnatural D-amino acid derivatives and tagged them with an antigen that draws a response from a pool of antibodies that most human beings already have. As predicted, the bacteria placed the tagged D-amino acids on their surface, essentially marking themselves for destruction. Pires then added the antibodies that seek out and bind to that particular antigen and marked them with a fluorescent tag. The tag allowed him to verify that the antibodies had found and coated the surface of the bacteria.

“We wanted to find a way to get the bugs to tag themselves,” Pires says. “It ended up working pretty well.” Pires and his team have a few hurdles to clear as they move forward. Their initial work required a large amount of the unnatural D-amino acids to get enough antigens on the surface of the bacteria, an amount that would be far too great for use in a drug intended for humans. They’re now trying to reduce the amount of D-amino acids required for the same result, perhaps by changing the antigen used to tag them.

Another challenge is the fact that up until now, every research group that has conducted experiments using this strategy has worked with bacteria in a flask. Nobody knows yet if the swapping of D-amino acids would happen with a bacterial infection in a human. “The question is still open as to whether what we’ve done is enough to trigger an immune response. We won’t know until we get this into a living organism,” says Pires.

For this next step, Pires plans to work with some basic model systems, starting with fish and, if successful, moving to mice. Financing these more advanced steps can be quite costly, so Pires is working to optimize his research technique before seeking additional funding.

Pires described the results of his research in a recent article in *ACS Chemical Biology* that he co-authored with Jonathan M. Fura and Mary J. Sabulski, who are graduate students in chemistry. The article was titled “D-Amino Acid Mediated Recruitment of Endogenous Antibodies to Bacterial Surfaces.” Pires’s research was also featured in a recent article titled “Enlisting the Immune System to Attack Bacteria,” which was published in *Chemical & Engineering News*.

He hopes that his research will one day help provide the human immune system with a strategic tool for the biological game of hide-and-seek in which antibiotics are becoming less and less effective. “Right now it’s just one step beyond a concept,” he says. But it is one step closer.

*Excerpts from Kelly Hochbein’s article posted to Lehigh Archives Aug. 11, 2014. Photo by Douglas Benedict.*

**Department of Chemistry  
Lehigh University  
6 East Packer Avenue  
Bethlehem, PA 18015-3102**

<http://www.lehigh.edu/~inche>

**Department Chair**

Robert A. Flowers II  
610-758-4048  
rof2@lehigh.edu

**Undergraduate and Graduate  
Coordinator**

JoAnn DeSalvatore  
610-758-3471  
jmd207@lehigh.edu

**Faculty & Academic Coordinator**

**Newsletter Editor**

Jane Derbenwick  
610-758-3470  
rd0b@lehigh.edu

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Does anyone recognize the student **in this photo on  
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