Chemical Engineering

Fall 2008

Catalyst

UNIVERSITY OF WASHINGTON
COLLEGE of ENGINEERING
A Community of Innovators

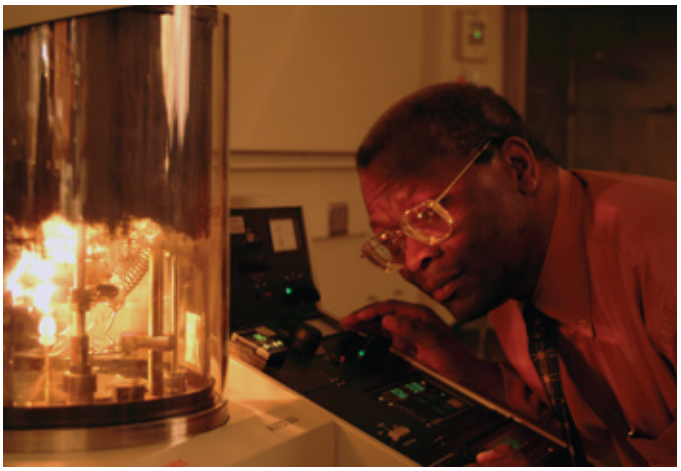
Nanowires boost solar cell efficiency

The sun is an almost limitless source of clean energy. As gas prices continue to climb, scientists are exploring new ways to make solar energy a cost-effective alternative to petroleum-based fuel.

A team of researchers led by Samson A. Jenekhe, UW professor of chemical engineering and chemistry, recently boosted the efficiency of organic solar cells by using self-assembled polymer nanowires that convert sunlight into electrical energy.

Jenekhe's research team is expanding the scope of promising materials being explored for use in organic solar cells made from semiconducting polymers. These polymers are less expensive to produce and more flexible than the silicon used in today's solar rooftop panels and calculators, but still far less efficient.

"Solar power from the sun is the most abundant source of clean energy on earth," Jenekhe said. "The main challenge in fully exploiting this resource is in developing new technologies to significantly lower the cost of solar power conversion devices." *See NANOWIRES, page 5*



Samson Jenekhe, professor of chemical engineering, watches as a thermal evaporator completes the final steps in the fabrication of organic solar cells made with self-assembled polymer nanowires.

NUE UNIQUE puts scanning probe microscopes in hands of undergraduates

Jason Killgore (left), teaching assistant, helps undergraduates Marissa Hackett (center) and Kristine Smith (right) examine data gathered using scanning probe microscopes.

Since the introduction of scanning probe microscopy in 1981, the technique has dazzled scientists around the world by providing new ways to view objects at the nanoscale level.

A group of 16 undergraduates from UW and other universities nationwide had opportunities in June to use a variety of scanning probe microscopes as part of NUE UNIQUE's "Nanoscience on the Tip," a five-day series of workshops that introduced participants to one of the most important new tools in science.

Now in its second year, NUE UNIQUE (Using Nanoscience Instrumentation for Quality Undergraduate Education) is a collaborative effort between educational institutions and equipment manufacturers that puts scanning probe microscopes in the hands of undergraduates.

Manufacturers lease the cutting-edge equipment to participating educational institutions for use in hands-on workshops at UW, giving students access to the same tools available in leading research laboratories.

"By involving instrument manufacturers and by inviting students to participate from all over the country, NUE UNIQUE is working on a new paradigm of leasing the equipment instead of purchasing it," said René Overney, UW professor of chemical engineering and program director.

Overney said the goal of the program, now in its second year, is to develop a "nationally replicable model of a sustainable and up-to-date undergraduate teaching laboratory of scanning probe methods applied to nanosciences."

See NUE UNIQUE, page 4

In this issue

Message from the Chair

Eric M. Stuve

AIChE Reception

UW Chemical Engineering invites alumni to a reception from 7 p.m. to 9 p.m. Tuesday, Nov. 18 in Philadelphia, Penn. The reception is held in conjunction with the national meeting of the American Institute of Chemical Engineers. For more information and venue details, e-mail dept@cheme.washington.edu.

What does the UW Chemical Engineering graduating class of 2014 need to know? This is the central question of our department's goal to update our curriculum for the 21st century. If the wide variety of topics covered in this issue of *Catalyst* is any indication, we have a lot of work to do to prepare our undergraduates for the diverse careers that may await them. The science they need to know is happening now.

With the help of our Advisory Board, faculty are beginning the process of curriculum reform. This is not a task to be taken lightly. Planning continues to challenge us, but our Advisory Board's business expertise helps us through the process. Follow the curriculum reform online at http://faculty.washington.edu/stuve/Curric%20Web/index.htm.

Samson Jenekhe's research on self-assembled polymer nanowires in solar cells is a clear example of the focus of our new curriculum, which emphasizes nanoscale phenomena and molecular engineering. Jenekhe's work expands the scope of materials being explored for use in solar cells. This addresses a key question that our undergraduates will face in the next century. Where will we get our energy?

Talking about nanoscience in the classroom is one thing. How do we give our undergraduates the tools they need to study emerging topics in a hands-on way? NUE UNIQUE, a collaborative effort between local educational institutions and scientific equipment manufacturers, is a step in the right direction. This annual series of workshops coordinated by René Overney puts scanning probe microscopes in the hands of undergraduates, enabling them to view and manipulate objects at the nanoscale level.

The new curriculum also will integrate concepts from biology. We are fortunate to have Hong Shen, who won a CAREER Award from the National Science Foundation for her research on using polymer-coated biominerals to target certain areas of the body. Ludmila Chistoserdova used her chemical engineering background to obtain a complete genome sequence for a previously unknown organism in Lake Washington.

Our department mourns the loss of Morton David, a former UW professor of chemical engineering who passed away in July at age 87. David, who served in the U.S. Navy and worked as a research assistant on the Manhattan Project, taught at UW from 1953 to 1977. He worked on early projects in solar energy and consulted in areas such as ion exchange, heat transfer, mass transfer and applied economics.

We hope you enjoy this issue of *Catalyst*. Look for the next issue in winter of 2009.

National Cancer Institute features Shaoyi Jiang's work

The National Cancer Institute's Alliance for Nanotechnology in Cancer featured the work of Shaoyi Jiang and his research group in the "Nanotech News" section of their Web site in April 2008. Jiang's group is researching anti-biofouling coatings that may have applications in medicine and more. Jiang is a UW professor of chemical engineering and bioengineering.

Hong Shen receives WTC grant for biomedical research

Washington Technology Center (WTC) awarded $30,000 in July to Hong Shen, UW assistant professor of chemical engineering, and EKOS Corporation, a Bothell-based medical device company, for a project that aims to improve the company's proprietary catheter-based drug-delivery system. The project was one of seven in Washington to receive funding as part of WTC's Research and Technology Development program.

Undergrad Danny Kress takes first in AIChE regionals

Seniors Danny Kress, Álvaro Presenda and Marc Yamamoto competed in the American Institute of Chemical Engineers' (AIChE) Pacific Northwest Regional Student Research Paper Competition April 25-27 at Washington State University in Pullman, Wash. Kress took first place with his paper titled "Improvement of Fiber-Reinforced Composites" and will compete in AIChE's national paper competition in November. Undergraduate students from UW Chemical Engineering have won the regional competition every year since 2006.

Anya Yermakova

UW ChemE professors mentor Amgen Scholars

UW Chemical Engineering hosted three undergraduates from other universities who were part of a 28-student group that visited UW this summer as part of the national Amgen Scholars Program. Anya Yermakova worked in Professor Danilo Pozzo's lab. Alyssa Sheih and Wallace Thompson worked in Professor Hong Shen's lab.

Yermakova worked with Pozzo to develop a microfluidic device designed to accurately detect the level of fibrinogen in a patient's plasma. "Professor Pozzo has so many ideas and so much enthusiasm that it inevitably transferred to me in my work," Yermakova said.

Undergrad Sarah Koser co-authors conference paper

Sarah Lynn Koser, a senior at UW majoring in chemical engineering, co-authored a paper that will be presented at the Water Environment Federation Technical Exhibition and Conference (WEFTEC) Oct. 18-22 in Chicago, Illin. Koser helped write the paper, titled "Biologic degradation of triclosan at micro-molar concentrations by Ralstonia spp. SK-1," with Heidi Gough, a UW research associate in civil and environmental engineering, and two others. Koser also received the Dean's Undergraduate Research Award for her work.

Cataloguing invisible life: Microbe genome emerges from lake sediment

When entrepreneurial geneticist Craig Venter sailed around the world on his yacht sequencing samples of seawater, it was an ambitious project to use genetics to understand invisible ecological communities. But his scientific legacy was disappointing—a jumble of mystery DNA fragments belonging to thousands of unknown organisms.

Now a team led by Ludmila Chistoserdova, UW research scientist in chemical engineering, has studied lake mud containing microbial communities even more complex than those in seawater. The team homed in on bacteria that perform the ecological task of eating methane. The study, published Aug. 17 in the journal *Nature Biotechnology,* shows a way to sequence unidentified life.

"This work demonstrates that we can get a complete genome for a totally unknown organism," said lead author Chistoserdova. "We extracted a complete genome from a very complex community, and this is something novel."

Only one percent of microbes survive in the laboratory, Chistoserdova said, and the remaining 99 percent are undiscovered. Genetics can bypass the laboratory to help reveal microscopic communities, but most genetic tools use short stretches of known genetic code. Researchers look for these short stretches and copy, or amplify, them from the environment.

"You can only use amplification when you know what you're trying to get. And that's the problem," Chistoserdova said. "When you want to discover something unknown, amplification is a very deficient technique because you keep discovering the things you already know. So how can you discover the unknown?"

The researchers targeted a particular ecological function, in this case eating single-carbon compounds such as methane. First they collected samples of mud from the bottom of Lake Washington, a typical freshwater lake of moderate temperature and average levels of compounds such as methane, produced by decomposing organisms, in the sediment. Then they mixed the mud with five different samples of food labeled with carbon-13, which is a heavier isotope of carbon.

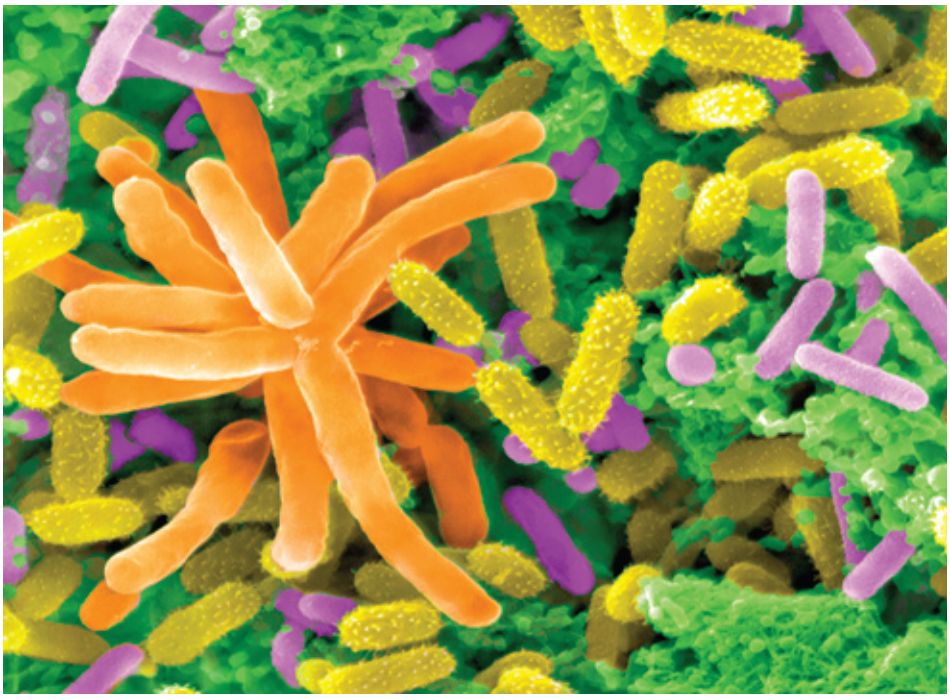


Photo by Dennis Kunkel, color enhancement by Ekaterina Latypova

Shown above are microorganisms from a mud sample collected in Lake Washington. The purple and orange organisms are relatives of Methylotenera mobilis*, a bacteria whose complete DNA sequence is now published following a study by Ludmila Chistoserdova and her research team.*

Over time, organisms that ate the lab food incorporated the heavy carbon into their cells and DNA. For the five different single-carbon food sources, the scientists then separated the DNA by weight, knowing that the heavier pieces must belong to organisms that ate the lab-catered food.

Chistoserdova estimates the original mud sample contained about 5,000 different microbes, but the five batches of enriched DNA each contained only a dozen or so organisms. Researchers then were able to piece together carbon-13 DNA fragments to create one entire genome for *Methylotenera mobilis*, a microbe that eats methylamine, a form of ammonia (This microbe was already known, though the team did not use that knowledge to create the sequence.).

They also produced a partial genome for *Methylobacter tundripaludum*, a methane-eating microbe that so far resists cultivation in the lab.

Discovering an organism's entire genetic sequence has many uses. For example, the genetic code may produce clues for growing the microbe in the lab, which would allow scientists to study it and perhaps harness it for practical applications. Other research groups could look for the DNA in the environment as a telltale sign that the same microbe is present elsewhere. And knowing the identity of the most ecologically important organisms would help understand ecological cycles and monitor microbial population shifts, for instance due to climate change.

Chistoserdova's team looked at methylotrophs, organisms that eat single-carbon compounds. Methane in the atmosphere, generated by decomposing plants and animals, is a greenhouse gas 25 times more potent than carbon dioxide.

The project was funded by the National Science Foundation and the Department of Energy. For more information, visit http://depts.washington.edu/microobs.

UWEB transitions into the 21st century

Buddy Ratner

University of Washington Engineered Biomaterials (UWEB) launched in 1996 as a National Science Foundation (NSF) Engineering Research Center. UWEB focused on the biomaterials component of the medical device industry. Medical devices are estimated to be a $100 billion or more endeavor. Though devices manufactured by the medical industry save lives and improve the quality of life for millions, significant issues impede device performance and increase costs to the healthcare system and the patient. These issues include blood clotting, infection, poor healing, fouling, mineralization, degradation and scarring. UWEB approached these compelling problems through collaborative, interdisciplinary teams.

UWEB addressed issues confronting biomaterials and medical devices with an eye toward the needs of patients and the industry. UWEB revolutionized implant healing, developed new strategies to address ectopic calcification, evolved new fouling-resistant surfaces, proposed new types of blood compatible surfaces, invented approaches to reduce infection on biomaterials and demonstrated new drug delivery strategies. Also, UWEB expanded its scope to include tissue engineering and addressed some of the hard problems such as angiogenesis and cell phenotype control. UWEB innovations led to at least six spin-off companies. Finally, a generation of students was trained in understanding modern biomaterials and also how industry works.

UWEB-21 will take the UWEB foundation and expand it to the next level—a program to address needs for 21st century biomaterials. UWEB laboratories and scientists will partner with UWEB-21 Consortium companies to provide analytical services, collaborate on research and device development, pursue funding, review IP licensing opportunities and assist with recruitment and training. Students will have a variety of opportunities in training, collaboration, research and employment.

Specific areas where UWEB-21 will focus include healing, integration and biocompatibility; blood compatibility; biofilms and device centered infection; calcification; surface modification; surface analysis; tissue engineering (heart, skin, esophagus, bladder, cartilage, bone, cornea); non-fouling surfaces; biomolecule immobilization; patterning and porosity; new polymers and biomaterials; controlled release/drug delivery; and cell and molecular biology.

For details on UWEB-21, contact Buddy Ratner, UWEB director and UW professor of chemical engineering and bioengineering, at ratner@uweb.engr.washington.edu.

NUE UNIQUE *(continued from page 1)*

"Engineering has shifted in many areas away from large scale 'bulk' processes to much more sophisticated and refined processes that involve interfaces and small dimensions," Overney said. "It is imperative to put undergraduates in direct contact with molecular engineering principles and nanotechnology."

Overney developed the program with David Ginger, UW assistant professor of chemistry, and Mehmet Sarikaya, UW professor of materials science and engineering. Sarikaya directs UW's Genetically Engineered Materials Science and Engineering Center (GEMSEC).

Four laboratory modules introduced the students to topics such as surface interactions, capillary forces, thermal transition, electronic properties, reaction kinetics and peptide binding on solid substrates. The students worked in groups of four, each guided by teaching assistants from UW's Chemical Engineering, Materials Science and Engineering and Chemistry departments.

Jason Killgore, a UW doctoral student in chemical engineering who worked as a teaching assistant, said the students quickly learned how to use the advanced microscopes. "Some of the delicate, hands-on tasks like changing probe tips were challenging," Killgore said. "However, the familiar Windows-based interface made instrument operation very intuitive."

> ***"It is imperative to put undergraduates in direct contact with molecular engineering principles and nanotechnology."***
>
> ~ René Overney

Marissa Hackett, a UW junior studying bioengineering, said she picked up the basics fairly easily. "The only difficult thing about the microscopes was how precise you had to be to get them to function properly," Hackett said.

Kristine Smith, a junior from Whitman College, might not have had the chance to use such specialized tools at her school. "It was great to be able to use the classroom version of equipment that is used in booming research fields today," Smith said.

The National Science Foundation (NSF) helped fund the annual workshop, now in its second year. Partners included GEMSEC, North Seattle Community College and equipment manufacturers Nanosurf AG and nanoScience Instruments.

NSF's direct support for NUE UNIQUE will end next year, so Overney and his collaborators are looking into models on how to finance the program in the future. He said other instrument manufacturers are interested in participating next year.

While seeking additional sources of support, GEMSEC will provide the funding needed to continue the program in the near future. Plans are in place to expand the program internationally.

When University of Alabama student Daniel Sweat returned from NUE UNIQUE this summer and shared the knowledge he gained with one of his professors, the professor e-mailed Overney the following message: "I am impressed with your program and appreciative of your instruction. It is clear that Daniel learned a lot, and that the workshop broadened his horizon."

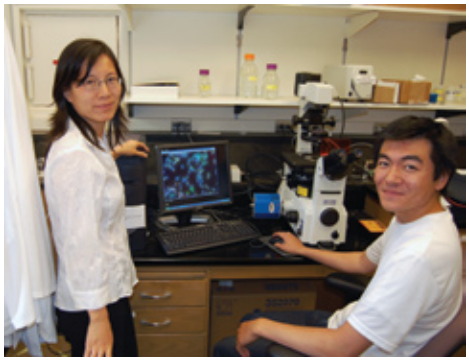
Hong Shen wins NSF CAREER Award for research on nanomaterials in medicine

Hong Shen, UW assistant professor of chemical engineering, won a five-year, $400,000 CAREER Award from the National Science Foundation (NSF) to support her research on using engineered nanomaterials to fight cancers, infections and autoimmune diseases.

The NSF CAREER Award supports the early career-development activities of teacher-scholars who most effectively integrate research and education within the context of the mission of their organization.

Shen's research group is developing polymer-coated biominerals to monitor and control activities in the endocytosis pathway, the part of a cell that serves as a communication hub and gateway to the outside world.

Biominerals, such as bone, are sensitive to their environment. Shen's group plans to "tune" these biominerals to respond to their surroundings in helpful ways. Polymer coatings can be applied to the biominerals to make them target certain cells or tissues.



Hong Shen (left), UW assistant professor of chemical engineering, and Kenny K. Tran (right), doctoral student, examine the effects of nanomaterials on cells.

"Our approach bridges engineering and biology," Shen said. "We are taking engineering's focus on design and quantitative analysis and applying it to biological processes, where answers sometimes aren't so clear," she said.

The award (abstract #0748285) supports Shen's research project, titled "Microenvironment pH controllers: regulating the endocytosis pathway."

In addition to supporting her research, Shen will use the award to foster an interdisciplinary environment for undergraduate and graduate students in UW Chemical Engineering.

"My educational goals are to enhance students' flexibility and communication skills in an interdisciplinary environment, and to attract and retain students in our program," Shen said.

"We cannot imagine a day when chemical engineers lack the skills to design processes and products vital for our survival," Shen said. "However, we also cannot afford to leave students unable and unprepared to effectively communicate with others outside their field."

Shen also plans to develop two classes. "Biology for Engineers," an existing class, would be updated and made a required course as part of the new curriculum. "Biomolecular Engineering and Design," a new class, could be used as an elective. She said she also plans to integrate relevant topics from biology into other chemical engineering classes.

NANOWIRES

(continued from page 1)

"Because current organic solar cells lag behind silicon photovoltaics in power conversion efficiency," said Jenekhe, "a major focus of researchers is to improve the efficiency of organic photovoltaics to close this gap in performance."

Researchers prepared the polymer nanowires by solution-phase self-assembly, slowly cooling a hot solution to room temperature in a dark environment.

Although polymer solar cells have been made and studied for a long time, Jenekhe said using self-assembly "brings a new dimension with enormous potential to transform the design, fabrication, and performance of solar cells."

The main challenge that scientists face is how to precisely control the size, shape, and make-up of the component materials used to fabricate polymer solar cells. "Self-assembly automatically does the process and quality control in bringing materials together for constructing a solar cell," Jenekhe said.

The self-assembled nanowires perform multiple functions. First, they absorb the photons from sunlight. Second, their large surface area enables more efficient conversion of the absorbed photons from sunlight into charges or electrical current. Third, they serve as the conduit for moving the charges produced to external collecting electrodes.

> ***"Self-assembly automatically does the process and quality control in bringing materials together for constructing a solar cell."***
>
> ~ Samson Jenekhe

Jenekhe's team used the material poly(3-butylthiophene) to build the polymer solar cells, which are pushing beyond the 3.5-percent power conversion efficiency as their work continues.

This rate rivals the power conversion efficiency of poly(3-hexylthiophene), another polymer material that has been the focus of most research effort on organic solar cells to date.

"One of the attractive aspects of the nanowire approach is that we are not limited to using one specific polymer," Jenekhe said. "We have already constructed solar cells from nanowires of other polymers that are also more efficient than poly(3-hexylthiophene)."

Jenekhe's research team included Hao Xin, chemical engineering postdoctoral research associate, and chemical engineering graduate students Guoqiang Ren and Felix Sunjoo Kim. Their work was featured in the April 23, 2008 issue of the Journal of the American Chemical Society (volume 130, page 5424).

The research was made possible with support from the U.S. Department of Energy's Office of Basic Energy Sciences, the National Science Foundation and the Air Force Office of Scientific Research.

Bill Pope

Bill Pope (MS ’49, PhD ’58) still heeds three words of wisdom given to him by John Sundlen, the department’s former master shop mechanic. “Nothing is simple,” said Pope, who just turned 86. “This has turned out to be very true.”

Fast forward from durable bits of advice to drill bits. In 1992, one of Pope’s U.S. Synthetic customers reported that a drill bit equipped with one of his company’s synthetic diamond cutters broke a world record by grinding through more than 240,000 feet of rock without needing to be replaced.

This feat inspired Pope to think of the medical applications of synthetic diamonds, which can be used to make bearings for artificial knees, hips and more. Pope founded Dimicron in 1996 for this reason. “Think of lifetime prosthetic joints,” he said.

Pope was born and raised in Salt Lake City, Utah in 1922. He conducted experiments in his basement until an explosion rocked the house and his parents asked him to stop.

When Pope was 20 years old, his Army ROTC group at the University of Utah was called into active duty during World War II. After basic training, he married Margaret, his wife of 65 years, and served for three years as an officer in the Infantry and Engineering Corps in the United States, the Philippines and Japan.

After Pope’s military service, he returned to the University of Utah and completed his bachelor’s degree in 1947. He received a fellowship to UW and completed his master’s degree in 1949.

Pope left UW before completing his PhD to work for American Oil Company. Despite the valuable industry experience he gained, his advice to graduate students is to “never, ever, if possible, leave campus before completing your thesis.”

Pope returned to UW and completed his PhD in 1958, then started as a professor at Brigham Young University (BYU). In fall of 1959, he took a three-year leave to organize a graduate program in chemical engineering at Abadan Institute of Technology in Iran.

Pope returned to BYU in 1962 and served for four years as department chair. In 1966 with two other professors, he founded Megadiamond, a supplier of synthetic diamond grit. He retired from BYU in 1978, the same year his son Louis founded U.S. Synthetic. Bill joined the company, which became the leading international supplier of synthetic diamonds for use in gas and oil drill bits.

Pope has one son, three daughters and 28 grandchildren. He is the winner of the Utah Governor’s Medal for Science and Technology, Business Man of the Year by the Provo and Orem Chamber of Commerce, and many other awards.

More than 50 years after Pope shined as UW student, he still puts in a full day of work at Dimicron or U.S Synthetic. His colleagues and customers might be inclined to give him three more words: “diamonds are forever.”

Sung T. Chung treats former PhD advisor John Berg to grand tour of Korea

Sung T. Chung (PhD ‘71, Distinguished Alumnus ’02) and his wife, Young Sook treated John Berg, Chung’s former PhD advisor, to a weeklong tour of Korea in October 2007.

The group visited the following areas in and around Seoul: the Seoul Tower (highest point in the city) and ancient ramparts, the South Gate, the Presidential Blue House, Insadong Street (the arts and crafts district), Cheonggyecheon Stream (a linear park running some four miles through the city), a look into the DMZ, traditional dinner and entertainment at the Korea House, and an early 15th-century minister’s residence of the Joseon Dynasty, the last monarch, 1392-1910.

They also took the bullet train to Gyeongju, a national park and archeological site near the center of the country and the ancient capital of the Shilla Dynasty, 57 BC-932 AD. They visited ancient burial sites, museums and a series of thousand-year-old Buddhist temples. Gyeongju was also host to a World Culture Expo at the time, which they attended. The trip included a two-day visit to the lush resort island of Jeju,

John Berg (center) with Young Sook (left) and Sung T. Chung (right) near the entrance to Gyeongju National Park in Korea.

where they hiked among dormant volcanic craters, in a subtropical forest and along beaches. They visited world-famous cliffs of basalt columns, a magnificent Buddhist temple and many other sights.

The tour concluded with a moving visit to the site of the pivotal Incheon landing during the Korean War, with its Memorial Hall and Museum, and the adjacent Freedom Park, celebrating Korean-American friendship.

“This was my first visit to Korea, and it was a wonderful experience, beyond my dreams,” Berg said. “Not only was it an unbelievable opportunity to see so many of the important sights in the country, but also to experience the warmth of the Korean people.”

“Most important to me was the fact I could spend this time with my dear friends Sung and Young Sook,” Berg said. “It’s difficult to find the right words to express my gratitude.”

Chung was one of Berg’s first PhD students. He went on to become a leading industrialist in Korea, a faculty member of the Korea Advanced Institute of Science and a Full Member of the National Academy of Engineering of Korea. He is presently a professor of chemical engineering at Inha University and is a member of the board of directors of the S-Oil Corporation, listed in *Fortune’s* Global Top 500 in 2007.

Chung served for six years as the president of the UW Korean Alumni Association and recently co-spearheaded an effort to raise $3 million in support of the UW’s Korea Studies Program.

Alumni News

Andrew Benedek (PhD '70) accepted the first Lee Kuan Yew Water Prize in June 2008 from the government of Singapore for his groundbreaking work on applying membrane technology to the water treatment process.

Jeet Bindra (MS '70) and **Gary Leal** (BS '65) were selected to represent UW as part of the American Institute of Chemical Engineers (AIChE) centennial celebration. AIChE is preparing a Web site celebrating the organization's 100-year anniversary. The site includes biographies of notable alumni from universities nationwide. Bindra is president of global manufacturing for Chevron. Leal is a professor of chemical engineering at the University of California, Santa Barbara. Read their biographies online at http://www.aiche.org.

Gilbert Drowley (BS '42) passed away in August 2008.

Arthur H. Every (BS '48, MS '49) passed away in August 2006.

Philip Harding (PhD, '97) started in September 2007 as the Linus Pauling Chair in the School of Chemical, Biological and Environmental Engineering at Oregon State University. The position is an endowed, five-year appointment intended to bring an individual with broad industrial experience into the department with the objective of improving the workforce readiness of graduating seniors.

Jake Koerner (BS '04) was accepted to Columbia University's full-time MBA program and began classes in New York in fall 2008. Previously, Koerner worked at Lawrence Livermore National Laboratory and resided in San Francisco, Calif.

Dennis Lam (BS '01) passed away in December 2006 at age 28 at his home surrounded by loving friends and family. Lam is survived by parents, Yue Fong Lam and Joseph Lam; his brother, Jeffrey Lam; grandparents, Mr. and Ms. Niu On Ng; and many uncles, aunts, cousins, and friends.

Charles Matthaei (BS '43), chairman of Roman Meal Company, was inducted into the American Society of Baking Hall of Fame in March 2008. Matthaei joins a long list of baking pioneers, including the inventor of the world's first bread-slicing machine.

Roderick B. Nolte (BS '45) passed away in April 2006.

Mike Oddo (BS '87) works for WasteMinCo, a small Seattle environmental consulting firm. The firm helps large organizations prevent pollution at the source—saving them money and increasing their sustainability.

Thomas B. Owen (BS '40, Distinguished Alumnus '96) passed away in October 2006 at age 86. Owen was an admiral in the Navy and served as chief of naval research at the Naval Research Lab in Washington. He graduated cum laude in chemical engineering at UW. He received the Silver Star during World War II, as well as the Distinguished Service Medal and the Bronze Star. He was assistant director of the National Science Foundation and associate dean for graduate affairs and research at American University.

Joseph H. Rantz (BS '39) a member of the 1936 UW crew team that won the Olympic gold medal, passed away in September 2007. Rantz never lost a race as a Husky. His team came from behind to win the gold at the Olympics, after nobody in the crew heard the starting gun and Rantz got them going. He worked for Boeing for 35 years, and after retirement went into business for himself making cedar products. The family plans to donate Rantz's rowing memorabilia to UW.

Susie Stenkamp (PhD '99) and **Richard Zheng** (PhD '00) won a 2007 R&D 100 Award from R&D Magazine for developing a compact device that manages heat and recovers water in fuel systems.

George Charles Szego, (MS '50, PhD '56), who founded pioneering solar technology company ITC/Solar and persuaded former President Jimmy Carter to install solar collectors on the roof of the White House, passed away in April 2008 at age 88.

John A. Tershin (BS '27) passed away in April 2007 at the age of 103. Tershin worked as a chemical engineer for Boeing for 40 years and retired in 1969. He generously left a bequest to the department to establish the Tershin Endowed Chemical Engineering Fellowship.

Message from Charles Sleicher, UW professor emeritus of chemical engineering and past chair

I am alive and well, though still trying to regain strength after a knee "revision," the medical term for the replacement of a replacement. My new right knee is much better than the old one, which had just about completely worn out. I now have more flexion than I have had for over 30 years, but I am way behind in strength and endurance.

My interest in travel and outdoor photography continues, though at a slower rate. In June I went to British Columbia to photograph birds and got some good photos of loons and of loons with small chicks. One of them appeared on the July 2008 cover of *Ranger Rick*, a nature magazine for children. Last January my wife and I went to Merida, Mexico, with friends and I took lots of photographs there, including many images of nearby Mayan ruins.

In April my wife, Jan, and I had a splendid dinner with former graduate student Don Bernhardt, now an anesthesiologist practicing in Bellevue. He had invited three other locals who were his contemporaries in graduate school—Tim Larson, Robert Ruggeri and Rick Smith. We had a wonderful evening, thanks in part to the splendid cooking of Sue and Don. My contribution was a loaf of bread, which after years of trying, I have finally mastered baking thanks to a new technique. (Google "no-knead bread" for the basics.)

I am looking forward to an interesting new year for UW Chemical Engineering and an improved Husky football team.

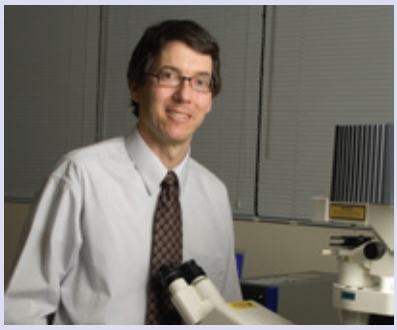
Join us at the Engineering Lecture Series

Beyond Oil: Powering the Future

7 p.m. Thursday, Oct. 30, Kane Hall

Miles P. Drake, Senior Vice President of Research and Development, Chief Technology Officer, Weyerhaeuser

Daniel Schwartz, Boeing-Sutter Professor, Chemical Engineering and Associate Dean of New Initiatives, College of Engineering



Daniel Schwartz

Transportation consumes 70 percent of the oil used in our country. As worldwide demand for oil soars, supplies tighten, and prices skyrocket, how will we keep transportation moving? Can we develop efficient, environmentally-sound, and economic alternative energy sources? A more diversified energy future has myriad implications for how we live, for infrastructure investments, and our overall ability to address the challenge of a sustainable and secure energy economy. Come hear the discussion. Register online at uwalum.com or by calling (206) 543-0540.

Bruce Finlayson wins CACHE Award

Bruce Finlayson

Bruce Finlayson, UW professor emeritus of chemical engineering, won the 2008 CACHE Award for Excellence in Computing in Chemical Engineering Education from the American Society of Engineering Education (ASEE).

The award, sponsored by the CACHE Corporation and given by ASEE's Chemical Engineering Division, honors significant contributions in the development of computer aids for chemical engineering education. ASEE presented the award to Finlayson in June at the annual conference in Pittsburgh.

Helping to solve problems—from reducing pollution caused by catalytic converters to designing medical sensors tiny enough to slip into a slot on a cell phone—has been Finlayson's focus during his 40 years at UW. Despite retiring in fall 2006, he continues to teach his popular elective course for undergraduates on chemical engineering computer methods.

Colleague Sam Jenekhe, UW professor of chemical engineering and chemistry, nominated Finlayson for the award. "Bruce not only pioneered computer methodologies for solving engineering problems but, equally important, he has through his courses here at UW, lectures around the world, and his books, taught generations of chemical engineers how to effectively use those computer tools," Jenekhe said.

Fall 2008 Leadership Seminar Series begins

The Fall 2008 Leadership Seminar Series provides a forum for industrial, academic and government leaders to share their expertise and insights with students. All events are 2:30 p.m. Wednesdays in the Physics Astronomy Building (PAA 114). Everyone is welcome. For more information, visit cheme.washington.edu.

Sept. 24: Dale E. Brooks (BS '60), retired, American Institute of Chemical Engineers (AIChE)
Oct.1: Jud Virden (PhD '91), director of energy programs at the Energy and Environmental Directorate, Pacific Northwest National Laboratory (PNNL)
Oct. 8: Rick D. Smith (PhD '78), retired, Rocket Research Corp.
Oct. 15: Brian MacArthur (PhD '77), vice president of Chemithon Enterprises, Inc.
Oct. 22: Winslow Buxton (BS '61), retired, Pentair, Inc.
Oct. 29: Rick Hyman (BS '78), NVIDIA
Nov. 5: Jorge Sunkel (BS '90, PhD '98), senior engineer, Procter & Gamble
Nov. 12: Dan T. Dahlgren (BS '82), vice president, The Clorox Company
Nov. 19: Dorothy Bowers, (BS '69), retired, Merck Company Foundation
Dec. 3: To be determined.

Web site: www.cheme.washington.edu / Reception: (206) 543-2250

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