Mudd In Your Eye

Newsletter of the Department of Chemistry, Lehigh University

Number 28 • February 2005

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

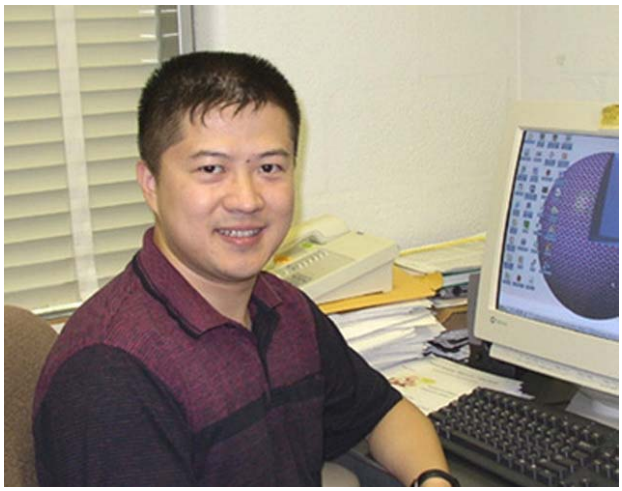
Tianbo Liu Joins Department Faculty

The newest member of the chemistry department faculty is assistant professor Tianbo Liu, who started with the Spring term. Born in Beijing, China, Liu came to the United States in 1994 after receiving his B.S. in chemistry from Peking University. He was trained as a polymer physical chemist at the State University of New York at Stony Brook, receiving his Ph.D. in 1999 with Distinguished Professor Benjamin Chu. After a two-year post-doctoral fellowship at Stony Brook, Liu went to Brookhaven National Laboratory as Assistant and then Associate Physicist before joining the Lehigh faculty.

During his graduate work in the fields of complex fluids, particularly block copolymer solutions and colloids, Liu used such major techniques as laser light scattering (LLS) and small-angle X-ray scattering (SAXS) techniques. LLS is suitable for studying solutes and suspensions with the sizes between 1–1000 nm. When he started to work at Brookhaven, he wanted to use LLS to characterize the solutions of giant inorganic ions. "Traditionally," Liu says, "inorganic chemists do not care about LLS because inorganic molecules/ions are so small. I realized that the size of the giant polyoxometalate (POM) anions and their supramolecular structures are in the nanometer scale, and therefore decided to use LLS to characterize these solutions, and obtained promising results."

What Liu found was the answer to a question that had puzzled chemists for several hundred years—the nature of the particles in solutions of molybdenum blue, the so-called "blue water" mystery. LLS showed that various nanometer-sized, highly soluble inorganic ions tend to self-assemble into 70–300 nm, single-layer, hollow spherical structures containing over 1,000 single ions in diluted solution. Liu uses the term "blackberry" to describe these unique structures. His results were reported in *Nature* (**2003**, 426, 59–62) and a series of papers in the *Journal of the American Chemical Society* (**2002**, *124*, 10942–10943; **2003**, *125*, 312–313; **2004**, *126*, 16690–16691). His discovery also received coverage in *New Scientist*, the German edition of *Scientific American*, *Materials Today*, and *Popular Mechanics.*

"Such giant POMs," Liu explains, **"**are highly soluble in polar solvents with their majority portions being



Tianbo Liu

macro-anions. But amazingly, these fully hydrophilic macro-ions do not exist as discrete ions even in diluted solutions, contradicting our common knowledge regarding inorganic solutes. Instead, they tend to aggregate into large (tens to hundreds of nanometers), stable spherical assemblies. Recently, my group proved that the strange aggregates formed by different POMs all had a unique single-layer, vesicle-like structure. The driving forces of blackberry formation are totally different from that of surfactant vesicles because hydrophobic interaction doesn't play a role and the attractive van der Waals force is trivial. On the contrary, the size and charge density of the macro-ions are critical, *i.e.*, the shared small cations between macro-anions might play an attractive role."

More importantly, Liu emphasizes that "the blackberry formation represents a new, general format of self-assembly in solution. Different than small ions like Na^+ and Cl^- that exist homogeneously in good solvents, the hydrophilic POM macro-ions have two solute states—an entropy favored general state (discrete macro-ions distribute homogeneously), and a thermodynamically favored second state (blackberries). The macro-ionic solutions are different from hydrophobic colloidal suspensions, amphiphilic surfactants and non-ionic polymer solutions, but show some similarities to polyelectrolytes, such as virus capsud proteins. The macro-ions in their 'second solute state' have totally different behaviors to small inorganic ions."

Liu concludes by indicating that "some of our natural feelings like 's*oluble inorganic ions distribute homogeneously in dilute solutions*' and 's*oluble ions reach equilibrium very quickly in dilute solutions*' might not be valid anymore for macro-ionic solutions. Many unexpected interesting phenomena, which in general cannot be observed in other solution systems, have been found in POM macro-ionic solutions, such as the unusual slowness in reaching equilibrium, 'dilution-induced association,' soft, biomembrane nature of the blackberry surface formed by purely inorganic materials, and the mysterious 'delay' period during blackberry formation in salt-containing solutions and mixed solvents, *etc*."

Liu is now working with the *Journal of Chemical Education* on considering how to incorporate the recent research progress into textbooks. He is proposing that "hydrophilic macro-ionic solutions" should become a separate portion in the curriculum in addition to traditional topics such as ionic solutions, polymer solutions and colloids.

While at Stony Brook and Brookhaven, Liu mentored twelve high school students who went on to become national Science Talent Search Competition winners. His first teaching assignment at Lehigh is Chem. 31 – *Chemical Equilibria in Aqueous Systems.* Liu says that he came to Lehigh because it had a tradition in colloids and polymers and that he can interface easily with his new colleagues in these areas—at Brookhaven he was alone in his field and missed the interactive stimulation that others of a similar background provided. He is also anxiously awaiting the arrival of his laboratory equipment from Brookhaven, which will be placed in the Sinclair building.

The First Chemistry Professor – Charles mayer Wetherill

Since Professor Tianbo Liu is the latest addition to the chemistry faculty, we present here some information on the first chemistry professor at Lehigh. The following is taken from A History of the Department of Chemistry and Chemical Engineering of Lehigh University *by Lehigh chemistry professor Robert D. Billinger in 1941. Billinger's history was never published and only a few typescript copies remain.—Ed.*

Charles Mayer Wetherill, Ph.D., M.D., was one of the original faculty of five scholars selected to chart the course of the young technical university. Wetherill was rich in training and experience, and came from a family well-known in the industrial and scientific world. [A cousin, Samuel Wetherill, was the cofounder of the Lehigh Zinc Company in South Bethlehem.] A graduate of the University of Pennsylvania, he had furthered his training in the well-known Philadelphia laboratory of Booth and Boye. His education was completed by a year with Pelouse in Paris and two years with Liebig in Giessen. Here he received the Doctorate in 1848. In the interval before coming to Lehigh he had been successively public analyst, lecturer, traveler, first chemist of the department of agriculture, special investigator for President Lincoln on gunpowder production and chemist for the Smithsonian Institute. His published researches cover papers on medical, agricultural, and mineralogical subjects. One of his most important pieces of work in Washington was a study and a plan for the ventilation of the Capitol building.

The first chemical laboratory consisted of two rooms in the west end of Christmas Hall–the first building on the Lehigh campus. Later the laboratory was moved to Packer Hall, where Wetherill designed an excellent laboratory on the first floor. For his first classes he prepared and printed *A Syllabus of Lectures on Chemical Physics for the first class of the Lehigh University, September 3d, 1866* and two years later *Lecture Notes in Chemistry*. Despite the duties of arranging courses, lectures and designing laboratories, Wetherill had time for research on the mineral articulite [and published the first research paper in the history of the chemistry department in *Silliman's Journal* **1866**, *91*, 1866].

Charles Mayer Wetherill (1825–1871)

Wetherill died at the age of 45, suffering a heart attack while writing a scientific paper on a Sunday morning before going to church. His report on the ventilation of the U.S. Capitol, his two course syllabi, and several other publications are available in the Lehigh Library Special Collections. Edgar Fahs Smith, Professor of Chemistry and Provost of the University of Pennsylvania, published an extensive biography of Wetherill in the Journal of Chemical Education ***1929***, *6, 1076–1089, 1215–1225, 1461–1477, 1668–1680, 1916–1927, 2160–2177.*

Alumni News

Seema Agarwal (Ph.D. 1995) has taken a position as Research Assistant Professor at the Yale Cancer Center. She spent the previous four years as Senior Research Biologist at Morphochem Inc., Monmouth Junction, NJ, where she was instrumental in initiating peptidomimetic chemistry and related biology.

Adam C. Baughman (B.S. 2004) is a biochemical engineer at Merck & Co., in West Point, NJ.

Stephen J. Benkovic (B.S. 1960, B.A. 1960, Ph.D. Cornell 1963) has received the 2005 Nakanishi Prize, sponsored by the Nakanishi Prize Endowment and administered by the American Chemical Society. At Lehigh, Benkovic had a double major in chemistry and literature. Benkovic is the Evan Pugh Professor and Eberly Chair in Chemistry at The Pennsylvania State University, where he has been since 1965. Benkovic, who coauthored *Bioorganic Mechanisms* with Thomas J. Bruice in 1966, is a pioneer in the development of biologically based catalysts. Lehigh awarded Benkovic an honorary D.Sc. degree in 1995. For more information see *Chemical & Engineering News* (Jan. 31, 2005). Lehigh chemistry professor Keith Schray received his Ph.D. degree under Benkovic in 1970.

Stephen M. Contakes (B.S. 1995; Ph.D., Illinois 2001) was married on 18 December and is now a post-doctoral fellow at the California Institute of Technology in Pasadena, CA.

Dale L. Darkes (B.A. 1963) is retired as chemistry laboratory supervisor of the Pennsylvania Department of Transportation. Commenting on Newsletter 27 (July 2004), Darkes says he wished he could have majored in biochemistry, which was not available to him. He also says the on-line courses would also have been important early in his career, if they had been available.

Vladi Heredia (B.S. 1999) received her Ph.D. from the University of Pennsylvania Medical School and is now employed at Pfizer at La Jolla, CA.

Richard C. Hoch (B.S. 1950) is retired as vice president of the Polyfibron Division of W. R. Grace & Co. He remembers "fondly the enlightening experience he had with teachers such as [Frank] Fornoff, [Richard] Rhoda, [Nelson] Easton, [Alfred] Zettlemoyer, [Edward] Amstutz, [Judson] Smull, [Earl] Serfass, and [Robert] Billinger." When he went to W. R.Grace in Boston in 1960, "as a Lehigh man, [he] was received respectfully by the Harvard and MIT men who dominated the laboratory."

Mark Kieke (M.S. 1991) has been with Cognis Corporation in Ambler for five years. Currently a Technical Sales Manager for the Plastics Division in the Northeast, he previously held positions as Lab Manager and Technical Service Chemist for the company. Mark began his career after graduation as an R&D Chemist with Occidental Chemical.

Kathryn Lucas (B.S. 2004) has taken a position with LFR Levine-Fricke, an environmental management and engineering firm in Branchburg, NJ.

Qisheng Ma (Ph.D. physics 2000) was a post-doctoral fellow with Professor Kamil Klier at Lehigh where he published six papers on computational modeling. He is now a staff member at the PEER center at the California Institute of Technology. Created in 2000, PEER (Power, Environmental and Energy Research) is a unique resource for collaborative research in energy and environmental issues.

Thomas Parliament (B.S. 1961, Ph.D. University of Massachusetts) spent the majority of his career at the General Foods, Kraft-General Foods and Kraft Foods Research Laboratories. During that time he studied the aromatic composition of meat, coffee, baked goods, seafood and pet foods. He has 23 patents and numerous publications in these and related analytical areas. He has co-edited six flavor-related books.

Elizabeth Piaggesi (B.S. 2002, M.S. 2003) is R&D manager at FMI, located in Allentown, PA. FMI is a growing contract manufacturer of personal care, household products and industrial fragrances. She was recently quoted in the *Chemical & Engineering News* article "The Pleasure Principle: Flavor and fragrance work combines biology, psychology, and chemistry (7 June 2004, http://pubs.acs.org/cen /employment/8223/8223 employment.html).

John J. Spaltro (Ph.D. 1985) joined Merck & Co., Inc. in May 2004 as Director, Regulatory Affairs–Domestic. John joined the Merck Research Laboratories after 12 years at Johnson & Johnson, where he was involved in licensing and acquisition, grant management, product development and legal work. At Merck he works with many development teams, reviewing their data, offering strategic paths forward in context with competitive activity and regulatory atmosphere; the strategic recommendation combined with business case and patent assessment drive investment in clinical programs.

David M. Stephon (M.S. 1986) was named vice president for quality assurance at Adolor Pharmaceuticals in Malvern, PA.

John Texter (M.S. 1972, M.S. 1976, Ph.D. 1976) has left industry for a Professorship in the Coating Research Center, College of Technology, Eastern Michigan Univer-

sity in Ypsilanti. John just received a $50,000 Petroleum Research Fund grant for his work in Comminution Dilatancy in Nanoparticle (Organic Nanopigment) Formation. John had 24 years of R&D experience in industry and is the author of more than 140 publications, including 41 U.S. patents. He is also editor emeritus of *The Journal of Dispersion Science and Technology.*

Heather Thomson (B.S. 2003) is pursuing a master's degree in chemical oceanography at Texas A&M University.

David L. Walters (B.S. 1978) worked briefly in pharmaceuticals after his graduation, then in petrochemicals before moving into the instrumentation business in 1988. He has co-developed several patents for a microwave gas chromatograph oven. He is currently self-employed as a manufacturer's sales representative selling analytical instrumentation in the Rocky Mountain states.

Jennifer Warner (B.S. 2002, M.S. 2003) is a medical student at the University of Colorado Health Sciences Center. She spent last summer working on an NIH-funded alcohol research study and as a counselor for the Rural Scholar's Health Program. A member of the track and field team at Lehigh, she currently competes in triathlons.

Marilyn Whittemore (Ph.D. 1999) is a senior synthesis chemist at Buckman Laboratories in Memphis, TN. She spent three weeks in the Ukraine last summer with her husband John, helping with an orphan's camp and a camp for Christian Ethics teachers. Buckman graciously purchased lots of science supplies for her to share with the teachers.

Emily S. Winn-Dean (B.S. 1974, Ph.D. Boston University) was recently named vice president of strategic planning and business development with world-wide responsibility at Cepheid in Sunnyvale, CA. Founded in 1996, Cepheid is a leading developer, manufacturer and marketer of systems that enable routine genetic assessment. In 2003 she was one of 13 scientists appointed to the U.S. Department of Health and Human Services Secretary's Advisory Committee on Genetics, Health and Society. Winn-Dean will be the speaker at Lehigh's annual Sigma Xi induction meeting on 23 March.

Department News

Motivated by discussions with Doyle Daves during his return engagement in the department as interim Chairman two years ago, the undergraduate teaching group has instituted a major change in Chem. 21. Now operating as an **experiment called Chem. 95**, the high-enrollment introductory service course now features a '**studio**' as opposed to the classical laboratory-recitation combo. Students in the studio work in teams, in groups of four, and as a classroom of 48 to answer questions and solve chemical problems using activities that blend gathering data in the laboratory with guided discussions in small groups. Work in the studio is integrated tightly with the lectures in the course. The class also features two new 'sidebar' courses, Chem. 96 and Chem. 97. Each sidebar meets once a week for an hour. Chem. 96 is taken by students in the Arts and Sciences College and is taught by a biochemist, who presents biological applications of introductory chemical principles; Chem. 97, for students in the College of Engineering and Applied Science, is taught by a team of faculty from the engineering disciplines and presents engineering applications of the material. To accommodate the classroom needs for the new approach, the wall separating classrooms 343 and 353 on the third floor of Mudd was removed to create one large space now called the "**studio."**
—Natalie Foster

Applications are now being accepted for the **2005 CESAR Summer Intern program**. Undergraduate chemistry, biochemistry, bioengineering and chemical engineering majors interested in research careers are invited to apply for a summer program supported by the Merck Foundation and ImClone Systems, Inc. The stipend for the ten-week program is $3000. Each participant will conduct an independent research project in the lab of a CESAR Fellow. Further details and an application form are available in the Chemistry Department office or from the program director, Dr. Ted Mellin, at 610-758-5609 (tnm3@lehigh.edu).

Faculty News

Gregory Ferguson gave an invited lecture at the American Chemical Society Northeast Regional Meeting in Syracuse. He was also interviewed for an article in *The Morning Call*, "Believers say oil is seeping from icon in Bethlehem," 26 March 2004. **Robert A. Flowers** gave invited lectures in South Korea at the Korean Advanced Institute of Science and Technology (KAIST), Pohang University of Science and Technology (POSTECH), and Honyang University. He also gave an invited lecture at the Department of Chemistry and Biochemistry at the University of Arkansas. **Natalie Foster** was one of three Lehigh faculty to make presentations in Denver when Lehigh received the 2004 annual award from EDUCAUSE for "systematic progress in teaching and learning." EDUCAUSE is the premier organization for managing information technology in higher education. Ned **Heindel** was an invited lecturer at a colloquium on "Suicide Inhibitors of Acetylcholinesterase" at the University of Nice, France. **Steven L. Regen** gave invited lectures at the University of British Columbia, University of Colorado, Dartmouth College, Northeastern University, Notre Dame University, and the University of Alaska.

Staff Spotlight: Rebecca Jane Derbenwick

Although her official title is Academic Coordinator (responsible for undergraduate records), Jane Derbenwick (she lost the "Rebecca" in childhood to avoid nicknames) enjoys the wide diversity of activities that constitute her daily schedule, making it far from routine. Her first responsibility is to monitor the undergraduate majors, both chemistry and the interdisciplinary program in biochemistry (a joint major with the department of biological sciences). At the present time this numbers more than fifty students. From helping in the recruitment of new students to written and email communications with majors, Jane makes sure that the minutiae of administrative details does not get lost, assuring students that their records are complete and accurate, and that they have a friend in the chemistry department office they can turn to for assistance in these matters.

Jane Derbenwick
(Photo Courtesy Arthur D. Bates

Jane also deals with all undergraduate course registration issues, interfacing with the faculty and the electronic Academic Banner system in place at Lehigh to prepare the details of the course offerings and schedules for each semester and the summer session, as well as monitoring student registrations. This means developing special relationships with various constituencies—faculty, students and administrative office personnel.

The list of Jane's responsibilities on the department administrative schedule is extensive, but she does it all cheerfully and with enthusiasm. In addition to dealing with students, Jane assists the new department chair with his schedule using an electronic calendar. She also pulls together all the details for the recruitment visits of new faculty members, which are extensive and will continue to be so as the department maintains a phase of faculty additions.

Jane was born in Elgin, Illinois and grew up in a rural town some 50 miles west of Chicago. She earned a B.S. degree in foods and nutrition at the University of Illinois, and took five chemistry courses in the process. Jane says this education gives her considerable empathy with the students and their chemistry department curriculum. Convinced by a faculty member to pursue a graduate degree, Jane went to Cornell, her first trip outside of Illinois. She received her M.S. in nutrition from Cornell, and also met her future husband there while he was working on his Ph.D. in solid state physics. They came to the Bethlehem area when he obtained a faculty position at Moravian College. He later moved to a position at Air Products in Allentown, while Jane stayed home and became a full-time mother with three children to raise.

After her youngest child entered middle school, Jane realized that she had more energy than she could expend in staying home and in much volunteer work, and came to Lehigh in 1990 to work in the biological sciences department, moving to chemistry in 1995. She has since received a master's degree in community counseling from Lehigh and spent several years in part-time work at the Catholic Social Agency. She firmly believes that this background has helped her in her relationships with others both on and off campus. She says that it is most gratifying to help a person struggling to adjust to academic life, listen briefly to their concerns, watch them develop, and occasionally recommend that they seek additional help. People often tell Jane that she is a great listener, and that trait allows her to thrive on the mixture of activities and challenges of her position in the department.

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Seeley G. Mudd building under construction,
circa October 1974

Recent faculty Publications

Khongtong, Sureurg; **Ferguson, Gregory S**. Temperature-actuated changes in wettability at elastomer/water interfaces. *Langmuir* **2004**, *20*, 9992–10000.

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McCullough, Donald H., III; **Regen, Steven L**. Don't forget Langmuir-Blodgett films. *Chemical Communications* **2004**, 2787–2791.

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In Memoriam

Eugene M. Allen, Professor Emeritus of Chemistry, died January 18, 2005, at the age of 88. Born in Newark, NJ, Allen graduated from Columbia University in 1938, took an M.S. degree in mathematics at Stevens Institute of Technology in 1944 while working at the Piccatiny Arsenal during the WWII, and completed a Ph.D. in chemistry with specialization on spectrophotometric physics at Rutgers University in 1952 while working at American Cyanamid. He left Cyanamid in 1967 to become director of the Color Science Laboratory at Lehigh's Center for Surface and Coating's Research, retiring in 1982. "Allen was best known for his achievements and scientific impact on the field of color physics. His work plays a very important role in the application of computer color-matching programs that are routinely applied today. He was the first to develop the formalism of color-mismatch regions to quantify the color mismatches that can occur with different light sources and perceptions by different observers. To his colleagues and students, he was an expert adviser and guide, who not only practiced his science, but always reached for wider connections between science, arts and humanities through the common language of mathematics, development of human perception of physical phenomena, and music." (Excerpted from a Lehigh University faculty resolution read 7 February 2005.)

Mystery Student

In the previous issue (Newsletter 27, July 2004) we presented the picture of a mystery student. **Charles H. Carter, Jr.** *(B.S. 1941) suggests that this might be Harry Brooks Osborn, Jr., (B.S. 1932). Osborn went on to get an M.S. (1934) and a Ph.D. in chemical engineering (1937) at Lehigh. He later became vice president and marketing manager of the TOCCO division of the Ohio Crankshaft Company in Cleveland Ohio and ended his career as a vice president of Park Ohio Industries, retiring in 1983. He died on November 9, 1987.—Ed*

(From the 1932 Epitome)

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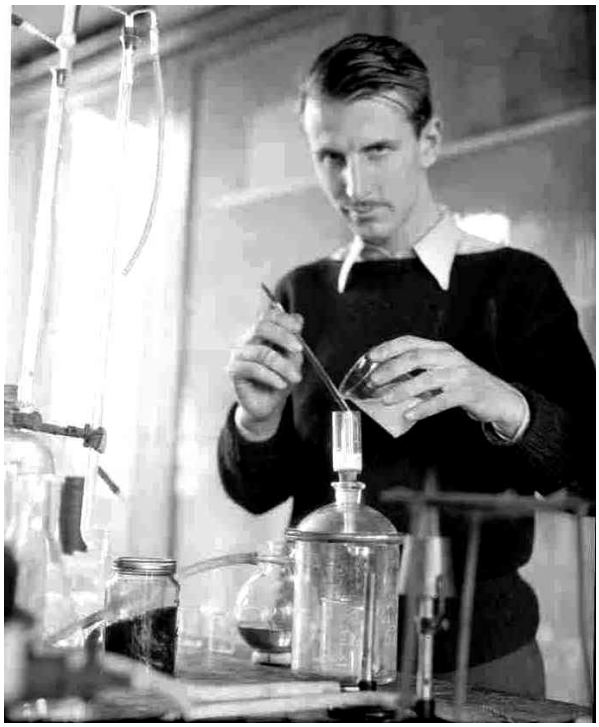

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