



Nancy Wade

Paul Hopkins, Chair

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Dear Friend of Chemistry,

It is my pleasure to report to you again in the *ChemLetter*. There is never a dull moment in our organization. As usual I am able to share just a few of the more consequential developments.

Though we could not function without our staff, graduate students, and post-doctoral associates, it is the faculty who are the choreographers of our performance. They select our classroom curriculum and guide our research programs. The arrival or departure of even a single faculty member can be of great significance. From 1995 through 2004, our faculty grew from 32 to 42 in number. The productivity (and quality!) in both our instructional and research programs skyrocketed.

Unfortunately, the period from 2004 until now has been less favorable by this measure. The weak budget of our College has caused faculty departures to strongly outnumber additions. An astonishing 12 of our faculty members have retired or departed (or will very soon) for a wide variety of reasons. These include Professors Bartholomew, Borden, Engel, Epiotis, Frank, Jonsson, Koeller, Kwiram, Macklin, Ruzicka, Schurr, and Xia. We find ourselves facing this next academic year with as few as 34 faculty members. The demand for our classes will not diminish, so this smaller group of faculty will be called upon to help the same or even larger numbers of undergraduate students learn chemistry. I am hopeful that within five years or so, our faculty ranks will be refilled with outstanding teachers and researchers.

There is also much good news to celebrate from the past year. We are extremely proud to have renewed and won two major center grants that together will bring us some \$40 million in funding for our students, postdoctoral associates, staff, and faculty during the next five years.

National Science Foundation (NSF) funding for the Center for Materials and Devices for Information Technology Research (CMDITR) was renewed for a second five-year period by Professor Larry Dalton and his collaborators. This is one of a small number of centers funded by the NSF nationwide. It is the only such center at the UW, and a real feather in our cap. The Center's programs seek to design and synthesize organic polymers, whose spectacular electrooptic properties are exploited in a wide range of practical applications.

Professor Karen Goldberg and her co-workers were the first and only winners in NSF's new "chemical bonding center" program. Its goal is to encourage chemists to work on the "big problems" facing society. This five-year grant will support the Center for Enabling New Technologies through Catalysis (CENTC). The Center unites leading experimentalists and theorists across the nation in efforts to discover new, practical catalysts for industrially important chemical transformations.

I have previously mentioned the long process of renovating research and teaching spaces in Bagley Hall. We are within weeks of occupying some 20,000 square feet of renovated Bagley Hall spaces. About one-quarter of UW students taking entry-level chemistry will, for the first time since the late 1930s, conduct work in brand new laboratories, while 60 of our researchers will benefit from improved research spaces.

It is my pleasure to congratulate Dr. Leland Burger, UW Chemistry Ph.D. 1948,

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60-Year Career as a Research Chemist

Dr. Leland L. Burger was awarded the Glenn T. Seaborg Award in Actinide Separations this year. He had a 60-year career as a research chemist and contributed to science's fundamental and practical understanding of separation chemistry, particularly for the actinides.

Dr. Burger was born in Wyoming and didn't leave the state until his senior year of college. He graduated from the University of Wyoming in 1939 and earned his Ph.D. from the University of Washington in 1948, with Professor George Cady (UW Department of Chemistry, 1938–1972) as his advisor. Burger's dissertation was "The Physical Properties of Some Fluorinated Pentanes." Burger spent two years at the UW, then four years in New York at Columbia University working on the Manhattan Project. He returned to Seattle for two more years to complete his Ph.D. Dr. Burger accepted an offer from General Electric to work at Hanford, where he spent the majority of his career in science.

Professor Joe Norman came to the UW Department of Chemistry in 1972, taking the inorganic-chemistry position vacated by Professor Cady's retirement. Professor Norman interviewed Dr. Burger in October 2007 during one of Dr. Burger's visits with his family in Seattle. A summary of that interview follows.

Dr. Leland Burger

Courtesy of Leland Burger



JN: What was it like "from the inside" working on the Manhattan Project during World War II?

LB: I started at Columbia before the Manhattan Project, and there we hardly noticed the transition scientifically. However, we were well aware of the major decisions to set up more labs at Chicago, Oak Ridge, Hanford, and later Los Alamos.

JN: Who originated the idea of separating uranium isotopes by gaseous diffusion of UF₆ that was applied so extensively during the Manhattan Project?

LB: I believe it was Harold Urey, Nobel Prize Winner in 1934.

JN: When you began work in actinide chemistry in 1942, had the newer form of the periodic table appeared that recognizes these elements as part of the f- rather than the d-block?

LB: Yes, it had. I believe the change was accepted about 1939, the year plutonium was discovered.

JN: As you look back on your scientific accomplishments, which ones stand out as most satisfying?

LB: I think of myself as primarily a separations, rather than actinide, chemist. I worked in many different areas—thermodynamics, radiation chemistry, solvent extraction theory, isotopes, and atmospheric chemistry. Perhaps my most important work was in plutonium, uranium, and fission products separation using solvent extraction.

JN: If you were continuing with scientific research, would you continue work on actinide separation? Are there still fundamental problems remaining in this area?

LB: I think it's important to find an efficient way to recycle plutonium and all the other actinides, thus providing maximum nuclear energy and minimum nuclear waste in the fuel cycle. Separation research could play a key role in such progress.

JN: Professor George Cady was important in the history of this Department. Can you share with us some personal memories of him?

LB: George Cady was an outstanding chemist, easy to work with, and very friendly. After I had been away from Seattle for six months, I sent a letter to my fiancé in Seattle, asking her to join me in New York. George and his wife Alpha attended the wedding. George had an easygoing and personal touch. He was highly regarded by everyone, and we remained close friends after I left the University.

JN: What did the Department “look like” to you when you were here during the 1930s and 1940s?

LB: I remember Professor Tartar showing me the then-new and sophisticated labs and classrooms in Bagley Hall in 1939, with all the latest technology for a chemistry department.

JN: What made you decide to study at the UW?

LB: UW had a good reputation throughout the Northwest and I wanted to see the area. I also had a friend in Seattle.

JN: Why did you choose to work at Hanford?

LB: The closer I came to earning my degree; the more I thought I should stay in the nuclear industry as there was important work to be done. I wanted to stay in Washington and General Electric (the Hanford contractor) seemed a good company. I ended up

working there from 1948 to 1986 for GE and Battelle. After I “retired,” I continued working 10 more years full-time, and another seven part-time!

JN: What advice would you give a graduate student today?

LB: I think the best path is to get a broad background in thermodynamics, kinetics, and molecular structure. The wonderful developments in instrumentation make so many more types of investigation possible. Many students focus much too narrowly.

JN: What opportunities did you have for teaching and interaction with universities while working at Hanford?

LB: Starting in 1948 at Hanford, GE worked in cooperation with the University of Washington, Washington State University, and Oregon State University to develop a graduate school onsite. I taught Physical Chemistry topics for several years, finally as a WSU Adjunct Professor. Eventually, the on-site school became a permanent graduate center; it is now a campus of WSU. I also took a one-year sabbatical from GE at Hanford and went to Oregon State University to study, take a few classes, and teach part time. At Battelle, we also had visiting professors during the summer. I learned a great deal and enjoyed the time.

JN: How would you sum up your career?

LB: I enjoyed my research and teaching thoroughly. I feel very fortunate that I was in the right places at the right times. ■



Bagley Hall, circa 1940

BAGLEY HALL RENOVATION

By Gary Pedersen

In the mid 1990s, a group of Chemical Engineering alumni, on campus for their 50th reunion, toured Bagley Hall (up until 1953, Chemical Engineering was an integral part of the Chemistry Department). A group gasp was heard when they entered a second floor undergraduate freshman laboratory. One alum blurted out in disbelief, “this lab looks just like it did when I took freshman chemistry.” He was right. In fact, up until this year, the lab was, for the most part, original Bagley Hall construction—not even a coat of paint had been added since the building was completed in autumn 1937.

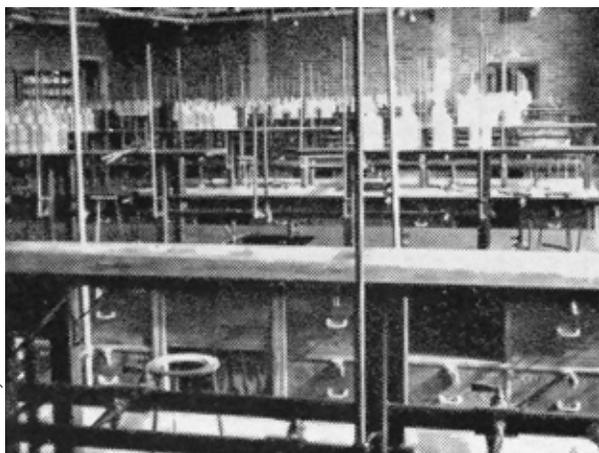
The undergraduate labs were state of the art for their time, and served students of that era well. However, over the last 70 years, there has been significant evolution in undergraduate laboratory design nationwide, yet the Bagley teaching labs remained “vintage”. They were aptly described by a 1990s UW Vice Provost as “something out of Dickens.”

As an aside, here is a one-question pop quiz. The answer will be provided at the end of the article. What incorporated technology related to the undergraduate program was most admired when the building opened in 1937?

With the completion in November 2007 of a \$10 million renovation that includes not only the freshman chemistry laboratory, but 17,000 square feet of research space on the third and fourth floors, our department has taken a considerable leap forward in the quality of teaching and research spaces available for our faculty and students.

The renovated research labs on the third and fourth floors allow our department to accommodate a research program that has grown by more than 100 graduate students and post-docs in the last six to seven years. The third floor space was designed to house the exciting and growing field of photonics. The fourth floor space will be home to faculty research groups currently located in the Chemistry Building and other Bagley spaces.

The undergraduate laboratory underwent the most radical design changes. Serious planning for the project began in 2001, with a series of workshops. Participants gathered to discuss and visualize the needs and requirements for the new labs. This led to the studio concept—an integration of lecture and lab facilities within the same space. The laboratory can, and will, be used for lecture, labs, and quiz sections. The setting also encourages greater interaction among students, faculty, and teaching assistants.



Chemistry Archives

Bagley freshman laboratory, 1937



Nancy Wade

Bagley Hall freshman laboratory, 2007



Bagley Hall and Chemistry Building

Students will work in pairs during laboratory sections and in groups of six for the discussion and quiz sections. The physical arrangement of the benches and shelving in the original laboratories precluded interaction between larger groups of students. The new studio model creates a collegial environment for discussion, inherent in the layout of the island benches. Students are able to work in pairs for the laboratory section, as small groups during discussions, and as individuals for quiz sections. The clusters of workstations are oriented so that all students can clearly see the teaching assistant in the front of the lab and vice versa. Not only does this foster lab safety, but the configuration will encourage interaction and discussion among students.

This is the first phase of undergraduate lab renovations. Three identical laboratories will be constructed when funding becomes available. We are looking forward to the time when all of our undergraduate students learn chemistry laboratory skills in contemporary chemistry laboratories.

A feature common to both the teaching and research labs is the installation of high performance

fume hoods. These hoods not only meet national standards for containment of hazardous materials, but do so with greatly reduced air volumes, saving thousands of dollars per year in heating costs and reducing the departmental carbon footprint. The high performance hoods came to campus partly as a result of departmental pressure and persistence, which began six or seven years ago and culminated with the first campus installation in Bagley Hall. The hoods are now officially approved by the university, and are quickly becoming the standard on campus.

We are pleased with the result of the recent laboratory renovations. They are quite attractive, highly functional, and environmentally friendly. We are appreciative of the UW's significant investment in our future.

In closing, the answer to the quiz: the high technology specifically called out in the 1937 publication "The New Daniel Bagley Hall at the University of Washington" (The old Bagley Hall is what is now called the Architecture Building), a pamphlet produced for the inauguration of our Bagley Hall, was... lighted blackboards in the lecture halls. ■

Alvin Kwiram Retires

By Professor Emeritus Mickey Schurr

Alvin Kwiram completed his K–12 training in Canada, earned Bachelor's degrees in chemistry and physics from Walla Walla College in 1958, and a Ph.D. from Caltech in 1963, under the supervision of Prof. Harden McConnell. Alvin emerged with a deep understanding of magnetic resonance phenomena and an enduring and highly contagious fascination with science in general. After a brief postdoctoral stint in the laboratory of Prof. William Fairbank in the physics department at Stanford, Alvin joined the chemistry department at Harvard.

During six years at Harvard, Alvin and his coworkers pioneered the development of two new magnetic resonance spectroscopies: (1) optically detected magnetic resonance (ODMR) of excited triplet states of various organic molecules in low temperature solids, and (2) electron-nuclear double resonance (ENDOR) studies of organic species in crystals and randomly oriented arrays. He also conceived new non-linear electron spin resonance (esr) spectroscopies, including the saturation transfer method to study slow rotational dynamics of spin-labeled species, which was subsequently brought to fruition in collaboration with his former student Larry Dalton with a theoretical assist from his postdoc Bruce Robinson. Alvin and his team at Harvard assembled a large quantity of rather unique and sophisticated instrumentation.

Kwiram joins UW Chemistry

Alvin joined the UW Chemistry Department in 1970. His equipment from Harvard would not fit into the largest lab in Bagley, so luckily, he recruited several graduate students (Willem Leenstra, Ann Motten, and Ken Rousslang) with strong backs as well as bright and eager minds. Their first project was to excavate a giant cavern underneath the lab to house some of the gear. The digging went on for many months, inspiring all kinds of interesting rumors. Nevertheless, under Alvin's tutelage these students and their successors, Youkang C. Liu, Rod Williamson, Tina Weeding, and Cynthia Wilson, all produced outstanding Ph.D. theses, most of which involved continued develop-

ment and elaboration of the new spectroscopies. Alvin was a well-organized, outstanding, and popular instructor, whose quantum mechanics notes were valued as much by his colleagues as by his students.

In 1977, Alvin became chair of Chemistry. At the time, both our department and the rest of upper campus were in a precarious state, grossly under-funded in comparison to peer institutions, and confronted by numerous problems, including an aging physical plant, too little external grant support, and a less than cohesive faculty—all of which made it difficult to attract outstanding people.

Alvin had a vision of what a more cohesive chemistry faculty and a better connected UW community could achieve, and he was remarkably persuasive. Soon a large majority of our department was engaged in advancing our common enterprise. A positive value was attached to writing proposals regardless of their eventual success or failure. Numerous proposals for departmental instrumentation, upgrades of instructional labs, and summer outreach programs, as well as for support of individual research groups, were submitted and many were funded.

Supporting collegiality

Alvin was quick to support the worthy ideas of others, such as Bruce Kowalski's original concept for an (initially) NSF-supported Center for Process Analytical Chemistry, which is still going. Alvin invited the chairs of several other departments to discuss future research directions and course developments to identify emerging areas and where mutually beneficial department-bridging appointments might be made. Faculty from other departments were often members of our search committees. The first department-bridging appointments were Tom Engel (with physics) and Brian Reid (with biochemistry), and that has been a recurring theme ever since.

Alvin also recognized the importance of building groups of faculty who work in related areas, and several hires were made with that objective—for example, Heinz Floss (with Niels Andersen, Paul Hopkins, and Mike Gelb) in the bioorganic area and Bruce Robinson and Gary Drobny (with Brian Reid) in the magnetic resonance area.



Professor Alvin Kwiram

Alvin persuaded the provost and dean that substantial start-up packages for new hires would be a wise investment to ensure their early research progress and subsequent success in the competition for external funding. A proposal to the Murdock Foundation for \$100,000 toward a nuclear magnetic resonance (NMR) instrument was submitted and funded. By using that \$100,000 as “starter” money, Alvin managed to raise several times that amount by a series of successive matching requests. Together with funding that Brian Reid garnered from the National Institutes of Health (NIH), this enabled the purchase of our department’s first 500 MHz NMR instrument. That, in turn, led to an NIH-funded DNA Program Project to study the structures and dynamics of DNAs in solution, which supported work in several labs for the next 15 years. It also led to an early National Science Foundation (NSF) center grant for \$500,000 toward new instrumentation, including a new esr instrument. During Alvin’s tenure, overall external funding rose about 10-fold.

Fostering Collegiality

Alvin and his wife Verla fostered collegiality and a sense of family through a number of wonderful dinners and dessert soirees in their home. Alvin promoted softball games at departmental picnics to develop camaraderie

among the faculty and to boost the morale of our grad students, who always won big. Luckily, the many injuries suffered by the faculty were not fatal!

While he was chair, Alvin helped to found the Council for Chemical Research, composed of members from academic, government, and industrial labs. Its goal is to advance research in chemistry and chemical engineering across the nation, in part by providing seed money to catalyze collaborations between academic, government, and industrial scientists. Alvin was also active in the American Chemical Society, especially the Physical Chemistry Division. He was part of the group that changed the theme of the *Journal of Physical Chemistry* to attract forefront articles by spectroscopists, biophysical chemists, and theorists, who had previously almost exclusively published in chemical physics or biophysics journals.

Kwiram becomes Vice Provost

Alvin moved from Chemistry chair to the position of vice-provost, and eventually vice-provost for research. There, he played a major role in securing funding for several new science and engineering buildings, including the new Chemistry Building.

Alvin built numerous bridges from the UW to various local industries. He brought together groups from inside and outside the UW to explore possible areas where fruitful collaborations might be facilitated by the UW. He strove to create joint institutes between the Pacific Northwest National Lab at Hanford and the UW in several areas of research. He guided the formation of the Office of Technology Transfer to expedite the patenting and licensing of ideas, instruments, materials, and techniques developed by UW faculty, and to manage the royalty income, which now exceeds \$30 million per year. He created the Royalty Research Fund, which awards about \$2 million per year in “seed” money to faculty, especially young faculty, who are initiating work in new areas of research, scholarship, and artistic endeavors. He catalyzed major expansions of the UW’s efforts in biomedical research and genomics, computer science and engineering, and materials science and nanotechnology. He worked hard to implement the Advanced Technology Initiative of the State of Washington, which has provided essential resources for these expansions of UW efforts in various directions.

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—Kwiram retires,
continued from page 7

Throughout his tenure as vice provost, Alvin maintained an active interest in science, and frequently collaborated with his former student, Larry Dalton, whom he eventually recruited to join our faculty. This led to a new initiative in photonics, which resulted in the creation of a very successful, NSF-sponsored center on Materials and Devices for Information Technology at the UW. When he became director of the center, he was instrumental in securing additional faculty lines and funding in the chemistry, materials science, and electrical engineering departments; for the renovation of Bagley Hall; and in winning additional grants and contracts to support the work of center participants. He also organized the Seattle Nanophotonics Initiative, which brings together industrial and academic scientists for monthly seminars, as well as an annual meeting at the UW's Friday Harbor Laboratories.

Alvin's vision, remarkable powers of persuasion, and ability to forge trusting relationships with diverse groups have truly altered the face and scope of science and engineering on both the upper and lower campuses of the UW, and have also greatly benefited the commercial sector. During the 1990s, nearly 100 companies were started, based on UW-developed technology. His legacy to the science and engineering enterprises of our department, the UW, our state, and our country is truly amazing.

In light of his retirement, Alvin's colleagues will sorely miss his cheerful enthusiasm for science and engineering, his profound wisdom, his gentle and often self-deprecating humor, and his respectful treatment and concern for others. ■

Younan Xia Relocates Highly Cited Materials Chemist

In September, Professor Younan Xia relocated to the Department of Biomedical Engineering in the School of Engineering at Washington University in St. Louis. Xia's wife, Dr. Dong Qin, the staff lead in the materials characterization facility of the UW Center for Nanotechnology, moved with him to the position of Associate Dean for Research at the same institution.

Xia joined the UW faculty in the fall of 1997. He established an outstanding program in the area of the synthesis of nanostructures. No structure was beyond the synthetic ability of Xia and his coworkers. Their publications are filled with spectacular images of spheres, rods, and cubes that were coaxed to grow from various mixtures. These publications garnered substantial attention in the scientific community. While at the UW, Xia became one of the most highly cited materials scientists in the world.

For this work, Xia received a number of prestigious awards including the 2006 NIH Director's Pioneer Award, the Leo Hendrik Baekeland Award (2005), the Camille Dreyfus Teacher Scholar (2002), the David and Lucile Packard Fellow in Science and Engineering (2000), an Alfred P. Sloan Research Fellowship (2000), an NSF Early Career Development Award (2000), the Victor K. LaMer Award of the American Chemical Society (1999), and a Camille and Henry Dreyfus New Faculty Award (1997).

Washington University has made a commitment to greatly expand its activities in the area of Biomedical Engineering. In order to make that investment wisely, they require leadership from the top talent in the world. It comes as no surprise to us that they recruited Xia to play this role.

The U.S. higher education system is strengthened overall by the occasional migration of researchers and teachers from one institution to another. This movement of scholars yields new combinations of faculty expertise that can produce stunning new discoveries. Our department and the University of Washington deeply regret the loss of Professor Xia and his outstanding programs. The search for new talent to occupy his vacancy is already underway.

We wish Professor Xia every success in this new position. We take great pride in having launched this highly successful career. ■

J. Michael Schurr Retires

As told by Professor Emeritus Alvin Kwiram

Mickey Schurr earned his Ph.D. in Biophysical and Physical Chemistry at the University of California, Berkeley in 1965. He has been as influential as anyone in achieving high academic standards in our department, and he maintained the same high standards in his own teaching and research. Mickey will not compromise when it involves his core principles. I've always valued his counsel, in part because he offers a frank and straightforward perspective, without political motivation. When I arrived in 1970 as a new faculty member, Mickey was a one-man welcoming committee. Later, he was an important member of "young Turks" that I had organized to find ways to strengthen the department. Mickey and I endured a particularly difficult period in the 1980s and his support was unwavering.

Mickey has been an exemplary citizen in the department. Sometimes feisty and rarely without an opinion, he has always provided valuable input that improved the discussion and the outcome. Another very important and laudable characteristic of Mickey's is that he has consistently been very supportive and solicitous of the staff—particularly those in the electronics and machine shops.

When I was chair, I never had complaints from any of the students in his classes, although some complained to the dean that he was too hard. This is a reflection that he always had high expectations and maintained rigorous standards. He didn't trivialize the subject matter in order to curry favor or to improve his teaching ratings. He has been an excellent mentor to many graduate students and even to those not studying with him. I usually left for home around 7pm and quite often would see Mickey still talking to a student in the hallway. This level of commitment to the art of teaching and mentoring went on for 40 years, and enriched the educational experience of many students.

Mickey has been a very meticulous investigator, bringing considerable depth of insight to his field. I daresay he understands the dynamics of DNA better than 99% of his peers. I believe his colleagues would agree that intellectually, Mickey would rank right at the top of the list of faculty in a department known for its intellectual horsepower. He has a very deep level of understanding of the physical sciences.

I can give you an example that illustrates this. Larry

Professor
Mickey
Schurr

Karen Schurr



Dalton, a few years before he joined the UW faculty, gave a seminar, where he presented his research and pointed out a specific conundrum that was bothering him. He had articulated a contradiction between some experimental results he had obtained and a paper that had been published by two Nobel Prize winners. During the Question and Answer session, Mickey asked Larry to go back to a particular slide, and suggested a possible explanation. Subsequently, Bruce Robinson, Larry, and Mickey stayed for several hours after the seminar and hammered out the solution. Mickey's insight broke the intellectual logjam raised in Larry's presentation—even though this wasn't Mickey's area of expertise. This led to a significant publication that pointed out the problems with the paper referred to previously.

Mickey has always been a lively and charming participant in the department's social functions. He was very personable with our kids, and has continued to inquire about them over the years. Mickey has a wonderful sense of humor, and as a family, we thoroughly enjoy the Schurrs' cleverly crafted, and always entertaining, Christmas letter. Mickey's wife Karen is a warm and generous person, with a razor-sharp mind. Mickey is a fearless mountain climber and an inveterate hiker. There are legendary tales of hikes that prospective faculty members would take with Mickey. One prospect had serious doubts as to whether he would ever return alive from one of these "relaxing hikes."

In short, Mickey has been a superb faculty member, colleague, and friend. He didn't engage in the competitive offer game and wasn't a fan of the potentially corrupting aspects of "star" power. I have a great fondness and huge respect for Mickey, who has truly been one of the central pillars of our department. ■

**Assistant
Professor
Munira Khalil**



Munira Khalil New Assistant Professor

Munira Khalil was born in India and spent her first 10 years in Calcutta and the next six in Bombay. At 16, she came to the US as an exchange student and spent 11th grade in a Massachusetts high school. Khalil finished high school in India, and then returned to the states, earning a bachelor's degree at Colgate University in upstate New York. It was a challenge to adjust to a small rural community and to the very cold winters. Khalil took advantage of the choices available in the liberal arts, majoring in both Chemistry and English.

Khalil spent 1998 to 2003 at MIT, earning her Ph.D. in Physical Chemistry. She did her postdoctoral work at Berkeley from 2004 to 2007.

In autumn 2007, we are fortunate to have Assistant Professor Khalil join our faculty.

This year, Khalil won the Camille and Henry Dreyfus New Faculty Award. The Dreyfus is awarded to faculty before they begin an appointment. Each institution can nominate one person from Chemistry and Chemical Engineering. Each awardee receives a \$50,000 fund for research.

Khalil's favorite subjects in school were chemistry, physics, and math, and combining them led to her interest in learning about matter at the microscopic level. While an undergraduate, Khalil had an opportunity to do research in Boulder, Colorado, as a member of a large collaborative group. This gave her a perspective on how science is done and how to approach problems. As a Ph.D. candidate, she enjoyed the process of unraveling a problem and becoming an

expert on a particular issue. This led to her desire to become a professor. She enjoys the creative freedom to pursue problems she is passionate about, to design and perform experiments, to observe, and to attempt to explain a chemical problem.

Khalil is interested in exploring light-driven processes in chemistry and biology. For example, how do charges move around in compounds during charge transfer processes on the timescale of molecular vibrations? How can we find the various energy pathways and learn what the molecule does with the absorbed light? What are the molecular structural dynamics accompanying the charge transfer process? Khalil will explore these questions using novel spectroscopies in which multiple femtosecond (10^{-15} s) pulses of coherent light are used to interrogate the sample. Controlling the pulse sequences can provide information about structural changes and energy transfer pathways.

Laser equipment is on order and Khalil's laboratory in Bagley Hall will be ready shortly. The graduate students that work with Khalil will have an opportunity to visit the Department of Energy's Lawrence Berkeley National Laboratory to perform experiments using femtosecond x-rays at the Advanced Light Source. These experiments will detail the molecular structural changes occurring during and after a light-induced chemical reaction. ■

**Professor
Thomas G.
Spiro**



Thomas G. Spiro New Professor

Tom Spiro was raised in Canada, where his Hungarian parents found refuge on the eve of WWII. They first lived on a farm near Sherbrooke, Quebec, and then in Toronto. When Tom was 15, the family moved to Los Angeles, where he graduated from the University of California, Los Angeles (UCLA).

His interest in chemistry was kindled (classically) by a chemistry set, and reinforced by a stimulating high-school teacher. At UCLA, Tom's chemistry courses were supplemented by writing for the *Daily Bruin*. Tom always tells his students that this was the best preparation for a career in science because of the importance of writing a story clearly.

In 1960, Tom earned his Ph.D. in Bio-Inorganic and Bio-Physical Chemistry at Massachusetts Institute of Technology with D.N. Hume. His postdoctoral experience was in Copenhagen with C.J. Ballhause and in Stockholm with L.G. Sillen. Tom then joined the chemistry faculty at Princeton University, later serving as department chair. His nine years as chair saw a major expansion of faculty and facilities, especially in the areas of materials and chemical biology. Subsequently, Tom led a university-wide planning effort on environmental studies, which led to the formation of the Princeton Environmental Initiative.

Tom took emeritus status from Princeton this year in order to move to Seattle and the University of Washington. He did this because he likes the people here, because of the hospitality of Professor Phil Reid (with whom he will share a laser spectroscopy lab) and because he is now close to his twin two-year-old grandsons, who live in Seattle.

At Princeton, Tom's teaching and research were in bio-inorganic and environmental chemistry, focusing on the application of laser Raman spectroscopy to protein structure and function. The National Institutes of Health-funded program will soon be up and running here at the UW, thanks to his five capable postdoctoral associates who moved to join him in Seattle. ■

Associate
Professor
Tomikazu
Sasaki

Nancy Wade



Tomikazu Sasaki Artemisinin Team Researcher

Associate Professor Tomikazu Sasaki received a Ph.D. in Bioorganic, Organic, and Biostructural Chemistry from Kyoto University in Japan, and has been with our department since 1989. For the last seven years, Sasaki has worked with research professors Lai and Singh, both with the UW Department of Bioengineering. The three scientists pioneered the anti-cancer aspects of artemisinin, with Sasaki adding his significant talents as a chemist to the team.

They are collaborating to develop a number of artemisinin-tagged compounds and technologies for the prevention and treatment of cancer, infectious diseases, and disorders characterized by abnormal cellular hyper-proliferation. Sasaki's team works on synthesizing derivatives of artemisinin and testing them on a variety of cancer cells.

Artemisinin is the active ingredient found in sweet wormwood, *Artemisia annual L*. The medicinal value of the plant was discovered more than 2,000 years ago in China, and has been used to treat many ailments. In the 1970s, artemisia was isolated from the plant and found to work well as a non-toxic compound against malaria infection. Today, artemisinin is the most effective drug against malaria, and is used by millions of people worldwide. Artemisinin contains an endoperoxide moiety (R-O-O-R') that reacts with intracellular iron to generate toxic radical species that damage cellular structure and lead to cell death. In the 1990s, artemisinin was first tested against human cancers. Cancer cells require a larger amount of iron, an essential nutrient, than normal cells to support their uncontrolled growth and proliferation. As a result, cancer cells are more sensitive to artemisinin than normal cells.

Sasaki developed novel classes of artemisinin derivatives

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—Tomikazu Sasaki, *continued from page 11*

by re-engineering natural artemisinin to target the iron uptake mechanism of mammalian cells. These new artemisinin compounds have shown anti-cancer effects comparable to commercial drugs, but with significantly fewer side effects. Sasaki says that the ideal cancer therapy would be effective, non-toxic, easy to administer, and low cost, but current cancer therapies are typically far from these ideals. Sasaki believes that artemisinin and its derivatives have a potential to become the basis of new radically improved anti-cancer therapies.

Artemisinin is currently approved in the US by the FDA for use as a supplement, but no derivatives are yet allowed to sell. Sasaki is a co-founder of Artemisia BioMedical, Inc., a privately held Seattle-area biotechnology company developing artemisinin-related technologies invented at the UW and other leading US institutions. The company was started in July 2006, with funding from a private party—an individual whose son was diagnosed with brain cancer. There are plans for clinical developments of the new artemisinin derivatives that could take 5–10 years before artemisinin-based drugs become available to the general public. Several leading oncologists have expressed their interest in artemisinin and human clinical trials of natural artemisinin could start as early as 2008.

Sasaki began this line of research when he became fascinated by the possibilities of overseeing drug development from discovery through commercialization. He finds it very rewarding to think of the potential positive impact of this research on people's lives. Since Sasaki has begun this research, he has heard many stories of inspiration. A boy in Oregon lay in a coma with a brain tumor eight years ago. He was treated with artemisinin supplements and has regained consciousness and is still living today. Sometimes the artemisinin supplements are used for treatment of cancers in animals, such as osteosarcoma (bone cancer) in dogs. Within 10 years, this could be helping countless people. ■

Michael Gelb

Early Diagnoses

—by Sophie Blanchard, *Research Associate*

Chemistry Professor Michael Gelb is one of the few scientists conducting research on the development of diagnosis tools for early detection of lysosomal storage disorders (LSD). These rare metabolic disorders are a family of genetic diseases caused by enzyme deficiencies within lysosomes, which are cell compartments where large cellular components are broken down. The malfunction of these enzymes causes waste material to accumulate in cells. These defects lead to crippling, even fatal, consequences starting at a very early age. Symptoms can be very similar among all the diseases and are usually not readily apparent, particularly early in life. This makes a medical diagnosis difficult and delays the administration of treatments to prevent—or at least limit—any irreversible damage.

Since starting work on the project in 1998, the Gelb group, in collaboration with UW professors Frank Turecek of Chemistry and C. Ron Scott from Pediatrics, has developed a panel of tandem mass spectrometry assays for early detection of several different LSDs from dried blood spots, easily accessible from newborn screening cards. The relatively simple technique allows the quantification of enzyme activities in blood from an infant—a low enzyme is an indicator that an infant may have the disease. Tandem mass spectrometry is already being used to screen for about 25 different inborn errors of metabolism, such as amino acidurias and fatty acid breakdown diseases.

So far, the screening method has been effective in the detection of several disorders—Krabbe, Pompe, Niemann-Pick, Gaucher, and Fabry diseases. Grad student Brian Wolfe and two postdoctoral researchers, Dr. Yuesong Wang and Dr. Sophie Blanchard are currently working on the project. The work is supported by grants from the National Institutes of Health and Genzyme Corp. of Cambridge, Massachusetts. Work is being pursued on diagnosis tools for other diseases such as Porphyrias, Metachromatic Leucodystrophy, Hurler, Hunter, or Maroteaux-Lamy syndromes. The advantage of this technology is that several enzyme activities can be measured in a single, multiplex analysis by tandem mass spectrometry, minimizing the length of the entire process.

Courtesy of Michael Gelb



Professor Michael Gelb

Based on the technique developed by the UW team, newborn screening for Krabbe disease is now in place in the newborn facilities of New York state. Dr. Scott is about to start a pilot study with the multiplex assay of five different enzymes here in Washington, a first step before the test could be adopted by state authorities. On November 5, 2007, Governor Blagojevich signed an Illinois bill into law. The bill makes Illinois the first state in the country to test all newborns for five fatal childhood diseases. And more states and other countries are moving towards this as well, mostly notably Austria and China.

Professor Gelb studied chemistry and biochemistry as an undergraduate at the University of California at Davis. His Ph.D. studies with Stephen G. Sligar at Yale University led to a better understanding of the catalytic mechanism of cytochrome P450. As an American Cancer Society Postdoctoral Fellow in the laboratory of the late Robert H. Abeles at Brandeis University, Gelb studied a variety of mechanism-based inactivators of serine proteases and developed fluorinated ketones as tight-binding inhibitors of several classes of proteases. In 1985, Gelb became a faculty member in the Department of Chemistry. ■

Faculty Honors

DAVID GINGER

- 2007 Alfred P. Sloan Research Fellowship
- 2007 Camille Dreyfus Teacher-Scholar Award

OLEG PREZHDO

- 2006 Max-Planck Fellowship, Institute for the Physics of Complex Systems, Dresden, Germany
- 2007 Fellowship of the Japanese Society for the Promotion of Science, Kyoto University

PRADIPSINH K. RATHOD TEAM

- 2007 Five-year, \$6 million award for Medicines for Malaria Venture (MMV)
Optimizing novel Dihydroorotate Dehydrogenase inhibitors for treating malaria
Professor Rathod's lab will receive \$2.7 million in funding for the project. Team leaders include:
Professor Margaret Phillips, *Department of Pharmacology, University of Texas Southwestern Medical Center*
Professor Pradipsinh K. Rathod, *Department of Chemistry, University of Washington*
Professor William Charman, *School of Pharmacy, Monash University*

DANIEL CHIU

- 2007 First-round winner of a Life Sciences Discovery Fund grant. This is one of just two awards in this round at the UW.
<http://www.lsdfa.org/grantees/profiles.html>
Fresenius Award—given annually by Phi Lambda Upsilon, our National Honor Society

MUNIRA KHALIL

- 2007 Named a Dreyfus New Faculty Awardee, one of 11 this year

Gary Pedersen

2006 Distinguished Staff Award Winner



Mary Levin

The Distinguished Staff Award program was established in 1997 to honor outstanding University of Washington staff. Those nominated for the award each year are recognized for their achievements at a campus-wide reception. From this group, five individuals or teams are selected to be the recipients based on their extraordinary accomplishments and contributions to the University.

Gary Pedersen, Executive Director of our department, won the 2006 Distinguished Staff Award. Pedersen's history with our department goes back to 1974, when he worked as a student helper in the Purchasing and Accounting (P&A) group. He earned his bachelor's degree in Chemistry in 1976. He became an accounting assistant with P&A and within a few years, earned a promotion to the position of office manager. In 1987, when Chemistry Chair Tom Engel faced the challenge of finding a new leader for the large staff, he wisely saw that Gary would be an excellent choice. Chemistry is fortunate that Gary accepted and served a "first term" as administrator from 1987 to 2000.

Pedersen's combined financial, analytical, and problem-solving skills served our department extremely well during a time of exponential growth. The new Chemistry building was designed and constructed during this time and Gary worked with architects, lab consultants, and construction teams to make it happen. He also oversaw numerous renovations to Bagley. Equally important, Gary's even-handed, sensitive treatment of all of his staff earned him high regard.

In 2000, Pedersen went to the UW School of Aquatic and Fishery Sciences and served as its administrator. His counsel and involvement were sought at all levels of the school and college. At the outset with Fisheries, he was given the daunting task of completing a 10-year academic review. The Fisheries director credits Gary with the strong success of that review.

In 2005, Chemistry Chair Paul Hopkins again faced the task of recruiting a new administrator and sought out Pedersen as a consultant. Hopkins says, "I knew from the outset that the best candidate for the job was none other than Gary. We are extremely fortunate he could be convinced to return."

Pedersen has had a significant positive impact on both Chemistry and Fisheries, and has also made remarkable contributions at the UW through work on University committees. He worked extensively on the University Services Renewal Project, which led to the success of various systems: the Online Payroll Update System, the Financial Desktop Initiative, the Financial Desktop Reporting Application, and the Access to Systems, Tools, Resources, and Applications.

Pedersen believes the best part of his work is the wide variety of tasks: handling student, staff and faculty issues; budgets; facilities and space; and even the occasional fire or flood. ■

Maxi Boeckl

A Rewarding Career

Maxi Boeckl had no idea that her decision to go to graduate school at the UW would lead to such a rewarding career. She is one of the principal scientists and founders of Asemblon, Inc., a company that specializes in the field of surface engineering, with emphasis on self-assembled monolayers (SAMs).

Four of the six Asemblon founders were researchers or post-docs at the UW at the time Asemblon was formed in 2000. The other founders are Dr. Daniel Graham, Dr. Esmaeel Naeemi, Professor Buddy Ratner, his wife Cheryl Cromer, and Patrick Quarles.

Maxi grew up just outside of Munich, Germany. While in junior high school, she and her family moved to Fort Collins, Colorado, in order to strengthen her English skills. She fell in love with chemistry after her first exposure in her ninth grade Chemistry/Physics class. Maxi enjoyed her math and art courses in college and earned a Bachelor of Science in Chemistry at Colorado State University.

Maxi returned to Germany for graduate work, but missed the United States and applied to graduate school at the UW after spending two years in Germany. The UW offered a friendly atmosphere and a variety of research options.

During Maxi's Ph.D. work in our department (1994–2000), she became involved with UW Engineered Biomaterials (UWEB), directed by Professor Ratner. It was there that Maxi was introduced to the concept of (SAMs).

Self-assembly is the spontaneous organization of molecules into complex and ordered supramolecular structures. It is the process nature uses to create life; molecules correctly self-assemble into living organisms. Many users of SAM technology are engineers, biologists, and physicists. However, until Asemblon opened its doors there were no commercial suppliers for these molecules. After receiving private funding, the founders opened their facility in Seattle in 2005. Now located in Redmond and employing 18 people, Asemblon anticipates growing to 25 employees in 2008.

Currently, Asemblon has two main areas of business.

Maxi Boeckl

Ph.D. 2000
Chemistry
T. Sasaki,
Advisor



Nancy Wade

Ph.D. thesis "Porphyrin Self-Assembly on Gold for the Design of Molecular Biorecognition Surfaces"

One is as the aforementioned specialty chemicals supplier for surface engineering applications. This area offers high-purity alkanethiols, and other self-assembling compounds, as well as custom synthesis, surface analysis, and consulting. Customers of Asemblon are primarily academic researchers and industry, especially surface analytical and sensor companies. Most applications are in nanotechnology, including modifying biomaterials, such as knee implants or catheters, to evoke a positive reaction from the body. Other examples include corrosion protection, molecular switches, biosensors, and microarrays.

The second area of business is a research and development project to store and transport hydrogen in the form of a proprietary liquid, HYDRNOL™. This fully recyclable material releases hydrogen quantitatively upon demand, and the residual liquid can then be charged again with hydrogen. This technology could be used for energy storage or as alternative fuel.

Maxi's role at Asemblon is to oversee the production of catalog items and the development of new compounds for use in surface engineering applications on the specialty chemical side of the company. She also has a consulting and support role for their hydrogen fuel storage system. Maxi looks forward to a challenging and exciting career at Asemblon. ■

mboeckl@asemblon.com

Rula Gladden's Year as a Bonderman Fellow



Courtesy of Rula Gladden

The motivations leading to my degree in Biochemistry, and my presence in five continents, sprang from the same source

As I journeyed around the world as a Bonderman Travel Fellow, people frequently expressed surprise when they learned about my academic background. “What is a biochemistry major doing with a travel scholarship?” they would ask. Although an International Studies or Anthropology student in that situation would make more immediate sense, interest in travel and chemistry are far from mutually exclusive—at the core of chemistry is curiosity about the inner workings of the world, and that curiosity led me to apply for the award. And so, oddly enough, the motivations leading to my degree in Biochemistry, and my presence in five continents, sprang from the same source.

For those who don't know about it, or have only heard rumors of some too-good-to-be-true scholarship, I assure you it does exist. The Bonderman Travel Fellowship provides \$20,000 for eight months minimum of travel through at least six countries in two or more major regions of the world.

Students in the Honors Program or obtaining departmental honors are eligible to apply, which they do by submitting an application essay detailing their travel proposal, the root of their inspiration and commitment to travel, and what they hope to obtain from their experiences. Some students are interviewed, and then each year, five are selected. (If you are thinking, “Whoa, this sounds awesome,” you are right.)

I was one of those incredibly lucky students. (I think I'm still in shock, even five months

after my return.) From September 2006 to May 2007, I traveled through Brazil, Argentina, India, Turkey, Italy, Egypt, Spain, Portugal, Morocco, Senegal, Mali, Burkina Faso, and Ghana. I was drawn to these countries for a variety of reasons: their overlapping histories and their religious and cultural similarities and contrasts. I wanted to see how people in different parts of the world saw themselves, how modernity was changing these perspectives, and how people from different cultures, religions, and generations connected across their differences. I certainly had some incredible experiences: seeing wild elephants while simultaneously combating leeches in the Indian jungle, climbing Mt. Sinai to watch the sun rise, watching dervishes whirl at a festival in central Turkey, viewing glaciers creeping in Patagonia, exploring amazing cities, eating excellent AND bizarre food, and, of course, watching people, meeting people, and making friends all over the globe.

I can't say now that I've entirely fulfilled the letter of my travel proposal by gaining a clear view into all human interaction, but I've gained a deeper appreciation for humanity's complexities. This strikes me as appropriate, because I would argue that an education in chemistry and biochemistry has the same effect—while you certainly learn guiding theories, facts, and principles, you come away with an understanding of the molecular realm as a dynamic, subtle, and alluringly mysterious place. But if my view of the world has become more uncertain, my understanding of my place in it has become, if anything, clearer.

I'm applying for medical school now, and hope to begin next fall. I'm incredibly excited by this prospect, but I have to admit there's a part of me that's sad I won't be freely roaming the globe for months on end any time soon. Who could blame me? It was an amazing experience.

—Rula Gladden

Chemistry, Climate Change, and Culture

During Summer Quarter 2007, Richard Gammon led 20 students to Salvador, Brazil, on an Exploration Seminar, "Chemistry, Climate Change, and Culture." The following is written by Aubrey Batchelor, a sophomore Biochemistry major and one of the students on the trip.

For most students, our experience of science thus far has consisted of lectures, lab work, and long nights with calculators. It is not often that we get to step outside of academia and explore the impacts of science in a real world setting. This summer, 20 of us had the unique opportunity to visit Brazil to study climate change as part of the Chemistry Department's first Exploration Seminar. The program was designed to give students a chance to study the chemistry of global warming, the international and national policies that aim to control harmful emissions, and the social aspects of those who are most responsible for our changing climate and those who will be most affected by it.

While in the city of Salvador, we learned about the rich culture that has shaped Brazil. We studied at the Federal University, as well as with a local school named Bahia Street. This small school helps young girls break the cycle of poverty through education and mentoring.

Salvador was the center of slave trade for South America, and the gap between upper and lower classes persists strongly to this day. Seeing true poverty for the first time is a harrowing experience. Nothing can prepare you for the realities of social injustice and the images of people who live with so little. And yet many of these Brazilians still manage to smile through their struggles. This was both tragic and inspirational to witness.

From Salvador, we traveled north to Arembepé where we worked with the Global Atmospheric Watch program, analyzing atmospheric levels of ozone, aerosols, and carbon dioxide. Arembepé is a small fishing town isolated from modern technology and

progress. The beachfront town, with its limited resources, will be affected in a drastic way by climate changes already sweeping the world

The Intergovernmental Panel on Climate Change (IPCC) report states that those least adaptable to change will be most adversely effected by rising temperatures and sea levels and natural disasters such as hurricanes, which have recently hit Brazil for the first time in recorded weather history. The residents of Arembepé, who so openly embraced us and shared their culture, will be displaced from their homes due to rising sea levels. Brazil is not a major greenhouse gas emitter. The USA is by far the largest emitter. To think that our actions in the states negatively affect the innocent people of Brazil is a tough reality to comprehend.

We also traveled to Santo Antonio de Jesus where we stayed with local families and studied at the State University of Bahia. We visited the Atlantic Rainforest of which only 5% of the original forest remains. Current weather modeling programs predict that the Amazon Rainforest will be entirely gone by 2050, replaced with a savannah-like geography. It is frightening to think how quickly we must act to change our ways.

Each aspect of our Exploration Seminar allowed us to explore more fully the issues which surround climate change, both on a scientific and a social level. The program was a great success, and I am thankful I had the opportunity to participate in such an incredible experience. ■



Professor Richard Gammon leading a class in Brazil

During the past decade, we have seen a remarkable transition in publicly funded higher education. A decade ago, gift-derived funds played a small role in our program, funding the occasional student fellowship or lecture. A decade later, we and other public institutions of higher education are heavily reliant upon gift funds for support of our baseline program. Today, annual gifts and endowment-derived funds are critical to every aspect of our teaching and research. Students, faculty, and staff are the beneficiaries of your gifts.

The UW Department of Chemistry is extraordinarily fortunate to have literally thousands of friends and alumni, a large fraction of whom contribute generously to our programs. We are deeply indebted to the donors named below and those who have come before. With your help, we are providing state of the art education to the current generation of students. Thank you!

Please contact us at: wade@chem.washington.edu. We apologize if your name is missing or misspelled.

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MINH-AN NGUYEN

The President's Medal is the highest honor conferred on a graduating UW senior. The medal is awarded on the basis of overall academic record. This year, the recipient is Minh-An Nguyen. She majored in biochemistry and chemistry and has been a Mary Gates Leadership Scholar and a Mary Gates Research Scholar. Minh-An was honored as a Howard Hughes Medical Institute Intern in 2005–2006 and was a recipient of the Hyp Dauben award for outstanding undergraduate student in the Honors organic chemistry sequence in 2005. Nguyen is currently attending the UW Dental School.

Editor's Notes

Corrections & Additions—*ChemLetter*, Spring 2007

Assistant Professor Xiaosong Li's name was misspelled.

Former UW Professor Wes Borden was a contributor on the original Phase I grant written for CATSB and one of the 16 PI's on the current and larger, CENTC proposal. Professor Borden is currently at the University of North Texas in Denton.



SEAN HUGHES

The Dean's Medal is presented to four undergraduate students each year, from each of the Arts and Science College divisions, and it is awarded based on grade point average and faculty recommendations. Sean Hughes was awarded the medal in the Humanities, yet he's also earned degrees in neurobiology and biochemistry. While a student, Hughes tutored, wrote short stories, and still managed to work in a faculty research lab.

Renewed Center Funding

CATSB/CENTC

As a follow-up to our story in the previous issue of *ChemLetter*, spring 2007, "Can't We All Just Break These Bonds?"

The CATSB Center (Center for Activation and Transformation of Strong Bonds) is now renamed CENTC (Center for Enabling New Technologies through Catalysis). The CATSB Center was started with a three-year, \$1.5-million Phase I grant from the National Science Foundation (NSF). The center, now CENTC, won Phase II funding from the NSF for a five year \$15 million grant. The center will continue its research in chemical bonds under the leadership of Professor Karen Goldberg.

For more information:
<http://depts.washington.edu/centc>

SCIENCE & TECHNOLOGY CENTER (STC)/CMDITR

The Center for Materials and Devices for Information Technology Research is focused on creating flexible photonic and electronic materials and devices based on molecular (organic) building blocks, in order to serve the information technology, energy, transportation, and defense sectors. With the leadership of Larry Dalton, the center was recently awarded a five-year \$18 million grant from the National Science Foundation. Phase II funding is mainly for nanophotonics research.

For more information:
<http://www.stc-mditr.org/index.cfm> ■

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who recently received the prestigious Glenn T. Seaborg Actinides Separation Award. Lee has made many outstanding contributions to this field during his 60-year career, and an interview with Lee is included in this issue.

My letter would not be complete without commenting on our extraordinary educational programs. This past year, nearly 260 undergraduate students earned a bachelor's degree in chemistry or biochemistry. Forty students earned their Chemistry doctoral degrees with us, placing our program among the top ten in the nation by this measure. Also, the grants and contracts won by our faculty fuel the strength of our graduate and postdoctoral research programs.

There has been an important change in our academic governance. Professor Michael Heinekey has served for more than a decade as an Associate Chair, first of the undergraduate and subsequently of the graduate program. Professor Heinekey stepped down from this position in October and we thank him for his long service. I am pleased to announce that Professor Robert Synovec, an analytical chemist and the faculty director for the Center for Process Analytical Chemistry, has accepted the position of Associate Chair for Graduate Education.

We do our work with a state- and tuition-provided budget that is modest by national standards. Our alumni and friends have been unusually generous and we depend heavily upon your gifts for support of all of our activities. Please remember us and the role we have played in your life as you consider your year-end giving. Please accept our thanks.

With very best wishes,



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