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

Vezenov Wins Major Grant From NIH

The National Human Genome Research Institute (NHGRI), part of the National Institutes of Health, has awarded Assistant Professor Dmitri Vezenov's research in force spectroscopy with a grant of $905,000 over a three-year period as part of their program to support the development of innovative technologies that reduce the cost of DNA sequencing and expand the use of genomics in medical research and health care.

Currently it costs around $10 million to sequence the 3 billion base pairs representing the entire DNA in the nucleus of every human cell. The NHGRI Revolutionary Genome Sequencing Technologies program, now in its fourth year, seeks to lower the cost to $100,000 in the near term, which would allow the sequencing of the genomes of hundreds of people and help identify the genes contributing to disease. The ultimate goal for the NHGRI is to assist in the development of sequencing technologies that achieve $1,000 per genome, which would enable the sequencing of an individual's genome as part of their routine medical care. According to NHGRI, "the ability to sequence an individual genome cost-effectively could enable health care professionals to tailor diagnosis, treatment and prevention to each person's genetic profile."

Vezenov's research group discussing DNA pulling experiments. L to R: (standing) Prof. Jutta Marzillier, Dr. Jin Seon Park, Piercen Oliver; (seated) Jonathan Cooper, Kyle Wagner, Amber Mantz, and Dmitri Vezenov.

Vezenov was one of nine grant recipients this year whose work is directed toward the $1,000 level genome. His group aims to develop a new sequencing platform on the basis of the difference in mechanical properties of single-stranded and double-stranded DNA molecules. With modern instruments such as scanning force microscopy one can apply forces to biomolecules in a controlled way by grabbing the two ends of a biopolymer (e.g. a protein or a DNA) and pulling on those ends to stretch the molecule. This technique is known as "force spectroscopy" and can be used to study the mechanical properties of polymers on a single-molecule basis, measuring the behavior of a molecule under stress.

Applying force spectroscopy to the process of the DNA replication, the identification of the nucleotides can be based on the changes experienced by the molecule as a whole. "If we can detect how properties of DNA, viewed as just another polymer, change after addition of a single base," Vezenov says, "then there are serious implications for genomics, because one can imagine sequencing without fluorescent labels and time-consuming purification steps, as with the current state of the art." "Hopefully," he adds, "full genome sequencing will be something that an average physician can do and our intent is to demonstrate a low-cost table-top setup for that use."

The key to the group's approach is the potential to create a parallel platform where millions of bases can be followed in the force spectroscopy experiment at the same time. Vezenov's group will build a setup where they can observe thousands of single DNA fragments and pull on them with controlled forces in the sub-nanoNewton range. In order to apply small forces and detect changes in molecular conformation, the group is developing new nanometer-sized probes to replace force microscope tips in direct force measurements on biomolecules.

In this project, Vezenov is collaborating with several other researchers, both on campus and elsewhere. Dr. Jutta Marzillier, Professor of Practice in Biological Sciences, is director of genomics facilities at Lehigh University and will apply molecular biology techniques to process genomic DNA and to enable new bioconjugation chemistry to link the DNA to solid surfaces and nanometer-sized magnetic and optical probes.

Dr. Weixian Zhang, Professor of Environmental Engineering at Lehigh, will share his expertise on the synthesis of magnetic iron nanoparticles. Professor Fridon Shubitidze of Dartmouth College, a physicist with a background in the theoretical treatment of optics and electromagnetism, will work on modeling photonic response of sub-wavelength probes, but also will move from electro-dynamics to thermodynamics to model behavior of DNA molecules under stress.

Shortly after Vezenov's grant was announced, NHGRI director Francis Collins participated in a press conference announcing the establishment of a $10 million prize offered by the X Prize Foundation for the creation of rapid genome sequencing technology. According to their web site at http://genomics.xprize.org, the "cash prize has been created to revolutionize the medical world" by stimulating competition in genomics relating to sequencing techniques.

Vezenov came to Lehigh a year ago (See *Mudd in Your Eye*, No. 29, July 2005) after postdoctoral studies at Harvard. His research interests include force spectroscopy of soft matter, nanostructural characterizations of materials and surfaces, optical near field techniques, and optofluidics. Chemistry Department chairman Robert Flowers said that the NIH recognized Vezenov's novel approach to genome sequencing and that "the department is thrilled that he is having such an important impact this early in his career."

Harvey A. Neville, chemistry professor 1926-1964, only faculty member elected as President of the University, 1961–1964. (photo by R. D. Billinger, 1926)

Chair's Message

The Chemistry Department is undergoing a number of major changes in the coming months. During this summer, the HVAC system in Seeley Mudd is being upgraded. While this upgrade will be disruptive, the changes will provide the infrastructure to double the number of hoods in the building. As a result, these changes will significantly enhance our undergraduate and research laboratories.

The department is also continuing to change its curriculum to better serve our students. As a part of our changes to the chemistry curriculum, the department has developed an integrated upper level laboratory sequence that combines synthetic methods and analysis of inorganic and organic compounds. The multi-week experiments will provide students with training on a number of modern instruments and better prepare them for their careers as professional chemists. Professor Jim Roberts has been the main driver for this course and the department is grateful for his efforts. This course sequence will be initiated in the fall semester 2007.

During the past six months, a number of our faculty have been recognized with awards and research funding. Bruce Koel has been named the forthcoming recipient of the 2007 George A. Olah Award in Hydrocarbon or Petroleum Chemistry. The award, which will be presented at the annual meeting of the American Chemical Society in March 2007, is a national honor that recognizes, encourages and stimulates outstanding research achievements in hydrocarbon and petroleum. Dmitri V. Vezenov recently received a three-year grant from the National Human Genome Research Institute (NHGRI) for the development of innovative sequencing technologies that reduce the cost of DNA sequencing and expand the use of genomics in medical research and health care. Professor Ned Heindel and collaborators at Rutgers were recently awarded a five year grant from the Department of Homeland security. The department is very pleased with the recent success and recognition of our colleagues.

At the end of the summer 2007, Professor Dan Zeroka will be retiring after 40 years of service to the department and University. Along with being a great colleague, Dan has been responsible for a great deal of the administrative duties in the department through his role as associate chair. His dedication to high standards, excellent instruction, and attention to detail is appreciated by colleagues and students alike and his contributions to the department will be greatly missed. We wish him the best in the next phase of his career.

In closing, I would like to 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. I would be very happy to show you around and describe our plans for the future.

Alumni News

William Adams (M.S. 1973, Ph.D. 1976) has been named chemistry coordinator for the Salem (Massachusetts) State College Masters of Arts in Teaching Program. Bill has created an online graduate-level course for High School Chemistry teachers entitled "Advanced Topics in Organic Chemistry."

Lawrence Casper (Ph.D. 1984) has recently been named the associate director of the Biomedical Engineering Center at the University of Wisconsin-Madison (http://bmec.wisc.edu/). He also serves as director of the Coulter Translational Research Partnership in Biomedical Engineering. Casper is in his seventeenth year as assistant dean for research and tech transfer in the College of Engineering. He writes that all of his vacation time "and all of his daydreaming" is spent at a second home south of Glacier National Park in Montana.

Sherry Rohn Clancy (M.S. 1994) completed ten years as a research and technical service chemist in the vinyls division of Occidental Chemical in 2005. Her work on dispersion & micro-suspension PVC included two patents, development of laboratory computer-controlled specialty polymerization, and production and customer troubleshooting. Sherry married Don Clancy, a senior scientist with GlaxoSmithKline, in May 2001. Their daughter, Dana Rhianne, was born in February 2006. Sherry reports that her best Lehigh experience since graduation was attending the 2002 NCAA Division I wrestling championships where her cousin Rob Rohn won the 184 lb. title while representing Lehigh.

Allyson Doerr Haring (B.S. biochemistry 2002, M.S. pharmaceutical chemistry 2004) has worked for Johnson and Johnson Pharmaceutical Research and Development as a clinical trials manager for the past two years. Prior to this she worked for OraSure Technologies, Inc. in Bethlehem in charge of their clinical trials program. She was married in July 2005 and lives in Bethlehem.

Deborah Hokien (Ph.D. analytical chemistry 1995) has been named Science Department Chair at Marywood University in Scranton, PA.

Joseph Karpinski (M.S. 2002), a research chemist at GlaxoSmithKline, is serving as a member of the adjunct evening college faculty at Gwynedd-Mercy College where he is teaching organic chemistry.

Jane Patriarca (M.S. 1998) has recently taken a position in project management with Binney & Smith, now known as Crayola, Inc. In this role she is managing cross functional teams through development and commercialization of several key initiatives. In the past few years her career path has been moving towards management and at the time of moving from R&D she had three direct reports who were completing the research. She writes "that at this point in my career here, it is a good decision as I will gain new perspectives in delivering a product post R&D work, learning about supply chains and procurement and the ever increasing involvement of work done overseas, which is new territory for me. It was a bit of a transition, though, to put my lab coat away."

Denise L. Rieker (M.S. 1991) has been promoted to Director of Regulatory Policy at sanofipasteur, Swiftwater, PA.

Jack Vanderryn (B.A. 1951, M.S. 1952, Ph.D. physical chemistry 1955) retired on January 1, 2006 from his post as senior fellow for environment and development at the Moriah Fund, a family foundation in Washington, DC. For the fourteen previous years, Jack was program director for environment and development at the foundation. During part of that time he was president of the Consultative Group on Biodiversity, a collaborative group of fifty-five foundations encouraging and financing work on the conservation of biodiversity. His previous positions include ten years (1981–1991) at the U.S. Agency for International Development as agency director for energy and natural resources and twenty-three years at the U.S. Department of Energy (DOE) and its predecessor agencies including the U.S. Atomic Energy Commission. At DOE he helped the government start R&D programs in solar and geothermal energy, worked on oversight of the nation's national laboratories such as Oak Ridge and Livermore, and coordinated all of DOE's R&D collaboration with other nations in such areas as coal liquefaction, nuclear power, conservation, solar and geothermal energy, and fusion energy. After obtaining his Ph.D. at Lehigh, Jack spent three years (1955–1958) as assistant professor of chemistry at Virginia Polytechnic Institute, as well as four years (1967–1971) in Vienna, Austria at the U.S. State Department's mission to the International Atomic Energy Agency (IAEA).

Marcian VanDort (M.S. 1981, Ph.D. 1983) has been named Director of the Radiopharmaceutical Development Program at the newly created Center for Molecular Imaging in the Department of Radiology at the University of Michigan Medical School. Marcian was formerly on the R&D staff of Solvay Organics-America.

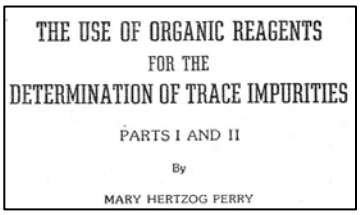
Two former Lehigh chemists have recently published a paper "Automated Stability Assessment Process for Early Development" in *American Pharmaceutical Review* **2006**, *9*, 62–67. **Bruce Weber** (Postdoctoral Fellow 1988–1990) and **Alan R. Oyler** (Ph.D. 1973) were research fellows at Johnson and Johnson Pharmaceuticals, Raritan, NJ, when the work was carried out. Oyler has retired from J&J to an adjunct professorship of chemistry at the University of Minnesota (Duluth).

In Memoriam

Mary H. Perry, 84, passed away on January 4, 2007 in Saucon Valley Manor, Hellertown, PA. She was the first woman to earn a Ph.D. in chemistry from Lehigh University. Although Lehigh was an all-male institution until 1971, times were different during World War II and the decision was made to admit a small number of women for graduate studies. Perry, who had received her B.S. degree from Russell Sage College, was awarded her M.S. from Lehigh in 1946.

Photograph courtesy Cedar Crest College

Although one or two other women terminated their studies with the M.S., Perry petitioned the university to continue on for the doctorate, which was awarded in 1949. She did her research in the analytical division with Earl J. Serfass and supported by a grant from the American Electroplaters' Society. She used organic chelating agents to bind trace metal ions and the resulting chromogenic shift could be measured by quantitative UV-visible spectrophotometry. Her Ph.D. dissertation was defended in the summer of 1949. She often jokingly remarked that that she never "officially" received her degree from the university president because on the day she was to march across the stage she was in the hospital giving birth to her first child.



THE USE OF ORGANIC REAGENTS
FOR THE
DETERMINATION OF TRACE IMPURITIES
PARTS I AND II
By
MARY HERTZOG PERRY

Her first position was as an analytical chemist with J. T. Baker Chemical Company in Phillipsburg. She had a teaching position at Muhlenberg College from 1965 to 1968, and then joined the faculty at Cedar Crest College, where she remained until her retirement in 1984. During most of that time she was chairman of the chemistry department. At Cedar Crest she taught introductory freshman chemistry, quantitative analysis, and a course in the history of chemistry.

According to Professor John Griswold of Cedar Crest, "during her tenure the department was very small, and she frequently bartered used instruments from industry in an untiring attempt to build up our capabilities. She lived long enough to see the department evolve into a large operation with ten full-time faculty and extensive modern instrumentation. She was very dedicated to promoting women's careers in chemistry, and was a great mentor to her students." She was a member of the American Chemical Society for 62 years.

Nelson J. Leonard, 90, passed away on October 9, 2006, at his home in Pasadena, CA. One of the chemistry department's most distinguished alumni, and considered by some as one of the more important organic chemists of the twentieth century, Leonard received his B.S. degree from Lehigh in 1937 and went on to Oxford as a Rhodes Scholar. When war broke out in Europe in 1939 he was forced to return to the United States, where he completed his Ph.D. with Robert C. Elderfield at Columbia University in 1942, working on the structure of alstonine, a naturally occurring antimalarial.

1937 *Epitome*

Leonard did a post-doctoral at the University of Illinois with Roger Adams, where he joined a team that was responsible for the synthesis and production of the antimalarial Chlorquinone in time for its use in the Pacific before the war ended. He remained at Illinois for more than forty years, directing the work of 120 doctoral students and 90 post-doctoral fellows and publishing more than 400 papers. Using chemistry to understand biology before interdisciplinary work was fashionable, Leonard spent more than twenty years synthesizing plant growth stimulators, many of which are used in horticulture today. His work on the synthesis of fluorescent probes to highlight nucleotide components of DNA and RNA within the living cell has important use today by cell biologists who use his fluorophore groups to study real-time behavior of single species. He considered his best work, however, to be the synthesis of surrogates of the purine-pyrimidine base pairs of DNA and RNA.

Leonard's career at Lehigh has been described as "glittering," and he often sang in Packer Chapel. He continued his singing at Oxford, and then pursued it professionally while at Illinois. He was a bass-baritone soloist in choral works with the Chicago, Cleveland, and St. Louis Symphonies, and by 1955 had reached the point where he could have opted for a career as a professional singer. But that was the year he was elected to the National Academy of Sciences at the age of 39. At that point he said that if his peers had chosen to recognize him as a chemist, "he had better do something about it." His decision to abandon music professionally was also influenced by Alexander Todd who Leonard heard lecture about the importance and structures of nucleic acids.

Leonard retired from Illinois as the Reynold C. Fuson Professor of Chemistry in 1986, and in 1992 took a position at Caltech, where he remained as Faculty Associate. Although he was no longer singing, he served on the board of the Pasadena Symphony. Shortly before his death, his autobiography, *More Than a Memoir*, was published by Xlibris.

Faculty News

Robert A. Flowers II had his work "Solvation Controlled Luminescence of Sm(II) Complexes" cited as a VIP paper by *Angewandte Chemie* (**2007**, 46, 1145–1148), one of fewer than five percent of the published papers that receive this recognition. Coauthored with graduate student Joseph A. Teprovich Jr. and postdoctoral fellow Edamana Prasad, the paper describes the preparation of stable and luminescent samarium complexes that could find use as an optical switch for small devices or dual mode imaging for diagnostic purposes. Other recent publications include "Stopped-Flow Kinetics of Tetrazine Cycloadditions: Experimental and Computational Studies Towards Sequential Transition States," *J. Phys. Chem.* **2006**, *110*, 1288–1294 (with D.V. Sadasivam, E. Prasad and D.M. Birney); "Samarium(II)-Based Reductants," *Handbook on the Physics and Chemistry of Rare Earths,* K.A. Gschneidner, Jr., J.-C.G. Bunzli, V.K. Pecharsky, Eds., Elsevier, 2006, Vol. 36, Chapter 230, pp. 393–473 (with E. Prasad); "Mild Conversion of β-diketones to Carboxylic Acids by CAN," *Z. Org. Chem.* **2006**, *71*, 4516–4520 (with Y. Zhang and J. Jiao); "Mechanistic Evidence for Intermolecular Radical Carbonyl Additions Promoted by Samarium Diiodide," *J. Am. Chem. Soc*. **2006**, *128*, 9616–9617 (with A.M. Hansen, A.M.; K.B. Lindsay, P.K.S. Antharianam, J. Karaffa, J.; K. Daasbjerg and T. Skrydstrup); and "A Convenient One-Pot Synthesis of Spirocyclic Pyrido[1,2-a]indole Derivatives from 3-(2-Bromoethyl)indole," *Synlett* **2006**, 3355–3357 (with J. Jiao and Y. Zhang). He also gave invited lectures at the University of Toldeo, Vanderbilt University, Virginia Commonwealth University, and Lycoming College.

Ned D. Heindel has received a grant for five years of research in chemical counterterrorism. Ned is part of a team of eight investigators from Lehigh, Rutgers, the University of Medicine and Dentistry of New Jersey, and Battelle Memorial Institute. The group, which received a $19.2 million grant, calls itself the CounterACT Research Center and consists of medicinal chemists, toxicologists, molecular biologists, physiologists, and pharmacists from the participating sites. Acting on evidence collected globally by the Office of Homeland Security, it was determined that the World War I chemical warfare vesicant, sulfur mustard, is in production by several terrorist cells. Homeland Security, acting through NIH, launched a crash program to develop pharmaceuticals which can block the blistering and staunch the pain for persons exposed to this war gas. Heindel's medicinal chemistry team at Lehigh received $1.5 million to develop bioactive compounds as anti-vesicants and anti-pain candidate drugs. The Lehigh team's pharmaceuticals will be tested *in vitro* and *in vivo* by the biology collaborators on the CounterACT team.

Heindel appeared in a NOVA documentary that aired on February 6, 2007 titled "Forgotten Genius." He discussed the scientific accomplishments of Percy Julian, the first African-American chemist elected to the National Academy of Sciences. He was also featured in a *Chemical & Engineering News* article (November 20, 2006, p. 90) about the American Chemical Society's Speaker's Service. For decades Heindel has been giving talks to ACS local sections organized by this program.

His recent publications include "Orally active vasopressin V1a receptor antagonist, SRX251, selectively blocks aggressive behavior," *Pharmacology, Biochemistry and Behavior* **2006,** *83,* 169–174 (with C. F. Ferris, S-f Lu, T. Messenger, C. D. Guillon, M. Miller, G. Koeppel, F. R. Bruns, and N. G. Simon); "Fluorescent Fused-Ring Triazoles that Inhibit Cell Proliferation," U.S. Patent 7,105,511 (2006) (with J. D. Laskin, D. Heck, A. M. Vetrano, C. Guillon, and P. DeMatteo); "Beta-Lactamyl Vasopressin Antagonists," U.S. Patent 7,119,083 (2006) (with R. F. Bruns, C. Guillon, G. A. Koppel, and M. Miller); and **"**Fluorescent Tags for Amino Acid and Nucleic Acid Analysis**,"** U.S. Patent 7,150,967 (2006) (with J. D. Laskin, C. Martey, M. Whittemore, and D. Heck).

Bruce E. Koel has received the 2007 George A. Olah Award in Hydrocarbon or Petroleum Chemistry from the American Chemical Society (*Chemical & Engineering News,* January 8, 2007, p. 52) for the major impact his work has had on understanding hydrocarbon chemistry on metal catalysts. Studies in his group have focused primarily on the adsorption and surface reactions of hydrocarbons on bimetallic Pt surfaces under ultra-high vacuum conditions. These results are also being correlated with high-pressure measurements of catalytic reactions such as the hydrogenation of crotonaldehyde and cyclohexanone. Koel's findings impact fundamental understanding and control of reactions on catalysts, fuel-cell electrodes, and sensors.

His recent publications include "Oxygen adsorption and oxidation reactions on Au(211) surfaces: Exposures using O_2 at high pressures and ozone (O_3) in UHV," *Surface Sci.* **2006,** *600*, 4622–4632 (with J. Kim and E. Samano); "CO Adsorption and Reaction on Clean and Oxygen-Covered Au(211) Surfaces," *J. Phys. Chem. B* **2006**, *110*, 17512–17517 (with J. Kim and E. Samano); Chapter 3.8.4, "Adsorbed CO_2, NO_2, O_3, SO_2, OCS, and N_2O on Metals," in *Adsorbed Layers on Surfaces*, Landolt-Bornstein Volume III/42 , H. Bonzel (Ed.), (Springer-Verlag, Berlin-Heidelberg, 2006), pp. 170–241 (with C. Panja, J. Kim and E. C. Samano); "Catalytic oxidation of HCN over a 0.5% Pt/Al_2O_3 catalyst," *Applied Catalysis B: Environmental* **2006** *65***,** 282–290 (with. H. Zhao , R. G. Tonkyn, S.E. Barlow, and C. H. F. Peden); "Fractional factorial study of HCN removal over a 0.5% Pt/Al_2O_3 catalyst: Effects of temperature, gas flow rate,

and reactant partial pressure," *Ind. Eng. Chem. Res.* **2006,** *45*, 934–939 (with H. Zhao, R. G. Tonkyn, S. E. Barlow and C. H. F. Peden); and "Desorption of Chemisorbed Carbon on Mo(100) by Noble Gas Ion Sputtering: Validation of Ground Test Measurements of Ion Engine Lifetimes," *Appl. Surface Sci.* **2006,** *252*, 2657–2664 (with C**.-S.** Ho, S**.** Banerjee, B. Duchemin, and J. E. Polk).

Kai Landskron's paper "Materials chemistry for low-k materials" was the cover story in *Materials Today* **2006**, *9*, 22 (with B. D. Hatton, W. J. Hunks, M. R. Bennett, D. Shukaris, D. D. Perovic and G. A. Ozin).

Tianbo Liu gave invited lectures at Shandong University (Jinan, China), Peking University in Beijing and at a Gorden Conference on Macromolecules, Colloids and Polyelectrolyte Solutions in Ventura, CA. His recent publications include "Deprotonations and Charges of Well-Defined $\{Mo_{72}Fe_{30}\}$ Nano-Acids Simply Stepwise Tuned by pH Allow Control/Variation of Related Self-Assembly Processes," *J. Am. Chem. Soc*. **2006**, *128*, 15914–15920 (with Brandon Imber, Ekkehard Diemann, Guang Liu, Katrina Cokleski, Huilin Li, Zhiqiang Chen and Achim Müller); "Wheel-Shaped Polyoxotungstate $[Cu_{20}Cl(OH)_{24}(H_2O)_{12}(P_8W_{48}O_{184})]^{25-}$ Macroanion Forms Supramolecular "Blackberry" Structure in Aqueous Solution," *J. Am. Chem. Soc.* **2006**, *128*, 10103–10110 (with Guang Liu, Sib Sankar Mal and Ulrich Kortz); "Cationic-Surfactant-Mediated Self-Assembled Highly Porous Quasi-Single-Crystals of Wheel-Shaped $\{Mo_{154}\}$ Macro-Anions in Aqueous Solutions," *J. Clust. Sci.* **2006**, *17*, 467–478 (with Xiangfeng Jia, Dawei Fan, Peiqin Tang, and Jingcheng Hao); and "Counter-Ion Association Effect in Diluted Giant Polyoxometalate $[As^{III}_{12}Ce^{III}_{16}(H_2O)_{36}W_{148}O_{524}]^{76-}$ ($\{W_{148}\}$) and $[Mo_{132}O_{372}(CH_3COO)_{30}(H_2O)_{72}]^{42-}$ ($\{Mo_{132}\}$) Macroanionic Solutions," *J. Clust. Sci.* **2006**, *17*, 427–443 (with Guang Liu, Melissa L. Kistler, Tong Li and Anish Bhatt).

R. Sam Niedbala's recent publications include "Composition and method for cleaning gelatin encapsulated products," U.S. Patent 6,998,374 (2006) and "Oral-Based Techniques for the Diagnosis of Infectious Diseases," *J. of CDA* **2006**, *34*, 297–301 (with Daniel Malamud, William Abrahams, Haim Bau, Jing Wang, Chen Zongyuan, and Paul Corstjens).

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Steven L. Regen's recent publications include "Ethanol-Induced Reorganization of the Liquid-Ordered Phase: Enhancement of Cholesterol-Phospholipid Association," *J. Am. Chem. Soc*. **2006**, *128*, 265–269 (with J. Zhang, H. Cao and B. Jing); "Gluing Langmuir-Blodgett Monolayers Onto Hydrocarbon Surfaces," *J. Am. Chem. Soc*. **2006** *128*, 682–683 (with J. Li and V.Janout); "Cholesterol-Phospholipid Association in Fluid Bilayers: A Thermodynamic Analysis From Nearest-Neighbor Recognition Measurements," *Biophys. J*. **2006**, *91*, 1402–1406 (with J. Zhang, H. Cao, B. Jing and P.F. Almeida); "A Bioconjugate Approach Toward Squalamine Mimics: Insight Into the Mechanism of Biological Action.," *Bioconj. Chem*. **2006**, *17*, 1582–1591 (with W-H. Chen, X-B. Shao, R. Moellering and C. Wennersten); "Sticky Monolayers and Defect-Free Langmuir-Blodgett Bilayers Using Poly(acrylamide) Glue," *Chem. Mater*. **2006**, *18*, 5065–5069 (with J. Li and V, Janout); "Covalent Gluing and Post-Gluing of Langmuir-Blodgett Monolayers at Hydrocarbon Surfaces," *Langmuir* **2006**, *22*, 11224–11229 (with J. Li and V. Janout); and. "Cholesterol-Phospholipid Complexation in Fluid Bilayers as Evidenced by Nearest-Neighbor Recognition Measurements," *Langmuir* **2007**, *23*, 405–407 (with J. Zhang and H. Cao).

Keith J. Schray received the 2006 Interfraternal Outstanding Faculty Award, the 2006 Branch Out Award from the Lehigh community service office and an Appreciation Award from the STAR Program.

Dmitri V. Vezenov's recent publications include "Optical Waveguiding Using Thermal Gradients across Homogeneous Liquids in Microfluidic Channels," *Appl. Phys. Lett.* **2006**, *88*, 061112/1–061112/3 (with S.K.Y. Tang, B.T. Mayers, and G.M. Whitesides) and "Fluid Optical Waveguides for on-Chip Manipulation and Generation of Light" in *Proceedings of the Summer Topical Meeting "Optofluidics: Emerging Technologies and Applications, Institute for Electrical and Electronics Engineers (IEEE) Lasers and Electro-Optics Society (LEOS)*, 2006, Quebec City, QC, Canada (with B.T. Mayers, S.K.Y. Tang, R.Conroy, D.B. Wolfe and G. M. Whitesides).

Chemistry Open House,
Chandler Laboratory, April 20, 1934.

Spotlight on Alumni: Audrey Bernstein

A strong chemistry department and a beautiful campus, coupled with a desire to "do something in the sciences" brought Audrey Bernstein to Lehigh in the fall of 1987 from her hometown of Framingham, Massachusetts. Because she was more interested in the biological sciences, Bernstein majored in biochemistry, receiving her B.S. degree in 1991. "The education was a good one," she says, "although the social aspects were not ideal. Lehigh turned out to be a little more "Greek" than I wanted."

Although she had a strong academic background in physics and chemistry, Bernstein realized that her interest was in cell biology and what was then the beginning of molecular biology. Uncertain as to whether she wanted to go to graduate school, she took a position as a technician in the laboratory of Dr. Stuart Levy in the department of microbiology at Tufts Medical School in Boston. After that experience and courses in molecular and cell biology, Bernstein decided to continue her education for the doctoral degree.

At the suggestion of a postdoc in the laboratory at Tufts, Bernstein decided to visit the University of Kentucky and "loved it there." Her coworkers treated her decision with skepticism because, as Bernstein admits, "most Northeast people don't really recognize the states in between Pennsylvania and Colorado." But the department of biochemistry was "full of good people" and Lexington had a "high quality of life and a low cost of living."

Bernstein says her training at Kentucky was "spectacular." Her mentor, Dr. Wally Whiteheart, was just starting as an assistant professor, so she had "the benefit of being trained by the principal investigator" and not some lab technician or postdoc. Her thesis research was on platelet exocytosis, exploring the proteins in the membranes that control the membrane fusion event in platelets. She cloned a new human gene, cellubrevin, at a time, Bernstein recalls, "when it was still part of a thesis project to clone a gene!" She then studied its function in platelets as well.

After receiving her Ph.D. in biochemistry from the University of Kentucky Medical College in 1999, Bernstein and her husband, who is an artist, decided that New York City "would be a great place for both science and art." She ultimately selected a postdoctoral fellowship with Dr. Sandra Masur in the Department of Ophthalmology at the Mount Sinai School of Medicine.

This position was appealing to Bernstein for two reasons. First of all, she was convinced that Masur would help her in her career and "not just use me to her benefit. It is so important to find mentors," Bernstein advises, "who know that investing in a person helps both the underling and the mentor. For some reason, this way of thinking is uncommon."

Photo courtesy Charles Chamot

Secondly, Bernstein was interested in the project on corneal wound healing. As Bernstein explains, "The eye is a very interesting model system to work with and the idea of improving vision and the quality of life for someone was attractive to me. Furthermore, in my Ph.D. thesis I had focused on the insides of cells, and I wanted to learn a new field and change my focus to understanding cells in context of their cellular environment."

Under Mazur's guidance, Bernstein was encouraged to write for grants, and was successful in securing a three-year postdoc grant from the National Eye Institute, which was later extended to a fourth year of funding. At the end of that time, in 2004, she was promoted to Assistant Professor in the Department of Ophthalmology and encouraged to write her own grant and become a principal investigator (PI). As a result, she received an R01 grant from the National Eye Institute and was able to start up her own laboratory in 2006.

Bernstein considers this unusual because "most laboratory PIs won't allow you the time to write a grant like this and the opportunity to use the data that was generated as a postdoc as the background for the grant." For this reason, she emphasizes, "it is important to choose the postdoc position carefully if you have intentions of continuing in academic science."

Bernstein's current research focuses on the molecular basis of wound healing in the cornea. Quiescent cells in the cornea (keratocytes) are activated on wounding to become fibroblasts, which migrate to the wound and differentiate into myofibroblasts and contribute to wound closure. She has found that a protease, urokinase (uPA) and its receptor (uPAR) are differently expressed in the keratocytes, fibroblasts and myofibroblasts. Her NIH-funded research will test the hypothesis that the uPA/uPAR pair is critical to the migratory activities in the corneal fibroblast. As a result of her research she was selected to be co-chair of a session on corneal proteases at the International Congress of Eye Research in Buenos Aires, Argentina in 2006.

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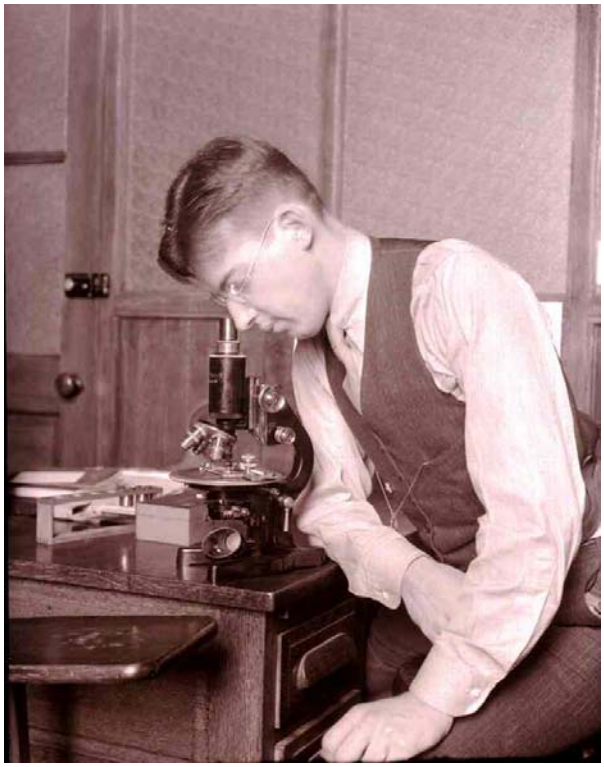

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