



# Mudd In Your Eye

Newsletter of the Department of Chemistry, Lehigh University

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

## Inorganic molecules achieve self-recognition

**Tianbo Liu**, associate professor of chemistry, and his research group have discovered a high-level molecular self-recognition in dilute aqueous solutions, something that was previously considered achievable only by biological molecules.

The group's results were published in the March 25 issue of *Science*, the nation's premier science journal. Liu was lead author on the article, which was titled "Self-Recognition Among Different Polyprotic Macroions During Assembly Processes in Dilute Solution."

"Publication of this work in *Science* is important recognition of the research being conducted in Tianbo's lab," said Robert Flowers, department chair and professor of chemistry. "His ability to succeed at such a high level shows that first-rate science is being done at Lehigh."

Liu's group has spent several years exploring the fascinating solutions of large, soluble ions called macroions. The behavior of these ions is completely different from the behavior of small ions, such as sodium chloride.

"Despite being water-soluble and carrying the same type of charge, macroions tend to attract each other with surprising strength," says Liu "and to form very stable, uniform single-layered hollow spheres known as 'blackberry structures.' The structures are common when ions become large, and they mimic some biological processes such as the virus capsid shell formation."

## Formation of two distinct blackberry structures

Exciting discoveries have been generated from blackberry solutions. Liu's group found that, when mixed into the same solution, two different types of 2.5-nm spherical macroions ( $\{\text{Mo}_{72}\text{Fe}_{30}\}$  and  $\{\text{Mo}_{72}\text{Cr}_{30}\}$ ) with almost identical size, shape and molecular structures tend to form two types of individual blackberries instead of mixed ones.

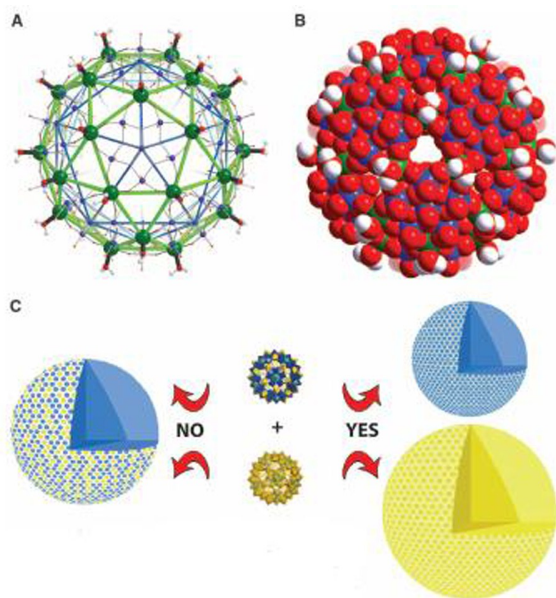
The macroions—Bucky ball-shaped inorganic compounds—were synthesized by a research team led by Achim Müller, professor of chemistry at the University of Bielefeld, Germany. Müller was a coauthor on the *Science* article. "This result," says Liu, "suggests that even in dilute solutions these two macroions can self-recognize during assembly."

This level of "intelligence," is usually believed to be achievable only by complex biological molecules. Self-recognition by large inorganic ions could lead to more opportunities for understanding the nature of biological interactions.

Liu's group believes the self-recognition results from the very slow formation of the dimers in the first step of the assembly. The slow speed ensures the formation of dimers with the lowest free energy, such as A-A and B-B dimers. The differences in charge density between the two types of macroions play an important role in the recognition, as does their surface water mobility difference.

The *Science* article was coauthored by one current (Dong Li) and three former members of Liu's research group. Melissa Kistler Langston (PhD 2009) is now an assistant professor of chemistry at Delaware Valley College. Joseph Pigga (PhD 2010) is now a postdoctoral researcher at Lehigh.

Celine Pichon was a postdoctoral researcher at Lehigh from 2008-2009 and is now a research scientist at the University of Bordeaux in France. Liu's work was funded by the NSF, the Alfred P. Sloan Foundation and Lehigh. The German collaborators were funded by Deutsche Forschungsgemeinschaft (DFG). Liu and Müller have an NSF-DFG International Collaborative Grant.



*Liu's group studied the structures of the two macroion clusters (A and B) and discovered that in mixed dilute aqueous solutions, the clusters (middle of C) self-assemble into distinct blackberry structures (C, right) and do not form mixed species (C, left).*



*Dmitri Vezenov in his research lab*

## **Dmitri Vezenov receives patent for DNA sequencing**

One day, a few years from now, your visit to the doctor's office may include a step on the office scale, a quick check of your temperature and a scan of your entire DNA, just to be safe. When that day comes, you may thank the research teams that are working now to deliver fast, cheap genomes.

**Dmitri Vezenov**, assistant professor of chemistry, and his research group are part of a world community of researchers working on such an advanced sequencing technology. Recently they reached a milestone when Vezenov was awarded U.S. Patent No. 7,892,739 for a quicker, more efficient method of sequencing DNA.

Human DNA and its 3 billion chemical base pairs hold the key to a healthy future. With the blueprint for humanity decoded, researchers will be able to discover the mutations that cause neurodegenerative disease, the miracle drugs that could fight cancer, and the genetic markers that signal future risk for heart disease.

Vezenov has figured out a faster, cheaper way to get that information. Put simply, he has created a system that reads long sequences of nucleotides, the building blocks of DNA, by looking at their physical properties.

### **"The promise of personalized, affordable medicine"**

Traditional methods may look at nucleic acids one at a time, or copy segments, dye them bright colors, separate, and count them up. Vezenov extracts the sequences by adding short DNA fragments complementary to the target nucleic acid, which bind to or release from DNA and measures changes in forces on the DNA molecules as they increase in length. Vezenov uses force spectroscopy, known in labs as "magnetic tweezers," to accomplish this

not the one-molecule-at-a-time way in which it was traditionally performed. His method couples and measures multiple oligonucleotides and DNA strands simultaneously, amounting to the identification of millions of base pairs at the same time using arrays of single molecules.

Processing speed is a primary advantage. A single researcher employing the traditional Sanger DNA sequencing method would have needed many years to sequence a single human genome. Cost is another factor. The person or company that can deliver low-cost genomic sequencing will, in Vezenov's words, "give the promise of personalized, affordable medicine."

Vezenov's method is on the right track. His technique does not require labeling of nucleotide bases, nucleotide separation or amplification (the copying of strings of DNA), which are all expensive, time-consuming steps. But knowing how much this technique will actually cost is a guessing game until more research is completed. Vezenov's research centers on direct manipulation of biomolecules, new tools for research into biological processes, and the assembly of functional nanomaterials.

It's the interdisciplinary approach that allowed for this invention, which required a firm understanding of how molecules interact, how the world's latest technology can solve a problem, and how nanoscale tools can provide a quick blueprint for the human body and mind.

There's nothing simple about Vezenov's system, or the DNA blueprint that makes us up. Take two people from opposite ends of the earth and their DNA is less than 1 percent different.

*Many thanks to Jordan Reese for the generous use of his articles on both Tianbo Liu and Dmitri Vezenov. These articles appeared in the Lehigh University News Center this spring and are stored in the LU Archives.*

### **DID YOU KNOW?**

**Lehigh's Chemistry Department is ranked 6th in the nation for producing [MS CHEM graduates](#)!** [Report from the ACS Committee on Professional Training, 2009.]

**The ACS designated the Chandler Chemistry Laboratory at Lehigh a Landmark in 1994, and there is much related information on the [ACS web site](#).**

**Chemistry Department newsletters may be viewed in pdf format on our website <http://www.lehigh.edu/~inche/>.**

### **Celebrating an event of 100 years ago:**

**Marie Curie, nee Maria Skłodowska**, was born in Warsaw in 1867. Marie was first nominated in 1911 as Nobel Laureate to the French Academy of Sciences but was rejected by the Academy's all-male membership. Later that year she eventually received the Nobel Prize — one hundred years ago. *Excerpted [www.nobelprize.org](http://www.nobelprize.org).*

## ALUMNI NEWS

**Lisa Murphy Vail** (MS 1986) was named Clinical Team Leader (Regulatory Approval) for Thoracic/Abdominal Sleeves and Stents in the Medical Products Division of W. L. Gore and Associates, Flagstaff, AZ.

**Melissa Kistler Langston** (PhD 2009) has joined the faculty of Delaware Valley College as Assistant Professor of Chemistry. Melissa formerly taught at Kutztown State University.

**Rajni Singh** (PhD 2011) has taken a position as a Postdoctoral Research Associate at the University of Connecticut, Storrs, CT. Rajni is studying protein solubility and stability as well as protein-excipient interactions in candidate pharmaceuticals. Rajni is working with Professor Devendra S. Kalonia.

**Hao (Audrey) Zeng**, M.D., Ph.D. (LU PhD 2000) has joined the faculty of Tongji University, School of Medicine, Shanghai (China), as Professor of Pathology and Director of the Pathology Division, Department of Pathology and Pathophysiology. Hao's job description includes: (1) helping to establish an English-teaching program in medicine, (2) leading the Pathology Division in teaching and research, and (3) helping Tongji revise its medical curriculum to the US format. She also teaches Clinical Medical English and Pathology to the medical students at Tongji.

**Bruce Weber** was a Research Scientist in Lehigh's Chemistry Department from 1985 to 1987. Bruce has taken a position as Associate Director for Analytical Chemistry at LZ Therapeutics, Bethlehem, PA

**George Marchesini** (MS 1989) has relocated from a position of Associate Director of Regulatory Affairs at J&J to Associate Director-Regulatory Affairs at Novartis Pharmaceuticals Corporation, Oncology Business Unit.

**Michael Ford** (BA 1970; PhD East Anglia 1973) has retired as Lead Research Chemist at Air Products and Chemicals and joined Lehigh as Research Associate in Chemical Engineering. Mike's research involves preparation, in situ characterization, and evaluation of novel supported oxide catalysts for organic reactions.

**Ryan J. Fealy** (MS 2006), a doctoral candidate at Bryn Mawr College, presented his research "Synthesis and Electrochemical Studies of Ruthenium Complexes Containing Multiple Metal Centers" at the 2011 Middle Atlantic Regional ACS Meeting. Ryan's presentation was on May 23 in College Park, MD.

**Herman E. Collier, Jr.** (PhD 1955) joined the staff of Academic Search Consultation Services in Washington, DC in 1988. Academic Search's mission is to help small colleges find new Presidents with personalities and philosophies that mesh with that college's tradition. Since joining Academic Search, Herman has led 20 small colleges to new presidencies. He is currently helping Brevard College in its presidential search.

**Linda Wu** (BS 2003, MEd 2004) has joined the Energy Storage Research Group at Rutgers University to work on the development of high-capacity rechargeable nanobatteries.

**Indira Gupta** (MS 1979) has joined Freescale Semiconductor as Senior Reliability Engineer. Freescale is one of the largest manufacturers of embedded semiconductors for use in mobile communication systems, medical diagnostic devices, appliances, and automobiles.

**Dr. Rajesh B. Shukla** (BS 1983) was named Senior Director for R&D at Meridian Medical Technologies in Columbia, MD. Meridian, a wholly-owned division of Pfizer, makes Epipens and auto-injector devices for drug delivery.

**Vernon C. Alford, Jr.** (MS 2006) is a medicinal organic chemist at Amicus Therapeutics in Cranbury, NJ

**Eric D. Seymour** (MS 2007) presented a paper at the Middle Atlantic Regional ACS Meeting (Marm 2011) in College Park, MD. Eric, who is a Research Scientist at Merck-West Point, presented his findings on the use of a new analytical technique, helium pycnometry. Eric is employed in Merck's Center for Materials Science and Engineering.

**Erik Aponte** (MS 2010), formerly a chemist with Wyeth in Pearl River, NY, has joined Merck as Supervisor - Compound Management Group in the In Vitro Pharmacology Department. Erik will be working at the Schering Plough R&D Site in Kenilworth, NJ, recently acquired by Merck in the purchase of Schering-Plough. Erik's unit processes the microtiter plate solutions of candidate drugs from the compound libraries for use by the Screening/Assay Group.

**Edward Scanzano** (MS Pharm Chem 2005) has completed his J.D. degree at University of Santa Clara Law School, has been admitted to the Patent Bar, and has enrolled in the L.L.M. program of Southwestern University, Los Angeles. Ed is pursuing a Masters in Media and Entertainment Law at Southwestern. Ed's "day job" is Software Development Manager at AribaWeb but he is also the prime consumer of Lehigh's distance education having obtained on-line M.S.'s in Pharmaceutical Chemistry, Molecular Biology, and Biological-Chemical Engineering.

**Matthew Szap** (PhD 1997), Manager of Multimedia Communications at GE Healthcare, is currently enrolled in New York University's certificate program in Video Editing. In addition to his "day job" with GE Healthcare, Matt is also President of SZAP Media, a video production company located in Metuchen, NJ, specializing in covering weddings and life-events. Szap Media produces professionally edited DVDs for commercial or gift distribution. Matt organized a band of musicians from his company and they have gone far.

**Mark C Plucinsky** (PhD 1986) has taken a position as Associate Quality Control Director in the Analytical Sciences Division of Shire Human Genetic Therapies, Inc in \*Cambridge, MA. Mark was formerly with Centocor/J&J in quality control of biological products.



## ALUMNI NEWS (continued)

The February 2011 issue (Vol. 12, issue 1) of *Pharmaceutical Outsourcing* features an article by **Robert H Seevers** (BS 1976) entitled "Regulatory Strategy to Support the Use of Radiolabeled Drugs in Clinical Trials." Seevers is a Regulatory Affairs Specialist at Eli Lilly Pharmaceuticals in Indianapolis, IN.

**Bruce Sachais** (BS 1988) was named Chair of Transfusional Services and Chair of the Institutional Review Board at the University of Pennsylvania School of Medicine. Bruce, who holds both MD and PhD degrees, is also Associate Professor of Pathology and Laboratory Medicine at Penn.

**Michelle DeCrosta** (PhD 1986) is Director of Analytical Services at Discovery Labs in Warrington, PA.

**Donna Fitzpatrick** (MS 1983; PhD 1986), a high school chemistry teacher at South Fork High School in Stuart, FL, writes that her school district just built her a new teaching laboratory. "I moved into a new lab that I had a hand in designing and it is fabulous, complete with plenty of fume hood space, twelve student computers, Smart Board, document camera, and sound system." Donna has started an ACS Student ChemClub at South Fork and has taken a position on the board of directors of the National Mole Day Foundation. Donna's high school chemistry students put on a "Hands-on-Chemistry Day" at three elementary and one middle school in their district.

**David March** (BS 1977) has joined Rockwell Automation (Charlotte, NC) as Process Capital Productivity Specialist.

**John Spaltro** (PhD 1985) has joined Covance Pharmaceutical Services as Senior Director for Global Regulatory Policy & Intelligence.

Deceased: **Dr. Thomas S. Freund** (PhD 1969) died in March 2011 in Sloan Kettering Cancer Center. He trained many scientists for various enzyme and microbial assay procedures and was a consultant to Digestive Care for 20 years.

(ALUMNI NEWS continued on page 5)

## LATEST NEWS ON THE STEPS BUILDING

Move-in-day for the STEPS building went very smoothly for an undertaking like that and the fall labs went off without missing a beat. The instrumentation labs are still a work in progress because of a snafu in the HVAC which took some time to correct. More equipment is coming in the second round of funding this summer. Currently organic has two IRs and two GCs with a GC-MS and LC-MS arriving in July. Intro uses two more IRs in a separate instrumentation room. For various reasons Intro is on the first floor and Organic is on the third. As can be seen in the accompanying photos, the labs are very good and larger than the Mudd labs.



*First year students in one of the Intro lab spaces*

There are three 24-student labs and two studios, one for 48 students and one for 24. We needed every bit of that due to record enrollments in the Intro chemistry courses this past year. In the Intro lab the island bench spaces allow a better interaction of the student groups when they work as pairs and fours.

There are two organic labs each designed for 20 students. The organic labs are, simply put, state-of-the-art to use a well-deserved cliché. Each of two labs has ten 8' hoods designed to accommodate two students. All glassware and equipment is in or under the hoods, minimizing the movement of students around the lab. The hoods are positioned in the main laboratory space but visibility is excellent across the lab because the hoods are glass all-around to allow visibility. The prep room has pass-through hoods into both labs.



*A section of the new Organic lab*

An unusual feature of STEPS is the large amount of display space. Chemistry has 48 feet featuring a variety of sections. The building is designed with lots of student study and gathering areas. In fact STEPS recently won the international green design award (see LU Archives of July 7) for its outstanding use of environmentally friendly areas.

## NEW ALUMNI—CLASS OF 2010-11

**PhD Chemistry:** Lili Liu, Esther Pesciotta Miller, Piercen Oliver, Joseph Pigga, Rajni Singh, Mauricio Valencia Ramos, and Xiaofang Yang.

**PhD Pharmaceutical Chemistry:** Raymond Pugh

**PhD Polymer Science & Engineering:** Mauricio Misdrahi Flores and Joseph Labukas.

**MS Chemistry:** Jaime Alexandroff, Scott Anthony, Sara Beth McGrath Aronson, Stacy Jarvis Bloxk, Justin Brandt, Jennifer Broyles, Angela Caravella, Kimberly Choquette, Kevin Cook, Kien Sun Du, Liane Grieco, Frank Harrison, Caprice Hightower, Jessica Horning, Nicole Hosein, Haley Kerr, Timothy Knittel, Michael Koons, Marissa Lamparski, Martin Lazorik, Mary Lent, Cong Liu, Todd Maisano, Breeanna Meneses, Arlana Moskalyk, Julie Novak, Kari Organtini, Emily Potts, Jonathan Rado, Panagiota Rizos, Jessica Rogers, Rory Sargeant, Joseph Schariter, Crystal Schneck, Rachel Sherman, Alison Smith, Charlotte Stallons, Carol Stein, Kenneth Willson, Kassie Woodard and Michelle Wren.

**BS Chemistry:** Jessica Fraser, Chad Goldman, Adam Koll, Lillian Kull, Michelle Ly and Peter Roman.

**BS Pharmaceutical Chemistry:** Jostine Mejia and Elizabeth Upton.

**BS Biochemistry:** Niall Buckley, Brian Czornyj, Robert DeJarnette, Rebecca Graziano, Lisa Hecht, Stephen Hesler, John Holtz, Ashley Libutti and Alexandra Viscosi.

## STUDENT AWARDS — 2011

**Matthew J. Gardner**—American Chemical Society Award Presented to the outstanding senior major in chemistry.

**Ashley M. Libutti**—American Institute of Chemists Award Presented to an outstanding senior majoring in chemistry or biochemistry.

**Jessica L. Fraser**— American Chemical Society Inorganic Chemistry Award for an outstanding senior. Jessica also received the Merck Index Award awarded to a senior chemistry major who has been active in student affairs.

**Jennifer M. Colquhoun**— 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.

**Brian C. Czornyj**—Harry M. Ullmann Chemistry Prize presented to the highest-ranking senior in chemistry.

**Lillian D. Kull**— William H. Chandler Senior Prize, established in 1920 by Mrs. Chandler, presented to the highest-

ranking senior in the chemistry department. Lillian was also awarded the Presidential Scholar Award.

**Michelle S. Hofman**—William H. Chandler Junior Prize presented to the highest-ranking chemistry junior.

**Cassandra B. Tuttmann**— William H. Chandler Sophomore Prize presented to the highest-ranking chemistry sophomore.

**Chad P. Goldman**—Hypercube, Inc. Scholar Award presented to a senior chemistry major who has shown outstanding promise in theoretical chemistry and molecular modeling.

## GRADUATE STUDENT AWARDS

Congratulations to the following chemistry graduate students who were awarded departmental fellowships for 2011-2012: Kimberly Choquette (Flowers group), Jinwoo Lee (Glover group) and Minghui Wang (Regen group). Additionally, Kevin Cook (Ferguson group) was awarded the Roy R. Hornor Research Fellowship in Metallurgy and Inorganic Chemistry and Kyle Root (Glover group) was awarded a Summer Dean's Fellowship through the College of Arts & Sciences.

The following undergraduate and graduate students from the Chemistry Department were chosen to present posters at the 2011 Academic Symposium at Lehigh University on March 29, 2011: Meredith Harman (BS biochemistry '12 - Flowers & Heindel research group member), Nina Finamore and Cong Liu (PhD students in Moore and Landskron research groups, respectively), and Piercen Oliver (PhD student in the Vezzenov research group).

## ALUMNI NEWS (continued from p. 4)

**Lauren (Williams) Fotiades** (MS 2004) has left a position as a Research Chemist with Aquarian Solutions to join Dynalene as Laboratory Manager. Dynalene, located in Whitehall, PA, conducts research on high efficiency coolant fluids and industrial heat transfer liquids.

**David M. Stephon** (MS 1986) has left a position as Vice President for Quality Assurance at Adolor Pharmaceuticals to form David M. Stephon Consulting Services. David specializes in FDA regulatory affairs and quality control issues in big and small pharma. He can be reached via the FDA Inspections group on the Linked-In network.

**Samantha Braganza-Pugh** and **Raymond Pugh** (both PhD 2010) found 2010 to be a year to really celebrate. First they each received a PhD and then they had a daughter, Tegan Reania on 20 December. Raymond is teaching chemistry and coaching at St. Anne's-Belfield School, a private K through 12 academy in Charlottesville, VA.

## CHAIR'S MESSAGE

It is hard to believe that another academic year has come and gone. As usual, the Department has been quite busy and a number of important changes have occurred. Aliana Lungu joined the Department as our new organic laboratory manager. She has been quite busy organizing our organic chemistry labs and getting new GC and LC mass spectrometers, gas chromatographs, and infrared spectrometers up and running so that our undergraduates have access and hands on use of important modern instrumentation.

A number of important changes have occurred with the faculty as well. We hired two new members of the faculty. Marcos Pires joins the faculty from the University of Pennsylvania where he was an NIH-NRSA postdoctoral fellow in the research group of Professor Bill DeGrado. Marcos' area of expertise is in chemical biology. Damien Thévenin joins the faculty from Yale University where he was a postdoctoral fellow with Professor Donald Engelman. Damien's area of expertise is in the area of membrane proteins and signal transduction. Along with Professor Jebrell Glover, Damien and Marcos form the core of our biochemistry group and we are very excited to have them on board. As a consequence of their arrival, major renovations are being carried out on the 6<sup>th</sup> floor of Seeley Mudd to provide modern biochemistry facilities for the education and training of graduates and undergraduates.

Since 2004, eight new faculty have joined the department. Among science departments in the college of Arts & Sciences, chemistry is first in a number of areas including research expenditures and external funding. While we are pleased with our progress, we are working hard to increase the profile of the department at the national level. As a continuation of our plan for faculty expansion, the department will be searching for a senior faculty member to build the ranks of senior faculty. The new STEPS building has been a big boost to our first two years of undergraduate laboratory instruction and we intend to capitalize on this first-class facility to increase the number of chemistry and biochemistry majors in our program.

In other faculty news, congratulations are in order to Tianbo Liu for his recent paper in *Science*. Dmitri Vezenov recently received a patent for his novel approach to DNA sequencing. Additionally, Kai Landskron recently published work in *Nature Communications* that has received broad attention in mainstream media outlets including ABC News in Australia and *USA Today*. We are very proud of their accomplishments and look forward to continued success.

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. If you happen to be in the area and want to see some of the big changes occurring in the department, please stop by.

Bob Flowers, Chair

## FACULTY NEWS

**Robert Flowers** co-authored "Organic Synthesis Using Samarium Diiodide" along with David J. Procter and Troels Skrydstrup which was published by the Royal Society of Chemistry. He also co-authored six papers and presented invited lectures at the University of Birmingham, UK, the University of Manchester, UK, and the University of Bonn, Germany in the spring of 2010. He also gave invited lectures at UCLA, USSB, UCSC and UCD in the spring of 2011.

**Gregory Ferguson** was the author of a *Langmuir* publication and supervised the poster presentation by Joseph P. Labukas at the Spring 2011 National Meeting of the Materials Research Society.

**Natalie Foster** was a co-author for the new edition of *Chemistry: The Science in Context*. This is a new edition of a textbook for introductory chemistry. She co-authored two Journal articles.

**Jebrell Glover** co-authored an article in *Nanoscale Research Letters* which was a collaborative effort with Kai Landskron.

**Ned Heindel** presented six lectures across the country and co-authored two books related to Promoting Chemical Safety. In addition he co-authored six journal articles in which he served as director of the chemistry component of the project.

**Kai Landskron** was awarded one patent: "Periodic mesoporous phosphorus-nitrogen" which is promising as a component in a variety of applications. A second patent: "Production of ultrahard stishovite nanoparticles" is pending. Kai contributed to two abstracts and published a total of seven journal articles this year. Kai even made the mass media—he published "Porous diamonds made in the lab" which was aired and published by CBS News.

**Tianbo Liu** presented invited papers in Israel and Hawaii. On an international tour during the summer of 2010 he gave three invited lectures. Tianbo directed the research which led to six journal articles.

**David Moore** published an article as a co-author in *The Journal of Chemical Physics*.

**Steve Regen** has a pending patent "Bisphosphonate-Prostatic Acid Phosphatase Inhibitor Conjugates to Treat Prostate Cancer Bone Metastasis." In addition Steve co-authored four journal articles.

**Keith Schray** as Co-PI submitted an NSF grant for the "GK-12 Lehigh Graduate Advancement and Communication Initiative: LEGACI." Its status is pending.

**Dmitri Vezenov** received a patent for a quicker, more efficient method of DNA sequencing. Human DNA and its 3 billion chemical base pairs hold the key to a healthy future.

In addition Dmitri co-authored three journal articles.

**HENRY LEIDHEISER, JR.**  
**MEMORIAL RESOLUTION – May 2, 2011**

Dr. Henry Leidheiser, Jr., joined the Lehigh University faculty in 1968 as Professor of Chemistry and Director of the Center for Surface and Coatings Research—later renamed the Zettlemoyer Center for Surface Studies. Henry was born in New Jersey but sought his higher education in the south, earning BS, MS, PhD degrees from the University of Virginia. He continued as a Research Associate for three more years before joining the newly founded Virginia Institute for Scientific Research in Richmond, where he eventually became its Chief Executive Officer.

Henry began his Lehigh tenure at its emergence as a noted research university, spirited by the formation of a number of research centers and institutes. His experience as a researcher and an executive at the Virginia Institute made him well suited for his new position as Director of the Center for Surface and Coatings Research, which became nationally and internationally recognized for its fundamental and applied research including: printing inks, colloids, emulsion polymers, corrosion, coatings, catalysis, cloud seeding, environmentally enhanced crack growth in metal alloys and surface science. Henry was tireless in his efforts to bring attention to the Center's activities and, thereby, to Lehigh via organizing many symposia and meetings for the American Chemical Society, The Electrochemical Society and the National Association of Corrosion Engineers. Many of these symposia and meetings were held at Lehigh. By the time Henry stepped down as the Director of the Center for Surface and Coatings Research in 1983, the combined research funding acquired by the faculty and staff associated with the Center had surpassed 20 million dollars annually. The total research productivity of the Center in terms of publications, patents and MS and PhD degrees was very extensive.

As a graduate student, and as a research associate with his mentor Allen Gwathmey at the University of Virginia, and later as a member of the Virginia Institute for Scientific Research, Henry helped pioneer the use of metal single crystals for the fundamental studies of corrosion, oxidation, electroplating, and catalysis. This work clearly demonstrated that the reactivity of certain metals was a function of the crystallography of their surfaces. The observation was a key factor in ushering in a new era in surface science that continues to this day. Methods were developed to machine single crystal metals in the shape of spheres, which were then used to differentiate the reactivity of different surface structures. Often the results were quite striking in appearance. For example, when copper single crystal spheres were oxidized, a complex pattern of varying colors was observed as a result of the range of oxide thickness that formed on different crystallographic surfaces. When these results were published, Tiffany & Company of New York requested several of these oxidized copper spheres to be put on display in their store window.

During his tenure at Lehigh, Henry built a highly successful and broadly based research program of his own in the field of corrosion and corrosion control. Some of his research dealt with finding the factors that led to degradation of the barrier protection of organic coatings and subsequent

corrosion of the metallic substrate. He discovered, along with co-workers, that surface carbon interfered with the phosphate conversion step used to improve the adherence of organic coatings (paint) to steel surfaces. The removal of this carbon prior to the phosphate treatment and painting significantly improved corrosion resistance, which increased the lifetime of many steel products, including car bodies.

Henry's research activities spanned more than 40 years, resulting in over 260 publications and many honors and awards—among these were the Electrochemical Society's Young Author's Award, Virginia Academy of Science's J. Shelton Horsley Research Award, served as a NATO Fellow to Cambridge University (England), American Electroplaters Society's Silver Medal, Society of Automotive Engineers' Arch T. Colwell Award, National Association of Corrosion Engineers' Whitney Award, Humboldt Senior Scientist Award, the Electrochemical Society's Electrodeposition Division's Research Award, and was an elected Fellow of the American Association for the Advancement of Science for research in corrosion.

While at Lehigh, Henry served as advisor to 19 master degree and 15 doctoral degree students. He taught chemistry courses including a course in corrosion science. Henry developed a short course on "Corrosion Protection by Coatings," which was presented annually at Lehigh for 16 years. Many members of the coatings industry benefitted from attending this course. Henry received Lehigh's Libsch Research Award in 1987 in recognition of his sustained and productive research career. During the year prior to his retirement in 1989 he served as Chairman of the Chemistry Department.

Many of those who knew Henry well considered him a "quintessential southern gentleman". Always neatly dressed, punctual, friendly, helpful, and generous—perhaps traits acquired by living many years in the south or, more likely, through the influence of his lovely wife, Virginia, a Virginia native. Many students, colleagues, visiting scientists and friends enjoyed dinner and wine at Henry's home in Bethlehem—the experience was enhanced by the gracious hospitality of Virginia. Henry and Virginia made you feel at home, and they showed a personal interest in everyone present.

Henry became Emeritus Professor of Lehigh in 1989 and moved to a new home in Venice, FL. Boredom in retirement was not an option for Henry. He read The New York Times daily, played golf avidly, became a member of the Orchid Society of Venice and, up to the very last days of his life, played duplicate bridge and won. He set out to play golf in every state, including Hawaii and Alaska, and then displayed each golf pencil, caddy tag, and golf ball from every golf course that he played, including famous courses in England and Scotland. In retirement, Henry and Virginia became world travelers, highlighted by a trip through the Panama Canal.

Professor Henry Leidheiser, Jr. died on March 10, 2011 and was preceded in death a few months earlier by Virginia. He will be remembered by his family as an educator, an avid golfer and bridge player, a respected scientist and world traveler, a talented orchid horticulturist, and a devoted husband, father, and grandfather. He is survived by his daughter, Margaret (Margie) Robertson, son, Henry Leidheiser III, four grandchildren and three great grandchildren.



## SPOTLIGHT ON ALUMNI:

### Charles H. Carter—BS Chemistry 1941

Have you ever had a life-threatening experience in the lab? Charles Carter certainly did. He was nitrating about six or seven thousand pounds of TNT in a big nitrator during a big thunderstorm. A ball of lightning (between the size of a baseball and a volleyball) hit the water line, came across the nitrator on the water line, from one side to the other. This was a distance of 20-25 feet, and down the pipe and out the other side. He decided then that he was destined to die some other way. More about his life follows.

Charles was born in Tamaqua on July 26, 1917. At that time mining of anthracite coal was the prime industry of this area. In his early years Charles was a breaker boy in the coal mines but also worked in the family grocery store, lining up cans on the shelf. By age 10 Charles was doing clerical duties, such as weighing out 1-pound packages, making change and waiting on people.

In high school Charles was only 5'8" and never played varsity sports. He did play intramural basketball and baseball. Mr. Walker, a science teacher and basketball and football coach, sparked Charles' interest in science. Kenneth Brown, a neighbor of the Carters who was director of research at Atlas Powder Company south of Tamaqua, offered Charles a job as a laborer at Atlas with a starting salary of 55 cents per hour. The fact that Charles had become a very capable softball player helped him get the job because of an intense rivalry in games between the laboratory and the labor groups. Mr. Brown told Charles, "You can have the job for two years and then you have to go to college. Otherwise I'm going to fire you." So a job that was to be of two years duration lasted a total of 40 years.

Another important person with whom Charles dealt at Atlas was Max Goepp. He was a PhD chemist/chemical engineer who assisted in the development of Span and Tween, two major surfactants. Max Goepp was also Lehigh's first Rhodes Scholar and he encouraged Charles to visit Lehigh. He escorted Charles to Lehigh where he arranged for him to meet with a Dean and Director of Admissions. Charles left that visit with free tuition scholarships for the first year and later for the following years of study.

Charles was the first person in his family to attend college. Chemistry was always of major interest to Charles. He had two main hobbies as a child: a chemistry set and an erector set. Upon entering Lehigh he was hoping to be a chemistry or chemical engineering, both of which were housed in Chandler Laboratory. His first year at Lehigh was a mighty struggle



*Carter in college room—1938*

because he had been out of high school for several years.

Charles remembers fondly the chemistry faculty during the 1936-41 time span. Harry Ullmann was then chairman of Chemistry and Chemical Engineering. Other faculty members were Judd Smull and Alpha A. Diefenderfer, referred to as "A-squared Diefenderfer." One lesson that Charles still remembers from Diefenderfer is that there are three ways to do something: the right way, the wrong way and Dief's way. Charles felt he was never treated as a number while at Lehigh. He had frequent contact with young faculty members such as John Mertz and Edward Amstutz.

Following graduation from Lehigh in 1941 with a BS in Chemistry, Charles returned to the Atlas Company until he was called into the service as Second Lieutenant. He had trained under Col. Theodore Gerber, an ordinance professor in ROTC at Lehigh. Charles was in the service when Japan attacked the U.S. Pacific Fleet at Pearl Harbor on Dec. 7. Charles supervised the ordinance staff for a government-owned facility. He completed his military service with the rank of major and was discharged in August of 1946.



#### ***Carter: Kankakee war department car***

One of Charles' ideas led to the invention of the red-dye security pack used in banks [U.S. Patent 3,828,341]. Lehigh prepared Charles well for his future work. Charles puts it, "If it hadn't been for Lehigh, I wouldn't have been able to do what I did." Charles started a Lehigh Club in Florida and he writes the column for the Class of 1941 in the Alumni Bulletin which he has done since 1955.

Charles remarks, "I've been very lucky. I've had interesting jobs; I loved the things I did. I loved going to school; I studied hard and worked hard. I always had a good work ethic. I don't have any regrets anywhere along the line. I always did the best I knew how and always hoped it was good enough. I think most of the time it was."

***This article was composed from a phone interview of Charles Carter by James Bohning held on January 25, 2011.***



## NEW FACULTY — MARCOS PIRES



Marcos Pires was born and raised in Brazil. He is married to Kristina Pires and they have a 1.5 year old son named Lucas. He earned his PhD in Chemistry from Purdue University and his BS, also in Chemistry, from Ithaca College. Before coming to Lehigh, he served as an NIH-NRSA postdoctoral fellow at the University of Pennsylvania under the guidance of Dr. Bill DeGrado. His research has included the development of polyvalent inhibitors to reverse ABC transporter-mediated drug resistance, stimuli-responsive collagen peptides as biomaterials, and the study of *de novo* designed diiron proteins.

Dr. Pires has published numerous articles in journals such as *Angewandte Chemie International Edition*, *Biochemistry*, *Journal of the American Chemical Society*, and *Organic Letters*. He is the co-holder of two patents, the recipient of several honors and awards, and has presented his work at conferences across the country. His future research at Lehigh University will involve controlling the oligomerization of proteins in mammalian cells, developing novel virus-inspired biomaterials, and developing agents that target the epigenetic markers involved in multi-drug resistance. His teaching and research interests center on chemical biology, mechanisms of clinical drug resistance, and biological targets for drug design.

## NEW FACULTY — DAMIEN THÉVENIN

Damien Thévenin was born in Clamart, France and is the only child of Isabel and Roland Thévenin. Isabel immigrated from Portugal in the 1960s. Roland obtained a Doctorate in Aeronautic Mechanics. After a simple but exciting childhood, Damien graduated from high school with an emphasis in Mathematics and Physics, and went on to study Medicine and then Biochemistry at the University Paul Sabatier (Toulouse).

During his college years, Damien had the opportunity to travel around the world (including many trips to the USA) and obtained his motorbike and private aircraft pilot licenses. His first internship was in 1998 at Life Technologies, Inc. (Rockville, MD), where he worked on the development of a new technology for the collection and storage

of nucleic acids. This technology is now commonly used and called FTA™ paper. Damien also worked at Toray, Inc. (Kamakura, Japan) in 1999, where he investigated the anti-tumor action of a naturally occurring molecule that induces cell apoptosis. He obtained his B.S. in Structural Biochemistry in 1999 and continued on to the Institut National des Sciences Appliquées, where he studied the structure/function relationship of lipase catalysis in organic solvents and obtained his MS in Biology and Biotechnology in 2000.

His several trips overseas and especially to the USA gave Damien a taste of what was possible to achieve outside France. He thus took a leap of faith and joined the Chemistry and Biochemistry graduate program at the University of Delaware in 2001. There under the supervision of Prof. Clifford Robinson and Prof. Brian Bahnson, Damien studied the folding and oligomerization of G-Protein Coupled Receptors and obtained his Ph.D. in August 2006. During his time at UD, he met his wife Anastasia, who is also a graduate of the Department of Chemistry and Biochemistry. In May of this year, they became the proud parents of a baby boy.

Having developed a strong interest for membrane protein biophysics, Damien joined the group of one of the pioneers and leaders in this field, Prof. Donald Engelman at Yale University, for his postdoctoral research. There he worked on a novel transport system (pHLIP) that can selectively target tumors and inflammation sites *in vivo*, and showed that pHLIP can translocate otherwise cell-impermeable molecules into cancer cells. He also participated in the development of a method to target influenza infection sites in the lung and on an approach to redirect the immune system towards cancer.

Damien joined the Department in August. He will continue working on the specific delivery of therapeutic peptides to cancer cells and on how integral membrane proteins transduce signals across cell membrane.



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