Mudd In Your Eye

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

NOVEL TOOLS TO GAIN INFORMATION ABOUT ENZYMES

Abstract: Unraveling how human cells respond to environmental cues requires specialized tools that report on changes within cells. Living organisms are wired with highly regulated networks of sensing and signaling proteins, in which information is often propagated via intermediate partners. Signaling mechanisms within cells control the majority of biological processes. Conversely, the loss of proper control over signaling or aberrant signaling can often lead to human diseases. We aim to develop of a novel set of tools that will provide critical information into how protein arginine deiminase 4 (PAD4) responds to environmental cues. PAD4 is an enzyme that is responsible for converting the amino acid arginine to citrulline. It was only recently discovered but is attracting increasing interest from the medical community due to its aberrant activity in numerous human cancers and autoimmune diseases. We recently reported a facile fluorescence-based assay for monitoring PAD4 activity *in vitro*. We propose to expand on this strategy to generate the first PAD4 probes compatible with live mammalian cells. These unique probes will serve to answer critical questions related to PAD4 activation in response to extracellular agents.

Nucleosomes, the basic unit of the chromatin, are composed of both DNA and proteins. For each chromatin, 147 base pairs of the genomic DNA are wrapped around a total of eight histone proteins. Two copies of each of the histone proteins (H2A, H2B, H3, and H4) form the structural scaffold that associates with the genomic DNA. It is becoming increasingly recognized that the protruding N-terminal tails of the histone proteins can be heavily post-translationally modified. The number of post-translational modifications and the diversity of these covalent tags (acetylation, methylation, phosphorylation, ubiquitylation, etc.) observed within these short protein segments suggest that this process is highly dynamic and potentially vital to the proper regulation of gene expression. Indeed, the breadth of possible tags on histone tails has led to the idea that large combinatorial arrangements of modifications can potentially generate distinct cellular consequences. This compilation of possible modifications, which can be inheritable and can alter gene expression profiles, has been referred to as the "histone code". Studies related to histone modifications fall under the class of epigenetics. Due to a recent surge of interest, we are now beginning to understand how various tags covalently added to the that epigenetic-based cellular signatures can have a direct influence on both cellular homeostasis and diseased states. A large group of enzymes is tasked with covalently tagging molecules to histones, while another group of enzymes is tasked with their subsequent removal. As a whole, we have an incomplete understanding of how these enzymes function and how they coordinate with their binding partners.

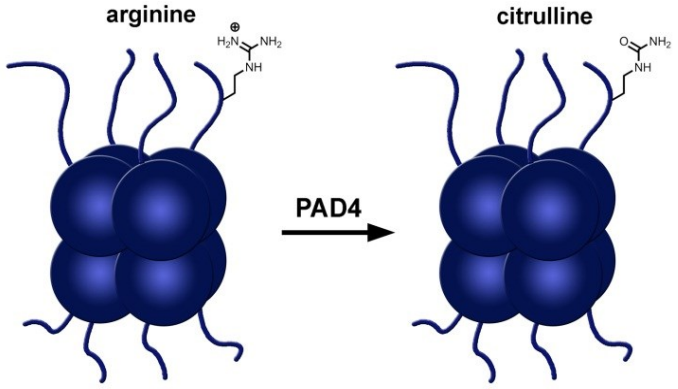


Figure 1. Schematic representation of the octameric histones found in a basic unit of a nucleosome. PAD4 is able to citrullinate arginine residues on protein substrates.

There is still a great deal to discover about PAD4 including the full scope of its cellular substrates, its activation pattern, its co-regulators, and its precise links to various human diseases. What we currently know is that the PAD4 isoform is highly overexpressed in a number of malignant tumors and its expression in several non-tumor tissues was undetectable. Strikingly, the finding that PAD4 expression level decreased following surgical removal of the tumor gives strong evidence for the close association between PAD4 and tumorgenesis. Additionally, it has been demonstrated that PAD4 is a co-repressor for p53, a major tumor suppressor protein that is highly mutated in most cancers. The knock-down of PAD4 in cancer cell lines via siRNA alone is sufficient to induce cell-death. Consistent with these findings, a recent report showed that an irreversible PAD4 inhibitor led to a 70% shrinkage of tumors in model organisms. In addition to cancer, it has been previously shown that aberrant activity of PAD4 is associated with several autoimmune diseases

(continued on p. 3)

Two-faced drugs fight hidden killers

An outbreak of fungal meningitis recently resulted in one of the worst public health disasters in recent U.S. history. Thirty-two people died and more than 400 became ill after the New England Compounding Center distributed contaminated vials of injectable steroids.

Public health officials are clamoring for stricter regulation of so-called compounding pharmacies, which until now have flown under the radar of the Food and Drug Administration. Of major health concern in cases like this is the nature of the infections themselves. Hiding behind the blood-brain barrier, or BBB, a concept every first-year biology or psychology student is familiar with, these infections escape direct contact with most medications and require patients to endure long and sometimes unsuccessful treatment with antibiotics.

Steven Regen, University Distinguished Professor of Chemistry, is working at the forefront of efforts to treat fungal meningitis that hides behind that barrier. Regen conducts research in the field of membranes and drug delivery with Vaclav Janout, senior research scientist, and Celine Bienvenu, postdoctoral research associate, both in the Department of Chemistry. With funding from the National Institutes of Health, they are seeking to develop a new class of drugs that can pierce the BBB and provide effective treatment for fungal meningitis and a host of other diseases in the brain.

A new paradigm for drug transport

"In a broader context," said Regen, "if we have any luck with our approach it could establish a new paradigm for the transport of many other drugs into the central nervous system."

The BBB consists of tightly packed endothelial cells that separate circulating blood from cerebrospinal fluid in the central nervous system. One of the greatest challenges facing medicinal chemistry is the search for drugs that can be transported across that barrier. Many classes of drugs with the potential for treating brain diseases (fungal and bacterial infections, malignant tumors, neurodegenerative diseases, etc.) have minimal effectiveness because of their limited ability to cross the BBB.

One example is amphotericin B (AmB), an antibiotic currently used to treat fungal meningitis. Because AmB does not readily cross the BBB, and because it is highly toxic, its overall effectiveness is limited.

Regen's team has been asked by NIH to create a new class of AmB agents based on what Regen calls molecular umbrellas. These structures are a novel class of amphiphiles, or chemical compounds whose exteriors are both hydrophobic and hydrophilic and thus ideal for crossing hydrophobic membranes like the BBB.

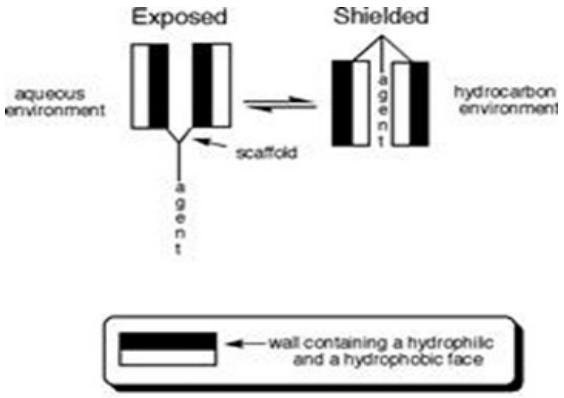
Dual conformational properties

What makes molecular umbrellas valuable, says Regen, is that they may be able to carry biologically active agents across the BBB in ways that have not previously been possible. The innovative aspects of this research lie entirely with the unique conformational and transport properties associated with molecular umbrellas. In essence, molecular umbrellas are molecules composed of two or more walls attached to a central scaffold. When immersed in an aqueous environment, a molecular umbrella favors a conformation in which the hydrophobic faces point towards one another, to shield themselves from water.

Conversely, when immersed in a lipophilic environment, the molecular umbrella favors a conformation in which the hydrophilic faces point toward each other and the lipophilic faces point outward. In this case, the hydrophilic faces now become shielded from the external environment. Regen's team calls such behavior "molecular amphomorphism."

Regen's team will test the potential of molecular umbrellas that are chemically attached to AmB to kill fungal cells in cell culture and in animal models. These animal studies will be carried out by Professor John Perfect, a collaborator at Duke University School of Medicine, who is an expert in fungal infections. If, as expected, one or more of the molecular umbrella-AmB combinations prove more effective than simple AmB, there could be good reasons to explore other molecular umbrella-drug combinations for a variety of diseases, possibly even brain tumors.

At a more fundamental level, the research challenges the current dogma that drug transport is limited by molecular size and lipophilicity. In published work, Regen and his team have shown that very large and hydrophilic molecular umbrellas can enter live cells in cell culture experiments. They have also shown that they can cross model membranes that mimic cell membranes.



As they test new compounds, the researchers will learn whether the antibiotic supply in the brain speeds or slows depending on the size and structure of their molecular umbrellas.

Regen's lab has developed a class of amphiphilic molecules that assume different morphological states in response to changes in microenvironment. Like an umbrella, the compounds cover an attached agent and shield it from an incompatible environment.

"Our approach could establish a new paradigm for the transport of many other drugs into the central nervous system."—Steven Regen

Thanks to Jordan Reese who wrote this article and posted it to the LU News Center in December.

Novel Tools (cont'd from page 1)

including rheumatoid arthritis and Crohn's Disease. In fact, rheumatoid arthritis patients display elevated levels of anti-citrullinated peptide antibodies, making these antibodies a reliable and specific biomarker for this disease. The link between PAD4 and disease states will rely greatly on our fundamental understanding of PAD4 itself.

We became interested in studying the activity of PAD4 due to its increasingly important connection to various forms of cancer such as lung, breast, and bone cancers. In addition, the proper function of PAD4 plays an important role in the human immune system and its overexpression has been found to have a strong association with a number of autoimmune diseases including rheumatoid arthritis and multiple sclerosis.

Therefore, probes that readily and reliably measure the activity of PAD4 would be important tools to enhance our understanding of PAD4 (and other PADs). We have recently described a novel mechanism-based fluorescence assay that quickly and reliably measures the activity of PAD4. The assay has several advantages over existing technologies, including strong signal-noise ratios, speed of analysis and robustness of measurement.

[Excerts from CHEMBIOCHEM—8/2013 issue]

Cost-Cutting Chemicals

A team of chemists at Lehigh have recently published a new study on an important and useful chemical reagent in the Journal of Visualized Experiments (JoVE), a new journal devoted to the publication of biological, medical, chemical and physical research in video format—a new step toward improved, multimedia communication of scientific discovery.

Robert Flowers, graduate student Kimberly Choquette and research scientist Dhandapani V. Sadasivam present their method for the production of samarium diiodide, SmI_2, a reagent widely used in organic chemical synthesis in many important bond-forming reactions. It is a focus for many chemists because it allows for the combination of relatively inexpensive starting materials to produce more complex molecules efficiently.

The Lehigh team is focused on finding new and environmentally-friendly chemical reactions that reduce costs and use readily available feedstock materials for the synthesis of complex end chemicals. SmI_2 has become a common tool for synthetic organic chemists as a mild and selective single electron reductant that carries out reactions important for the production of pharmaceutically relevant compounds at room temperature. SmI_2 can reduce and couple a variety of functional groups including epoxides, alkyl and aryl halides, carbonyls, and conjugated double bonds. One of the fascinating features of SmI_2-mediated reactions is the ability to manipulate the outcome of reactions through the selective use of cosolvents or additives. In most instances, additives are essential in controlling the rate of reduction and Flowers' research group has pioneered the mechanistic study of these processes.

Flowers' team employed the use of video to demonstrate their experimental method, useful as samarium diiodide is sensitive to oxygen and traditional chemical reactions are commonly carried out in a controlled environment. In this study, the Lehigh teams shows how the reaction can be carried out under an argon atmosphere on the benchtop providing a simpler and less costly approach for the synthesis of the reagent.

Thanks to Jordan Reese for allowing this to be reproduced. This article appeared in the LU News Center on Wed., March 27 and is now archived.

Research Scientist Dhandapani V. Sadasivam at work in Flowers' lab.

A glimpse from the past —1929 Epitome

Comments from Harry Maas Ullmann, AB, PhD Head of the Department of Chemistry just after the creation of the two departments.

From the Department of Chemistry and Chemical Engineering. Chemistry, in recent years, has come to be one of the most important of all sciences. In addition to its engineering phase, its work now includes economic and philosophical applications. Practically all industries and processes, whatever their type, have features which are based on chemical principles; consequently the man trained in chemistry or chemical engineering now has a vast field in engineering, manufacture, agriculture, biology, chemistry, and all the allied professions and industries. His activities are no longer confined to the laboratory.

The department, realizing the enormous field which must be covered in order to get a thorough understanding of the nature of chemistry, has so balanced its curriculum that the student gets a thorough insight into both theoretical chemistry and its engineering features. The department is primarily interested in guiding the incoming chemists and therefore maintains a constant relation between students and teachers. A close relationship between the department, undergraduates, and alumni is also maintained, with mutual benefit to all.

FACULTY NEWS

Greg Ferguson presented five invited lectures at regional colleges on "Regioselective placement of ligands on surfaces: studies at the nexus of surface chemistry, solution chemistry and electrochemistry".

Robert Flowers presented a special lecture at the 244th ACS National Meeting in August 2012 at a symposium in honor of Professor Athel Beckwith. Bob presented a series of invited lectures at four universities in Australia in summer 2012 and a seminar at Boston University in the fall of 2012. In the spring of 2013 he presented seminars at Georgetown University and the Philadelphia Organic Chemists Club. In addition, he gave seminars in Israel at Ben Gurion University, Bar-Ilan University, Technion and Hebrew University in Jerusalem. He was an invited speaker at the Gordon Research Conference on Physical Organic Chemistry this past summer. During the past year, Bob co-authored a chapter on "Organic Synthesis Using Samarium Diiodide" in the *Encyclopedia of Radicals in Chemistry, Biology and Materials.*

Jebrell Glover in conjunction with his graduate students presented a talk at the Delaware Membrane Protein Symposium on the biophysical analysis of the caveolin protein. At the FASEB Molecular Biophysics of Membranes and the 2012 Biophysical Society Network Meeting Jebrell presented several posters on the protein caveolin-1. He presented six lectures at various universities related to proteins as architects of cell membranes: probing the structure of caveolin. Jebrell's research accomplishments were highlighted at "Dialogue Across Disciplines," at Lehigh in March 2012.

Ned Heindel presented two invited papers for conferences in 2012 and also gave eight invited lectures. Ned gave a lecture at Wilkes University on "James Bohning - A Life in Chemistry Remembered". Ned and collaborators received a patent for "Pharmacologically-Active Vanilloid Carbamates." In *Angew Chem Int Ed Engl* Ned co-authored "Back-scattering interferometry: an ultrasensitive method for the unperturbed detection of acetylcholinesterase-inhibitor interactions". In *Bioorg Med Chem* Ned co-authored "Synthesis and evaluation of potent and selective human Vla receptor antagonists as potential ligands for PET or SPECT imaging" and"Investigation of anticholinergic and non-steroidal anti-inflammatory prodrugs which reduce chemically induced skin inflammation" in *J Appl Toxicol*.

Kai Landskron presented two poster/abstracts at the NECZA annual meeting as well as one poster for TechConnect. The subject was "Supercapacitive Swing Adsorption." Kai presented three invited lectures on "Nanoporous Nitride as Functional Materials." Kai was co-author of an article in *Microporous and Mesoporous Materials.*

David Moore, along with three graduate students and undergraduate Erin Hassell, presented posters at the Fall 2012 National Meeting of the ACS (Philadelphia, PA). David, along with two of his graduate students, presented three posters at a Gordon Conference on Vibrational Spectroscopy. David was Session Commentator for all of his Gordon Conference posters. David presented a lecture on "Freeze-Frame Spectroscopy: A Technique For Elucidating Molecule-Catalyst Interactions" for the Lehigh Chapter of Sigma Xi. David gave invited lectures on "Using cryogenic spectroscopy and computational chemistry to elucidate interactions of reactant molecules with nanocatalyst materials" to five universities, two of which were in Hong Kong and Japan. *International Innovation* did a write-up about David's NSF CAREER-funded research that was published in their September issue. He also contributed commentary for a round-table discussion of the future of alternative energy research in that same issue.

Marcos Pires presented three invited talks on "Bivalent Probes and Inhibitors of the Multidrug Resistance Protein P-glycoprotein" and "Metal-triggered Assembly of Collagen-like Peptides." Marcos received the Class of 1968 Junior Faculty Fellowship, awarded to pre-tenure faculty in the College of Arts and Sciences to support research, scholarship, and creative work. Marcos and collaborators published an article in *Langmuir* on "Controlling the Morphology of Metal-Promoted Higher Ordered Assemblies of Collagen Peptides with Varied Core Lengths." As a co-author he also published an article in *Nature Chemistry*, "Altering the O2-Dependent Reactivity of de novo Due Ferri Proteins." During the summer of 2012, Marcos organized a journal club for all members of the graduate program in the Department of Chemistry.

Steven Regen presented an invited talk at the 2012 Separations and Analysis PI Meeting on the subject of "Hyper-thin Membranes for Hydrogen Purification." Steve gave four invited talks on topics related to "Hyper-Thin Membranes." He co-authored three publications: "Minimizing Defects in Polymer-Based Langmuir-Blodgett Monolayers and Bilayers Via Gluing" in *Langmuir*; "Stimulated Release of Cholesterol From Liposomal Membranes by a PEGylated Phospholipid" in *Bioconjugate Chem*.; and "Sorting of Lipidated Peptides in Fluid Bilayers: A Molecular-Level Investigation" in *J Am Chem Soc.*

Jim Roberts has served as University Head Usher for a number of years. He is responsible for most commencement ushering duties except for the Presidential Party which is handled by University Marshall Rick Weisman. Jim also personally performs the ushering duties (including all instructions) at the PhD hooding ceremony in May.

Keith Schray receives about 15-20 student living group dinner invitations per year. Other activities range from academics (weekly tutoring sessions at Sig Ep and AOPi), dinners at his home for the AXE chemistry fraternity and two initiation days, as well as judging bed races and faculty student contests. He attempts to do as much of this as he can since colleagues busy with a focus on research can't very well commit this much time to these activities. It raises the academic and social integration at Lehigh.

Damien Thévenin presented a poster at FASEB - Molecular Biophysics of Membranes (Snowmass Village, CO) in June 2012. The subject title was "Modulating Membrane Receptor Signaling in Cancer Cells using pHLIP." Damien presented three invited lectures entitled "From Membrane Biophysics to Drug Delivery" at regional colleges. Along with Dimitrios Vavylonis from the Physics Department, Damien co-organized the Biophysical Society Pennsylvania Network Meeting at Lehigh on 9/14/12. Damien co-authored a chapter in *Membrane Protein Structure and Dynamics: Methods and Protocols, Methods in Molecular Biology*.

Dmitri Vezenov was session chair of an ITP 2012—19th International Symposium on Electro- and Liquid Phase-separation Techniques. His subject area was Nucleic Acids – III: Next Generation Sequencing. Dmitri gave invited talks at four other conferences, two of them in South Korea. Dmitri co-authored four journal articles: "High density single-molecule-bead arrays for parallel single molecule force spectroscopy" in *Analyt. Chem*.; "Quantifying interactions between DNA oligomers and graphite surface using single molecule force spectroscopy" in the *J. Phys. Chem*.; "Supramolecular aggregation of conjugated polymers containing POM-terminal side chains in polar and nonpolar solvents in *Chem Eur. J*.; and "Progress toward the application of molecular force spectroscopy to DNA sequencing" in *Electrophoresis*. Dmitri was a member of the Lehigh delegation (lecture and roundtable discussions) held at the one-week summer program in 2012 at Kazan National Research Technical University in Russia.

David Vicic in the 2012-2013 academic year has given invited lectures at Texas A&M, Texas Christian University, University of North Texas, Penn State Erie, University of Pennsylvania, and the University of Toledo. He was also an invited speaker at the 21st Winter Fluorine Conference. This summer David presented his group's research at the 2013 Gordon Research Conference in Organometallic Chemistry in Rhode Island and at the 17th European Symposium on Fluorine Chemistry in Paris. David also received a research grant from the U.S. Department of Energy spanning 11/1/2012 to 10/31/2015 for his proposal entitled "Development of Catalytic Alkylation and Fluoroalkylation Methods". The Vicic lab published two articles: "A Five-Coordinate Nickel(II) Fluoroalkyl Complex as a Precursor to a Spectroscopically Detectable Ni(III) Species" (*J. Am. Chem. Soc.* **2013**, DOI: 10.1021/ja4030462) and "Lithium Bromide-Induced Structural Changes in a Nickel Bis-Alkoxide Complex" *(Acta Chim. Slov.* **2013**, *60*, 190-192).

CHAIR'S MESSAGE

The 2012-2013 academic year was a busy and rewarding one for the department of chemistry. Dr. Andy Ho was named Director of General Chemistry after serving as our freshman chemistry lab manager. Andy has done an exceptional job in his new role and has helped us navigate the increasing enrollments in our freshman chemistry courses.

Denise Beautreau was hired as our new General Chemistry Laboratory manager and hit the ground running organizing and developing modern lab experiments for our students. In addition to these exciting changes in our freshman curriculum, we have had unprecedented enrollments in organic chemistry and are approaching 300 students in our first semester course. To accommodate students and provide the experience important in a Lehigh education we split the first semester course into two sections presently taught by Keith Schray and Marcos Pires. In addition, Aliana Lungu now teaches 14 lab sessions to provide the small class style lab instruction important for our students. Finally, one of our teaching labs on the second floor was updated to accommodate our advanced lab classes and a new biochemistry lab. These are exciting changes and we are looking forward to continued renovation of our second floor teaching labs this year. When this work is complete, we will have modern teaching labs at all levels of our undergraduate curriculum.

Jebrell Glover was tenured and promoted to associate professor. He hasn't skipped a beat giving several invited lectures and publishing several important papers. We look forward to continued success in his teaching and scholarship. We also welcome Heather Jaeger to the department. Heather's research explores coupled electron-nuclear dynamics in molecular, nanoscale, and condensed-phase systems. The goal of her work is to understand how structure and the surrounding environment impact charge evolution. Her research efforts are currently directed towards photo-activated processes of nanoscale materials and how quantum confinement can be advantageous to solar cell technology. Heather's presence will significantly help us achieve our goal of becoming a top-tier chemistry program.

Additionally, as a continuation of our plan for faculty expansion, the department will be searching for two faculty positions in physical and organic chemistry. We are very pleased with the continued investment in the department and anticipate sustained growth of our faculty, program and facilities over the next several years. In other faculty news, congratulations are in order to Dr. Rebecca Miller. Becky received the Alfred Nobel Robinson Faculty Award for achieving excellence in teaching or research and advancing the interests of the university. Natalie Foster retired at the end of the 2012-2013 academic year. Her service to the University was recognized at the annual university awards dinner. She will remain active in scholarly pursuits working on a new edition of her textbook and several other projects. Natalie's presence in the classroom will be missed by students and colleagues and we wish her the best in retirement.

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.

SPOTLIGHT ON ALUMNI - Michele Jetter

A Mudd-in-your-Eye reporter queried Michele Jetter (PhD 1989 – organic chemistry). Michele is originally from New York State and is currently employed at Teva Pharmaceuticals in Horsham, PA as a Senior Patent Chemist in the Legal Department. She and her husband Jim live in East Norriton, PA.

Very few of our PhD grads take an industrial postdoc. After your Lehigh PhD you did. Looking back, was it a good career choice?"

For me, the choice to do an industrial postdoc as opposed to a traditional academic one was a good one. I got into the hot area of gene therapy in a superb research environment, Dupont Central Research. I knew I wanted to test out the industrial atmosphere before I made a career choice between teaching and industry. I was lucky enough to spend 3 years in a dynamic team in Central Research and Development at the Dupont Experimental Station in Wilmington, DE. I worked in George Trainor's group. Back then George was doing chemistry, biochemistry and structural biology of nucleosides/nucleotides (oligonucleotides, DNA, RNA etc).

My project was the design and synthesis of novel nucleoside bases which were incorporated into short oligonucleotide DNA strands. We went on to study the binding of these modified oligonucleotides to double-stranded DNA in the formation of triple-stranded (triplex) DNA. A DNA triplex may be formed between the right oligos and target sequences on duplex DNA. In the early days of targeted gene therapy the intent was to silence a gene implicated in a particular disease. It was an exciting project; it involved organic chemistry, bioorganic chemistry and cutting-edge technology. It was hard work because I had to learn lot of new chemistry and new techniques (oligonucleotide synthesis, gel electrophoresis, DNA/RNA binding assays). I was really fortunate to be in a group of bright, hard-working scientists with varied backgrounds all of whom were willing to teach me and to discuss and explore ideas. Working in Central Research at the Experimental Station was a bit intimidating at first but our group leader, George Trainor, was wonderful to work for and he taught me some valuable lessons as a scientist. My post-doctoral experience had a profoundly positive effect on my view of industrial pharmaceutical research. I liked academia and I liked industry but my postdoc helped me chose the latter.

You were a gregarious student at Lehigh... with which of your colleagues do you stay in touch and what are they doing these days?

Yes, I did have a close knit group of friends at Lehigh. We've kept in pretty close touch as the years have passed, celebrating marriages, children, career changes etc. Some Lehigh friends stayed in the Philadelphia area working in pharma and academia. A few of my Lehigh buddies ended up being work colleagues of mine or my husband's at one time or another. I crossed paths with Tom Neiss (PhD with

Michele and her lab colleague, research scientist Jeff Lacey, enjoy a laugh in their Mudd lab in 1988.

Jim Roberts) both at Dupont and also at J&J. One of my closest friends from Lehigh, Susan Franks (formerly Susan Gross, (MS with Jack Alhadeff), was a colleague of my husband's for years at Wyeth Pharmaceuticals and is now a colleague of mine at Teva. Another good friend from Lehigh, Michael Riley (PhD with Jack Alhadeff), is teaching chemistry in the Philadelphia School District as is my husband Jim. Others have moved to various parts of the country but we will periodically meet and catch up, and don't forget that the current Lehigh chemistry department chair, Bob Flowers was my colleague while I was in Mudd.

And, of course, I stay in close contact with my PhD advisor, Ned Heindel. I usually see him at least once a year at ACS and we stay in contact often by phone and email. I've enjoyed getting to know the students/postdocs in his group over the years. During my time at Lehigh and since I've left, Dr. Heindel has had a huge influence on me during my career. He's given me some terrific advice and has always been very supportive and provided much-needed encouragement. More than 20 years have passed since I graduated and I still think of the Lehigh chemistry department as my home.

You were a hands-on pharmaceutical chemist with J&J for many years, what were your project areas? Did you see any 'signs' that the big drop in domestic R&D was coming?

I worked in drug discovery at Johnson and Johnson Pharmaceuticals for 17 years at their facility in Spring House, PA. Mostly my therapeutic focus was in drugs for acute and chronic pain. Pain research is quite difficult because while there is an enormous literature there is still so much that is not known about the body's pain mechanisms and how to approach pain management. J&J drug discovery was a team -oriented approach organized by therapeutic area. Team

members were involved from target ID through validation, assay design, lead optimization through all of the preclinical work. That type of integrated approach meant the work was very exciting and dynamic.

I saw the changes in R&D coming to J&J and the industry beginning around 2005. There was frustration throughout the pharmaceutical division regarding the ever-changing R&D management, resource allocation among the many research sites and integration of newly acquired companies and their technologies. I would not have predicted that the brand pharmaceutical industry would have imploded so rapidly in terms of slashing thousands and thousands of research positions. Less than two years after I was downsized, my husband's employer, Wyeth, was acquired by Pfizer and the staff became victims of massive layoffs. While it is sad for me to see so many bright and capable scientists out of work across the pharma industry, I consider myself privileged to have been involved in high level drug discovery research at a great company for many years.

But you're one who has survived the crash and stayed within the pharmaceutical industry. Tell us what you do now in the Legal Department of Teva.

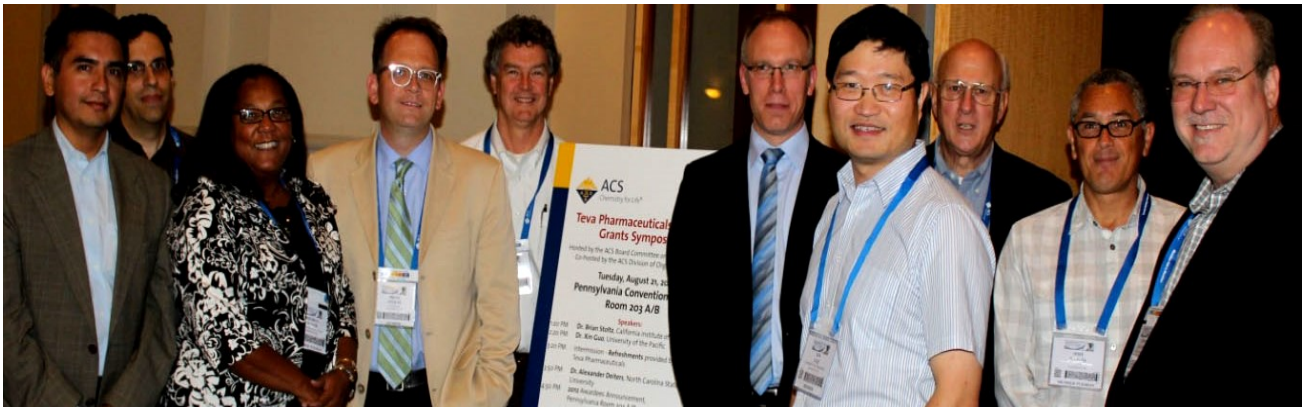
I can scarcely believe it but I just celebrated my 5-year anniversary at Teva Pharmaceuticals. Teva is the world's largest generic pharmaceutical company although we also have a branded product line that includes some of the world's best-selling drugs in the therapeutic areas of CNS (multiple sclerosis, Parkinson's disease), pain and cancer. If you've gotten a prescription for a generic drug in the last several years, chances are very good that it was a Teva product. I work as part of the Legal Affairs group at Teva located in Horsham, PA. The passage of the Hatch-Waxman Act in 1984 provided a pathway for generic companies to challenge the patents covering branded pharmaceutical products and therefore increase the potential for generic drugs to enter the market before the patent expires. As a generic leader, Teva has traditionally been a major player in mounting patent challenges on many so-called blockbuster drugs. As part of the pre-litigation group, my job is to utilize my knowledge of organic/medicinal chemistry, drug discovery, the brand pharmaceutical industry and US and European patent law to provide patent analysis and technical support to strategy and litigation teams. Our group is technically specialized with people whose backgrounds include expertise in medicinal chemistry, biology, formulations/polymorphs and engineering. In addition, we all have had intense training to understand Hatch-Waxman regulations and the fundamentals of patent law as it applies to pharmaceutical inventions.

While this is a different experience from bench research, there are some similarities. The job requires a good bit of reading and understanding journal articles/patents and keeping up with what is happening in the world of brand pharmaceutical research. When I was at J&J, I tended to focus on my current research in narrow therapeutic areas (pain and CNS) but at Teva I need to know more about current research and what drugs are in the clinic across a wide variety of disease areas. My job also requires good problem-solving skills and the ability to communicate well across disciplines and also with co-workers around the globe. Excellent communication skills are a must because I have never met or talked to many of these people. My main forms of communication are telephone or electronic links. Most of my group is in Petach-Tikva, Israel, but we do get together occasionally. When I joined Teva, I had to quickly get up to speed on regulatory issues and legal issues in the world of generics which is quite different from brand pharmaceuticals. The timelines are tight, decisions are made quickly and the budgets are usually smaller. I admit that it's been a challenge working so closely with internal and external attorneys but, all in all it's an exciting adventure.

What does your crystal ball see as the future for the Fortune 500 Global pharma companies?

Boy, I wish I had a crystal ball! I think what we've been seeing for the last few years will continue, i.e., less dependence on in-house drug discovery by large companies and more investment in external research whether it be in small companies, specialty companies or universities. For example, J&J has actually increased their external R&D spending while continually downsizing their internal drug discovery. I think we'll

(Michele Jetter article continued on p. 12)



Michele and other Teva scientists with the recipients of the first Teva Scholars Grant Awards at the August 2012 ACS National Meeting.

ALUMNI NEWS

Thomas Parliment (BA 1961; PhD UMass, Amherst 1966) has retired after 25 years in the food industry spent investigating food aromas, flavors and colors. Tom always remained in the same location in New York as his original company of General Foods was acquired by Philip Morris tobacco, merged with Kraft Foods to become Kraft General Foods and ultimately re-organized as Kraft Foods. He published more than 50 technical articles, obtained 22 US patents and had the opportunity to lecture both domestically (including Lehigh) and internationally. He now consults a bit, hikes a lot and has recently bought a home in Florida for the cold winter months. Tom always enjoys receiving Mudd in your Eye and thought he would give us a bit of an update for Alumni News–from Tom on 9/26/12.

Gerald (Jerry) Miller (PhD 1980) has recently joined the research staff of NetCentric Technology, Inc. as Principal Software Developer. NetCentric is located on the U.S. Army's Aberdeen Proving Ground (Maryland). When asked what he's doing, Jerry replied, "I can't say exactly what it is I'm doing, because then I'd have to kill you." However, since most of what goes on in Aberdeen is defense related we can guess that Jerry is defending our country with his computer keyboard.

Hasnain Malik (BS 2005) was named a Presidential Postdoctoral Fellow at the Novartis Institute for Biomedical Research (Cambridge, MA). Malik obtained his PhD in Organic Chemistry from the University of Michigan and has completed a postdoc at the University of Toronto. He is a synthetic organic chemist whose research has focused on transition metal catalysis.

Peter DeMatteo (BS 2002; MS 2004) is an NIH NIDA postdoctoral fellow at NIH (Bethesda, MD) working on small molecule opioid receptor agonists/antagonists being utilized in neurochemical studies of pain and addiction. Peter completed his PhD at the University of Delaware (2011) on the synthesis of natural products with asymmetric carbocyclic skeletons.

Emily Winn-Deen, MD (BS 1974) and several business partners have formed RxDx Advisors (San Diego, CA). RxDx specializes in molecular and companion diagnostic consulting services for both the pharmaceutical and diagnostic products industries. Emily and her partners assist companies with business planning and strategy, regulatory affairs and compliance, business development and partnering, diagnostic product development, biomarker commercialization, and patents and licensing.
Emily's company is at www.rxdxadvisors.com.

Sallie Wemple (BS 2006) received her MD degree from Albany Medical College in May, 2013. Sallie received her BS magna cum laude in Biochemistry from Lehigh. She has been selected for a residency in internal medicine at Virginia Commonwealth University Medical Center in Richmond, VA.

George Ngwa (MS 2004; PhD 2008) has accepted the position of Supervisor of Chemistry for B. Braun Medical Products, Bethlehem, PA. George also completed an MBA in Healthcare Management at the Western Governors University. After receiving his Lehigh doctorate, George joined the research staff of OraSure Diagnostics and then moved on to Particle Sciences before relocating to Axcentria Pharmaceuticals.

Bruce S. Sachais, MD (BA 1988) has been named Director of Transfusion Services at the Hospital of the University of Pennsylvania, Philadelphia, PA. At Lehigh, Bruce did undergraduate honors on psoralen chemistry and went on to do a combined MD-PhD program at Washington University, St. Louis, MO. After a residency in Pathology he joined the Penn faculty in the Department of Pathology and Laboratory Medicine where he is currently an Associate Professor. Bruce and his wife returned to Lehigh in May 2013 for his annual class reunion.

Raymond Pugh (PhD 2010) has joined the research staff of Professor Stephen Benkovic (BA 1960), the Evan Pugh Professor and Eberly Chair in Chemistry, Penn State University, as a Research Scientist.

Trevor Daly (PhD 2013) has joined the staff of the newly created Interdisciplinary Learning Laboratory at the University of Delaware, Newark, DE. Trevor will be part of an instructional team developing an innovative laboratory curriculum from the ground up for the UD introductory chemistry/biology course. During the Spring semester, Trevor served as laboratory instructor for Muhlenberg College, Allentown, PA.

Caprice L. Hightower (MS 2010), formerly a research scientist with AstraZeneca (Wilmington, Delaware), has joined the Manufacturing Division of Siemens Diagnostics (Malvern, PA) as an online technical problem solver for challenges arising in production of diagnostic assays.

Mark Plucinsky (PhD 1986) has left Shire Pharmaceuticals for a position as Associate Director Quality Control at Alexion Pharmaceuticals, Inc. Alexion Pharmaceuticals, Inc. is a biopharmaceutical company focused on serving patients with severe and ultra-rare disorders through the innovation, development and commercialization of life-transforming therapeutic products. It's exciting that Mark's daughter **Sarah Plucinsky** is currently a graduate student in our department working in Jebrell Glover's lab.

Rajni Singh (PhD 2010) has joined Shire Pharmaceuticals in Lexington, MA as a Postdoctoral Research Associate in drug formulation.

(continued on page 10)

NEW ALUMNI—CLASS OF 2012-13

PhD Chemistry: Kimberly A. Choquette, Trevor A. Daly, James J. Devery III, Jin Woo Lee, Dong Li, Kyle C. Wagner, Lindsey A. Welch and Panchao Yin.

MS Chemistry: Matthew D. Benrubi, Natascha A. Bezdenejnih-Snyder, Meredith C. Dapsis, Michael DePasquale, Fadi M. Haso, LaDonna A. Hicklin, Corey J. Hopper, Katherine M. Kressler, Yiqun Liu, Nicole L. Nguyen, Tiffany Z. Nuchols, Florence L. Okeny, Heidi J. Pixley, Sarah M. Plucinsky, Frank D. Price, Jr., Gene M. Rossi, Claude C. Simard and Jill E. Sledziewski.

BS Chemistry: Dennis P. Chen, Jason L. Cohen, Erin E. Hassel, Michael A. Kelly, Nyi Myat Khine Linn, Richard T. Mearhoff, Daniel A. Nissley, Jun Ha Park, Brent W. Schultz and Graham J. Touhey.

BS Pharmaceutical Chemistry: Emily Baut, Sean J. Keller, Stephanie N. Mack, Dongyoon Shin and Wintana Woldetensae Stefanos.

BS Biochemistry: Cheryn Amo-Adjei, Ghamar Bitar, Davida J. Browne, Erik N. Carrion, Wai-Tim Chew, Andrew S. Josephson, Taylor D. Standiford, Erin L. Wildeman and Lindsey R. Yap.

STUDENT AWARDS — 2013

Daniel A. Nissley—American Chemical Society Award Presented to the outstanding senior major in chemistry.

Taylor D. Standiford—American Institute of Chemists Award. Presented to an outstanding senior majoring in chemistry or biochemistry.

Emily E. Hollander— American Chemical Society Inorganic Chemistry Award for an outstanding student in inorganic chemistry.

Ghamar Bitar—American Chemical Society Organic Chemistry Award for an outstanding senior in organic chemistry. Ghamar also received the Harry M. Ullmann Chemistry Prize presented to the highest-ranking senior in chemistry.

Michael Kerner, Jr.—Alpha A. Diefenderfer/American Chemical Society Analytical Award presented to the highest-ranking junior in analytical chemistry sponsored by the ACS Division of Analytical Chemistry.

Wai-Tim Chew—William H. Chandler Senior Prize, established in 1920 by Mrs. Chandler, presented to the highest-ranking senior in the chemistry department.

Maxwell B. Watkins—William H. Chandler Junior Prize presented to the highest-ranking chemistry junior.

Anastasia M. Barros—Harry M. Ullmann Chemistry Prize presented to the highest-ranking chemistry sophomore.

Chemistry Honors Students for 2013

Stephanie Mack presented her Honors thesis on the topic of "Synthesis and Characterization **of Poly[dodecanediol a,w-diamineo-poly(ethylene glycol)(3350)]."** Her research adviser was Steve Regen.

Erin Wildeman presented her Honors thesis on "A Novel PAD4 Assay Using a Fluorescent Molecule." Marcos Pires was her research adviser.

GRADUATE STUDENT AWARDS

Congratulations to the following chemistry graduate students who were awarded fellowships for 2013-2014 :

Peng Cheng (Vezenov group**)** has been awarded the Newton W. and Constance N. Buch Fellowship.

Gabrielle L. Haddad-Weiser (Flowers group) has been awarded the C. Scott Althouse Fellowship.

Angela Smith (Moore group) has been awarded the Chemistry Foundation Fellowship.

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CHEMISTRY IS EVERYWHERE

ALUMNI NEWS (continued from p. 8)

David Pursell (MS-Chem, 1987; MA-Ed, 1987) is Associate Professor of Chemistry at Georgia Gwinnett College, Lawrenceville, GA. Dave joined the GGC faculty in 2007 from his previous position as Executive Director of the Chemistry Department at the University of Pennsylvania. David served as GGC's associate dean of its School of Science and Technology until 2010, when he returned to full-time faculty duties.

Lehigh Alums Turned DuPonters

Information was gathered by Alexandra Viscosi at DuPont. Upon their graduation from Lehigh, several students turned to DuPont to further their education.

The most recent undergraduate from Lehigh, **Patrick Osborne** from the class of **2012**, is an associate investigator working with chlorine dioxide as a treatment for wastewater used in oil and gas applications such as hydraulic fracturing. His job is to improve the performance while reducing the use of harmful chemical biocides in these products sold. He also is able to travel on-site in order to offer analytical support in oilfield operations for DuPont's chlorine dioxide generation equipment.

Steven Ackerman (BS 2010) is currently working in DuPont's Industrial Biosciences business as a member of the Sorona(R) polymer technology team. Sorona(R) is a partially biobased polymer used to make fibers for carpet and apparel applications. In this role, he is the technical support person for our carpet customers in Europe and he is also work in research projects focused on identifying polymer characteristics which may impact downstream processability.

From the class of **2011**, **Carolyn Ferreira, Jessica Fraser, Ashley Libutti, and Alexandra Viscosi** were also inducted into the Associate Investigator role at DuPont. Carolyn Ferreira started in DuPont Performance Coatings working as a Manufacturing Technology Engineer and has now been promoted and works as a Lean Six Sigma Black Belt for Technical, Sales, and Marketing for the now Axalta Coatings Systems. Jessica, Ashley, and Alexandra all work under the DC&F (DuPont Chemical and Fluoroproducts) business of DuPont. Jessica Fraser is in a synthetic chemistry role, spending most of her time creating polymers for anion exchange membrane fuel cells and providing R&D support for one of DuPont's plants. Ashley Libutti works to support new product develop and customer needs in the Institutional and Industrial surfactants business, while supporting R&D needs. Alexandra Viscosi, who received three degrees from Lehigh, is on the POI (priority of interest) project of the DuPont surfactant business working with paint customers to optimize their products and encourage sales in coatings. She also supports R&D development and new product commercialization.

Lori Stephans (PhD 1997) moved from a faculty position at Rowan (Glassboro State) to a high ranking position in analytical chemistry at DuPont. Lori did an NMR-oriented PhD thesis.

All of these Lehigh graduates are very excited about what they do and are open to discuss their projects and help fellow Lehigh students! Feel free to contact Alexandra Viscosi if you have any interest (Alexandra.C.Viscosi@dupont.com).

Lou Ann Tom (PhD 2005) has been promoted to Associate Professor with tenure in the Chemistry Department of Susquehanna University, Selinsgrove, PA. Lou Ann teaches General Chemistry, Instrumental Analysis and Pharmaceutical Chemistry. She conducts research in the area of molecularly imprinted polymers (MIPs) which are designed to detect low levels of specific molecules and can potentially improve prove methods for analyzing pharmaceuticals and other toxins in water samples by lowering detection limits. Prior to joining the faculty at Susquehanna, she worked as a chemist/senior scientist at Merck & Co. Inc. for 19 years.

Brendan H. Oakes (BS 2005) was awarded a PhD in Pharmacology and Experimental Therapeutics by Sackler School of Biomedical Sciences, Tufts University in May 2013. He is currently engaged in post-doctoral research at Sanofi Pasteur in Cambridge, MA.

Stephen K. Klasko (BA 1974, Chem/Bio), **MD** graduate of Hahnemann University, has been named President of Thomas Jefferson University and President/CEO of Thomas Jefferson University Health Systems. Steve was formerly Dean of the College of Medicine of the University of South Florida (USF). Prior to joining USF, Steve served in a series of leadership positions at Drexel University College of Medicine from 2000 to 2004, including Dean of the College of Medicine, Professor of Ob-Gyn and CEO of Drexel University Physicians.

Michael A. Gentile (PhD 2007) Associate Principal Scientist at Merck, is currently managing personnel and multiple projects requiring coordination with internal cross-functional teams at Merck as well as external collaborations with academic institutions and CRO's. Mike reports, "My recent experience involves the management of various preclinical studies and an external collaboration with fracture healing experts in academia." For one of Mike's current publications see, "Effects of Pharmacological Inhibition of Cathepsin K on Fracture Repair in Mice" in **Bone**, 2013.

Bruce P. Stiles (BS 1976) died unexpectedly in April of this year at the age of 59.

Sherry (Rohn) Clancy (MS 1994) is co-inventor on U.S. Patent 6,608,115, "Polyvinyl Chloride Resins and Their Production and Use in the Preparation of Whitened PVC Foam," from her work as a Research Chemist at Occidental Chemical (Pottstown, PA). Sherry is currently the Financial Administrator at St. James Lutheran Church, Pottstown.

Hao Zeng, MD, (PhD 2001) and her husband Dr. Mark Fung-A-Fat welcomed the birth of their son, Jonah Tianyu Fung-A-Fat on May 30th at St. Vincent Hospital, Worcester, MA. Hao is in medical practice in the Boston area and Mark manages the information technology program for the Massachusetts Medical Society.

RECENT FACULTY MEMBER DAVID VICIC

A Better Catalyst—by David Vicic

Research in organometallic chemistry involves using transition metals to manipulate the chemical bonds of organic molecules in order to transform the organics into higher value products. Vicic, a Professor of Chemistry employs a mix of focused exploratory chemistry, catalyst screening, and computational studies, to unravel how different metal/scaffold platforms could be used to either improve known reactions or carry out their own unique transformations. Many modern processes used to make industrially important molecules employ rare and expensive metal catalysts like palladium and rhodium. Vicic is trying to understand how to control the reactivity of more earth abundant and environmentally benign metals like copper, nickel, and iron in order to carry out similar transformations. "The price of rhodium is about 600 times more expensive than nickel and far more compared to iron," Vicic notes, "so there is big motivation for learning how to control the reactivity of base metals."

A metal-mediated transformation of particular interest to the Vicic lab involves replacing certain hydrogens in organic molecules with fluorine. Fluorination can increase the chemical and thermal stability of organic molecules. "The Teflon surface of a non-stick frying pan is largely fluorinated, as are special gaskets and seals that could withstand corrosive conditions." Vicic adds that fluorination is also important to the drug industry. "Pharmaceutical companies have an interest because they can replace some hydrogen atoms in drugs with fluorine to make them last longer in the body so they can get to their targets without decomposing." The stabilizing properties of fluorine, however, can also be a hindrance when it comes to developing new ways to prepare organofluorines, because "fluorine also makes the metal catalyst super stable and less reactive," says Vicic. "Many of the metal-catalyzed transformations that happen with normal organic substrates are slow with fluorinated ones. We're trying to figure out why and what we can do to the metal environment to improve catalysis." In this vein for his DOE-funded research, the Vicic lab has been preparing well-defined fluorine-containing organometallic complexes in order to see how they can be coaxed into targeted reactivity patterns.

WELCOME TO NEWEST FACULTY MEMBER— HEATHER JAEGER

Heather Jaeger was born in Indianapolis, IN and spent her childhood in the suburban, one-stoplight town of Wanamaker. Commerce in Wanamaker revolves around the local Feed and Seed, supplying farmers with various accouterments and entertaining children with the annual litter of resident kittens. Heather's parents, Ronald and Margaret Jaeger, have four children, of which Heather is the second. Ronald is employed by Harman International to write firmware for automobile audio-visual technology. Margaret has been employed by Conseco and One America as a Project Manager to direct internal procedures. Both still reside in Wanamaker, and Heather enjoys her trips back home, where one can still hear the crickets chirp at night.

Heather has been building a music library that spans rhythm and blues to folk music. Currently, she has taken a particular interest in shoegaze music, thusly named because musicians appeared to be staring at their shoes during live performances. Heather enjoys listening to her collection while she rides her bicycle. Heather is a road bicyclist, having a limited number of adventures in mountain biking. While in Rochester, NY Heather was able to commute via bicycle and take long, leisurely rides along the Erie Canal trailway.

Heather's interest in theoretical chemistry began during an undergraduate physical chemistry class. Her appreciation of the field lies in the symbiotic relationship between mathematics and physical foundations, a concept instilled in her by her undergraduate research advisor, Cliff Dykstra. As an undergraduate, Heather paralleled her chemistry studies with computer science. She then joined the research group of Henry Schaefer at the University of Georgia to study computational quantum chemistry. With an aim to understand and explore the quantum dynamics of electrons in condensed phases, Heather joined Oleg Prezhdo's group at the University of Rochester. The distinct viewpoints of her research advisors have provided Heather with an open-minded perspective on scientific research, one that she looks forward to passing on to her students.

(Jeter article continued from page 7)

see more big pharma investment in establishing and expanding innovative research in the emerging markets. I think the age of frantic mergers between the big pharma companies has slowed down. I don't think we'll see the megamergers that we've seen in the last several years, mostly because I don't know how successful they've been in terms of the quality and quantity of expanded pharma pipelines. I do think we'll continue to see the big companies acquiring smaller specialty pharma and biotechs to complement or add on to their pipelines. Big pharma is in the midst of redefining, reshaping, refocusing and trying to find better ways to bring quality medicines to the patients that need them. I suspect that the reshaping will continue for quite a while longer. I certainly don't know what the future of pharmaceuticals will be but I think I can safely say that it will never be what it was, for better or worse.

Tell us about the grant-awards program Teva has started through the ACS for young faculty? What's your role in that?

In 2009, Teva rolled out the "Teva Scholars Grants Program" to award 3 $300 K grants to support academic researchers involved in the areas of organic and medicinal chemistry. The Teva grants are targeted to recognize and support the work of recently tenured faculty and are administered through the American Chemical Society. At last year's ACS meeting in Philadelphia, Teva sponsored an afternoon symposium and reception to showcase the research of the inaugural award recipients. The grantees were from various universities around the US, their presentations were excellent and we had a great turnout. At the symposium, we also announced the names of the recipients of the next set of 3 grants. The idea for the Scholars grants program started in my group and my role in the program is to serve as the liaison between Teva and the ACS. I also had the pleasure to work with ACS to set up and run the Teva Scholars Symposium at the Philadelphia ACS meeting. The company received very positive feedback about the program overall and the ACS symposium last year and I'm proud to be a part of it.

What's it like to be married to a chemist? Is dinner-table talk about reaction mechanisms? What's your hubby doing these days?

Actually we are often asked this question by our friends. The answer is, "It's great!" Jim and I share a passion and love for science so we always have lots to talk about. For many years, we were both involved in drug discovery research at big pharma companies so we could really appreciate each other's everyday ups and downs, successes and failures that come with the job. It helps to have a spouse "in the business" when you have to miss dinner because of a difficult scale-up or go in on the weekend to work up a reaction. Over the years, we have attended many chemistry meetings and conferences together, attended each other's talks and poster presentations and proofread publications. We have had many dinner table conversations about tough synthetic problems, new reactions/reagents, and spectroscopic interpretations. Of course, since we worked at "rival" companies (me at J&J and Jim at Wyeth), we were very careful not to talk in specifics about our projects. Jim and I were also both adjunct faculty at Cabrini College and taught the same chemistry course for several years. I taught the weekend section and he taught the same course at night. The bookcase in our family room rivals the chemistry section of any university bookstore, including several Aldrich catalogs and the Merck Index!

Jim was downsized from Wyeth a few years ago when Pfizer acquired the company. He has always enjoyed teaching so he got his teaching certification and is now teaching chemistry and physics at the high school level in the Philadelphia School District. While we are no longer involved in drug discovery research, our career changes have given us new and exciting areas of chemistry to explore together.

NATALIE FOSTER RETIREMENT

Natalie Foster earned her PhD in Chemistry from Lehigh and her BS degree in Chemistry from Muhlenberg College. Prior to serving as associate professor of Chemistry at Lehigh, Natalie was an adjunct assistant professor of Radiation Oncology and Nuclear Medicine at Hahnemann University in Philadelphia, and an assistant professor of Chemistry at Cedar Crest College. She was the 2008 recipient of Lehigh's Lindback Award for Distinguished Teaching. She has co-authored three books, the most recent is Chemistry: The Science in Context, and has two books scheduled for release in 2014.

FACULTY/STAFF AWARDS

Rebecca Miller *(center) received the Alfred Nobel Robinson Faculty Award for achieving excellence in teaching or research and advancing the interests of the university. This was presented at the Lehigh Appreciation Dinner on April 30. by Pres. Alice Gast and Provost Patrick Farrell.*

Robert Flowers is named Fellow of AAAS

Robert A. Flowers, department chair and professor of chemistry, has been named a fellow of the American Association for the Advancement of Science (AAAS)—an honor bestowed upon AAAS members by their peers. AAAS, the world's largest general science organization, publishes Science magazine. Founded in 1848, it serves more than 260 affiliated societies and scientific academies.

Flowers, who holds the Danser Distinguished Faculty Chair in Chemistry at Lehigh, was lauded for his distinguished contributions to the field of physical organic chemistry, particularly in understanding the mechanism of single electron transfer reactions of lanthanides in important synthetic reactions.

Flowers was among 702 AAAS members who were named fellows because of their scientifically or socially distinguished efforts to advance science or its applications. He was formally recognized at the AAAS annual meeting in February 2013.

Earlier this year, Flowers and an international team of chemists from Germany were recognized for developing a new method for jump-starting common industrial chemical reactions with a single-electron catalyst that regenerates itself during the reaction. The research was funded by the National Science Foundation and the Deutsche Forschungsgemeinschaft.

Andy Ho was promoted from General Chemistry Labs Manager to Director of Freshman Chemistry effective January 2013.

NEW FACE IN CHEMISTRY

Denise Beautreau joined the department in February. She is excited and motivated to be a part of Lehigh University and the Department of Chemistry. Denise has assumed the position of General Chemistry Labs Manager.

Denise was born and raised on the Nature Island of the Caribbean, Dominica. She migrated to the United States to pursue an undergraduate degree from the State of New York College at Plattsburgh. Denise received a BS degree in Biochemistry from SUNY Plattsburgh and participated in Organic Synthesis research during her time at SUNY Plattsburgh.

Denise also holds an MS degree in Chemistry from Long Island University. Her thesis research involved protein peptide construction and inhibition studies. Denise's project investigated the use of Protein Kinase C Beta II as an inhibitor in the activation pathway of oncogenic *ras*-p21.

Denise has extensive laboratory operation and teaching experience, cultivated from her undergraduate and graduate tenures at SUNY Plattsburgh and Long Island University, and at her previous positions at Medgar Evers College of the City University of New York and Mercy College. Denise also has a strong passion for sharing her love for science and science education. She has participated in several workshops and seminars promoting science awareness and the opportunities available to students in these fields. Denise is very invested in showing young people the many avenues that can be pursued in STEM, particularly for women, and enjoys her participation in the American Association of University Women's annual Explore Your Opportunities Conference. She is looking forward to continuing this work at Lehigh and in the Lehigh Valley as opportunities present themselves.

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Can anyone identify this undergraduate (circa 1934)? Note the absence of safety glasses or explosion shields, both of which were uncommon in the 1930s.