The Gift of Education

ALUMNI, FACULTY AND FRIENDS ENRICH DEPARTMENT, RESEARCH

This year the Department of Chemical and Biomolecular Engineering at the University of Maryland has benefited from a variety of generous gifts from its alumni, faculty and friends. Some of these gifts were years in planning. Some were in honor of alumni no longer with us. Others were inspired by fond memories. All of these gifts are not only deeply appreciated, but will enhance the educational and research experiences of students and faculty for years to come. These are their stories.

RAGHAVAN AWARDED FIRST SUNG PROFESSORSHIP

In 2006, we told you about T.K. “Patrick” (M.S. ’69 and Ph.D. ’72, chemical engineering) and Marguerite (B.S. ’70, mathematics) Sung, who established two endowed professorships in chemical engineering with a $1.5 million gift to the Clark School. We are pleased to announce that Associate Professor Srinivasa Raghavan has been named the first Patrick and Marguerite Sung Professor in Chemical Engineering.

The proceeds of the endowment will be used to support the research of Raghavan’s Complex Fluids and Nanomaterials Group, which studies the spontaneous self-assembly of molecules and nanoparticles at the nano- and micro scales. The group uses this behavior in the design of new types of “smart” fluids and materials that could be useful in consumer products, oil recovery, drug delivery, wound care, and nanotechnology.

The search to fill the second professorship, the Patrick and Marguerite Sung Distinguished Professorship in Chemical Engineering, designed to attract a leader in chemical engineering education and research, will begin in approximately five years.

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TIME FLIES WHEN YOU’RE HAVING FUN! I CAN’T BELIEVE I HAVE BEEN AT UMD ALMOST THREE YEARS!

In 2008, the department had its periodic External Review as mandated by the University System of Maryland. As part of this, we prepared a Self Study, lead by our Associate Chair and Undergraduate Program Director, Professor Kyu Yong Choi, and presented to four eminent chemical engineers from industry and academia during a special review visit. Their report reinforced my own belief that with hard work and additional resources, this department has great potential. We would like to thank all of the alumni who responded to the survey that contributed to our Self Study.

This brings me to my most important message for this year: Resources. Every department needs resources to be great. This is especially true in times of shrinking budgets, and it should come as no surprise that University’s has been adversely impacted. But there are some bright spots in our efforts to develop new sources of revenue. One is that our faculty is extremely busy writing proposals to federal agencies to take advantage of the American Recovery and Reinvestment Act.

Resources can also come in the form of contributions from alumni, faculty and friends of the department. In the past year, we have both received new gifts and seen the maturation of funds previously established for the benefit of our department and students. In this issue’s special feature story (cover; pp. 8-9) we’ll tell you about the many ways we have benefited from this generosity, and about our idea for a new study abroad scholarship.

If you have any questions, would like to learn how to help the department or just share some good news, please contact me! I would love to hear from you.

Joe

FIRST YEAR FOLLOW-UP

Last issue we introduced you to our three newest faculty members: assistant professors Jeffery Klauda, Ganesh Sriram, and Chunsheng Wang. This issue, we’d like to share some of their first-year accomplishments and activities with you.

Professor Klauda has established the Laboratory of Molecular & Thermodynamic Modeling. His research includes environmentally-benign hydrogen storage using gas hydrates; determining the complete transport cycle of sugars in the lactose permease cell membrane protein, which is important in understanding the molecular mechanisms used to transport antibiotics out of bacterial cells; and the development of computational tools used to determine the structure of realistic yeast membranes that will be used to study cholesterol transport in the human body. Klauda has taught sections of Statistics & Experimental Design and Chemical Engineering Thermodynamics. His undergraduate advisee, Joseph Lim, won both the best poster award at U.-Md.’s Bioscience Research & Technology and Review Day (Biochemistry/Biophysics Division—see p. 5) and a 2009 Howard Hughes Medical Institute Undergraduate Fellowship. Klauda tells us his favorite experiences have been setting up his lab, advising, and the enthusiasm and accomplishments of his student researchers.

Professor Sriram has established the Metabolic Engineering Laboratory. His research areas include metabolic engineering and systems biology. He is currently investigating carbon flow through networks of chemical reactions in complex cells such as plant cells, a project that has implications on improving plant-based food and biofuel production. Sriram interacts with the strong plant biology community on campus and is developing research collaborations with faculty members in that area. He has taught Chemical Engineering Analysis and Chemical Process Thermodynamics to ChBE sophomores, and has also been advising undergraduates. His best experiences have been working with his enthusiastic research group, setting up his laboratory, and the pride he takes in his group members’ accomplishments: Shilpa Nargund, one of his graduate students, won first place at ResearchFest; Yuting Zheng, another of his graduate students, is currently a Sengers Fellow (see p. 8); and Emily Lin, an undergraduate researcher, recently won the prestigious Summer Undergraduate Research Fellowship (SURF) award from the American Society of Plant Biologists (ASPB), and was previously awarded the Louis-Stokes Alliance for Minority Participation in Research (LSAMP).
Professor Wang has established the Advanced Li-Ion Battery and Fuel Cell Laboratory, where he has been working on a variety of research projects including a novel anion exchange membrane for alkaline fuel cells, novel electroanalytical tools for phase-transformation electrode materials, and a micro-direct methanol fuel cell with a nano-structured platinum catalyst using the tobacco mosaic virus. Some of these and other projects have been supported by the Army Research Office (ARO) and the Office of Naval Research. Wang has been managing the undergraduate Unit Operations Laboratory, where he also teaches the senior lab course, and has also run the department's graduate engineering seminar. In 2008 he organized a workshop titled “Soldier-Portable Power Systems: Status Review and Research Needs” for the ARO. Wang tells us his favorite experience has been the opportunity to collaborate for the ARO.

Greer was lauded for her active role in mentoring undergraduates in research, and constantly involving them in her own research group. Students have regularly noted her drive and enthusiasm, and colleagues have praised her teaching of chemistry to engineers.

She was also cited for her commitment to improving the campus climate for female students, whom for twenty years she has played a major role in attracting and retaining, beginning with her work for the President’s Committee on Undergraduate Women’s Education, which lead to the university becoming a national model of an environment conducive to the professional advancement of women.

Greer’s research program has earned her an international reputation for her work in the thermodynamics of fluids, fluid mixtures, and phase transitions (especially in polymer solutions); and, most recently, biopolymers. The impact of her publications led to her election as a Fellow of the American Association for the Advancement of Science and the American Physical Society. A dedication to ethics in science and engineering inspired her to become one of the first and few to create courses on the topic.

For more information about Dr. Greer’s accomplishments and career, visit our news archives at www.chbe.umd.edu/news/news_archives.php.

Distinguished University Professor Emeritus Jan Sengers (joint, Institute for Physical Science & Technology [IPST]) was selected as the recipient of the 2008 Office of International Programs Distinguished International Service Award. The award, which recognizes significant contributions to the development of international programs at the university, was presented to him at a ceremony by university president C.D. Mote, Jr. at a ceremony held in November.

Sengers is internationally recognized for both his research and contributions to the improvement of engineering education. In addition to his decades of experience as a professor, his education-related activities include a comprehensive comparison of physics and astronomy curricula in European countries to those in the U.S., resulting in a significant structural change in how science and engineering degrees are granted in a number of European nations. In 2000, along with wife Anneke, he established the Jan and Anneke Sengers Fellowship Fund to support doctoral students in ChBE (see p. 8).

Currently, Sengers’ activities include compiling and editing Applied Thermodynamics of Fluids, which will cover the measurement and correlation of thermodynamic and transport properties of substances. It will be published by the Royal Society of Chemistry in late 2009. Sengers also delivered the plenary scientific lecture titled “Nonequilibrium Phenomena in Fluids: A History of Surprises” at the 8th International Meeting on Thermodiffusion held in Bonn, Germany, as well as served on the conference’s scientific advisory board.

Associate Professor Sheryl Ehrman has been named the department’s Associate Chair and Graduate Program Director. Ehrman previously held the Graduate Program Director position from 2004-2006, and resumed her duties in 2008 following a sabbatical. Associate Professor Evangelos Zafiriou served in the position for the Department during the previous two years.

“I really enjoyed the different aspects of the position, including recruiting, advising new students, and being responsible for the smooth functioning of our graduate program,” Ehrman says of her prior experience. “I’m happy to be returning to it, and I look forward to working with the other members of the Graduate Studies Committee and with [Assistant Director of Undergraduate and Graduate Studies] Kathy Lopresti on continuing to improve the quality of our graduate program. I also look forward to meeting and working with the incoming students!”

The department would like to extend its thanks to Professor Zafiriou for his tenure as Graduate Program Director.
A research study conducted by Associate Professor Panos Dimitrakopoulos and his former advisee, alumnus Walter Dodson (Ph.D. ’08, bioengineering) that describes the behavior and deformation of capsules in high flow-rate environments has been published in Physical Review Letters, one of the world’s top physics journals. The paper, titled “Spindles, Cusps, and Bifurcation for Capsules in Stokes Flow,” presents the results of a computational investigation using a highly accurate numerical algorithm developed in Dimitrakopoulos’ Biofluid Dynamics Laboratory.

Capsules (membrane-enclosed fluid volumes) are commonly used in a variety of industrial and biomedical applications that require the controlled release of pharmaceuticals, aromas, flavors or other agents. As the capsules travel through flow environments, they deform significantly in response and may rupture in strong enough flow rates.

Avoiding the premature rupture or degradation of the agent-carrying capsules, which are subject to strong fluid flows in manufacturing or in the body, is an important part of maintaining safe, effective, and high-quality products. However, due to the complex interaction of fluid dynamics with membrane tensions, little is currently known about capsules’ deformation and dynamics in strong flows despite their wide use.

In order to accurately understand and describe the capsules’ behavior under various flow conditions, Dimitrakopoulos and Dodson used an advanced spectrally-accurate computational algorithm that they recently developed under a National Science Foundation grant.

The resulting study shows that strain-hardening capsules in strong extensional flows develop steady-state shapes whose edges form spindled (or concave) become cusped with increasing flow rate so that the capsules withstand the increased hydrodynamic forces. These findings complement the similar evolution for low-viscosity drops first identified by the famous experiments of G.I. Taylor in 1934, the results of which were further explained in the 1970s and 1980s and are still used in many applications today.

The findings also show that capsule dynamics are more complicated than previously thought. The spindled-to-cusped edge transition results from the appearance of compressive tensions near the capsule’s edges at high flow rates. By implementing different transient experiments, Dimitrakopoulos and Dodson also found that the highly non-linear nature of capsule dynamics results in a bifurcation in the steady-state shapes (existence of both spindled and cusped edges for a range of high flow rates), as a result of the different evolution of the membrane tensions.

“Our work provides physical insight on the extensional dynamics of capsules in strong flows or large deformations,” Dimitrakopoulos explains, “while our results can be used to predict not only membrane rupture, but also the location of the rupture for a specific membrane with a known lytic tension [the maximum value of tension a membrane can withstand before rupturing].

“Our study clearly demonstrates the importance of compressive tensions in capsule mechanical deformation that is applicable to both industrial and physiological processes. We hope it provides motivation for more experiments with capsules at high flow rates, especially experimental studies that could monitor the capsule from different viewing angles in order to capture the details of the complicated three-dimensional interfacial shapes we found.”

“Nonequilibrium, Metastable and Critical States” at the 15th International Conference on the Properties of Water and Steam (ICPWS), held in Berlin, Germany in September 2008. Also in attendance were two of Anisimov’s advisees, graduate students Daphne Fuentevilla, who delivered a talk titled “Thermodynamics of the critical behavior of supercooled water,” and Heather St. Pierre, who spoke on “Interfacial concentration profiles in aqueous systems near the critical point of steam.” (See related story, next page.)

Fuentevilla discussed work done in collaboration with Anisimov related to the relatively recent discovery of a possible second critical point of water under supercooled conditions. While this critical point cannot be seen directly, Fuentevilla is able to infer its location by applying a sophisticated theory of fluctuations, which in turn has produced, according to Sengers, “an elegant description of the anomalous behavior of compressibility, thermal-expansion coefficient and specific heat capacity of supercooled water.”

St. Pierre demonstrated how a new concept, developed with Anisimov and called “complete scaling”, makes it possible to determine concentration profiles in droplets of aqueous systems. Droplet formation occurs frequently in turbine engines, so a better understanding of their properties and behavior is extremely important.
FISHER NAMED JOHN AND MAUREEN HENDRICKS ENERGY RESEARCH FELLOW

Graduate student Aaron Fisher, advised by Fischell Department of Bioengineering professor Peter Kofinas, has been named a John and Maureen Hendricks Energy Research Fellow. Fisher’s fellowship will support research that he and Kofinas have proposed on nanostructured polymer electrolytes.

The goal of the research is to develop innovative flexible battery electrolytes based on room temperature ionic liquids (RTIL) incorporated into polymer matrices, resulting in a solid electrolyte. An advance in battery technology of this kind could result in batteries capable of conforming to the shape of the device that requires them. Device designers would no longer have to “design around” a particular battery, which currently limits the form their products take. Instead they could design a battery to fit the device, winding it into coils or processing it as a sheet. Batteries made with the new solid polymer electrolytes would also be safer for people and the environment, because unlike common batteries we currently use they would not contain corrosive liquids and gels.

The John and Maureen Hendricks Energy Research Fellowship program was established by the John and Maureen Hendricks Charitable Foundation to support the efforts of the University of Maryland Energy Research Center (UMERC), a multidisciplinary initiative that focuses on advancing the frontiers of energy science and technology, particularly forward-looking approaches to alternative energy generation and storage.

LIM WINS BEST POSTER AWARD

Junior ChBE major Joseph Lim won the Best Poster Award in the Biochemistry/Biophysics Division at the 2008 Bioscience Research & Technology and Review Day. Lim presented some of the research he conducted in the Laboratory of Molecular & Thermodynamic Modeling, directed by his advisor, Assistant Professor Jeffery Kluda.

Lim’s poster, titled “The Application of Molecular Dynamics Simulations to Sterols and Lipid Bilayers,” presented a study on how sterols, found in the fatty tissues of plants and animals—cholesterol is a well-known example—are distributed in cellular membranes of polyunsaturated lipids or fatty acids (PUFA).

It is generally believed cholesterol exists in—or pierces through—the outer leaflet (plasma cellular membrane) of both saturated lipids and PUFA in human and animal fatty tissue. Recent experiments, however, have shown that it may actually exist between the inner and outer leaflets of PUFA cells.

Lim used atomic-level simulations of cholesterol naturally manufactured in the body (vs. though dietary intake, which can be controlled with eating habits) in lipid membranes to determine whether this is the case. Understanding how cholesterol interacts with different lipid membranes is important, because if scientists have a clearer idea of how cholesterol gets into and builds up in places it shouldn’t, it would be easier to design drugs capable of inhibiting it.

STUDENT NAMED CHAIR OF A VT ADVISORY BOARD

Graduate student Stefanie Brady, advised by Associate Professor Nam Sun Wang, has been named Chair of Virginia Tech’s Department of Biological Systems Engineering’s (BSE) Advisory Board. Brady, a VT BSE alumna (B.S.’00) who has served on the board for the past 3 years, is one of 8 representatives from industry who meet twice annually to hear updates on the department’s progress and suggest ideas to help improve funding and enrollment. This year, as Chair, she will participate in the department’s ABET accreditation process.

Brady works full-time as a bioprocess engineer at Human Genome Sciences in Rockville, Md., while pursuing her M.S. She is currently writing her thesis and plans to graduate this spring. “It’s been challenging and has required a lot of time management!” she says of the experience, “But it was enjoyable to come to campus to take classes.”

Brady has observed some growing pains as biology’s role in engineering, particularly chemical engineering, expands. “It’s hard to find that happy medium between bioengineering programs and chemical engineering programs at colleges,” she says. “Both knowledge sets are needed to understand and excel in the field. I think it’s good that traditional chemical engineering departments are growing to accommodate that.”

In her observation, cost is one of the biggest challenges faced by schools providing bio-oriented engineering programs. “Bioprocess equipment is quite expensive,” she explains. “To run a 100L bioreactor probably costs around $2500 and that’s not including purchasing the bioreactor itself. It’s hard for schools to obtain all the funding needed for equipment and disposables required to give every student hands-on experience.”

To learn how recent gifts have helped ChBE at Maryland meet this challenge, see pp. 8-9.

FUENTEVILLA RECEIVES BEST PRESENTATION AWARD

Graduate student Daphne Fuentevilla, advised by Professor Mikhail Anisimov, won the International Association for the Properties of Water and Steam (IAPWS) Student Award for an outstanding presentation at the 15th International Conference on the Properties of Water and Steam (ICPWS), held in Berlin in September 2008. Her presentation was titled “Thermodynamics of the critical behavior of supercooled water.”

“The conference was a fantastic opportunity to meet some awe-inspiring scientists attending from more than 20 countries,” says Fuentevilla. “I was particularly thrilled to have the opportunity to listen to a talk by Dr. Gene Stanley, a professor at Boston University and member of the U.S. National Academy of Sciences, and discuss our overlapping research interests.”

RENEWAL OF FUNDING FOR GHOSH, BATTERY RESEARCH

Graduate student Ayan Ghosh, advised by Fischell Department of Bioengineering professor Peter Kofinas, has been awarded a second Wells Fellowship by the University of Maryland Energy Research Center (UMERC). The Fellowship provides annual funding for Clark School graduate students working on energy engineering and alternative energy sources.

continues next page
Ghosh is designing a new battery electrolyte that does not become corrosive when exposed to air. It is a polymer film, not a liquid, so it also does not require a bulky container, allowing it to be incorporated into device coatings or flexible materials.

In the time since we reported on Ghosh’s first Wells Fellowship award, his research has gained momentum. “Things are progressing nicely for me,” he says. “Since last year, we’ve filed a patent disclosure on our material, I gave a talk at the ECS [Electrochemical Society] conference last fall and I got a paper accepted into the ECS journal.”

**PALATRA, DEL PILAR LEON GAIN INTERNATIONAL RESEARCH EXPERIENCE**

Two graduate students advised by Associate Professor Ray Adomaitis participated in international research experiences in summer 2008.

**Thomas Palathra** (M.S. ’08) won a National Science Foundation grant under the East Asia and Pacific Summer Institutes for U.S. Graduate Students (EAPSI) program. He spent eight weeks working at the National University of Singapore in the research group of professor of electrical and computer engineering Arthur Tay, on modeling and control of photolithography systems for microelectronics manufacturing.

**Maria del Pilar Leon** (M.S. ’08) was invited to participate in the 2008 American Advanced Study Institute on Emerging Trends in Process Systems Engineering in Mar del Plata, Argentina. The institute brings graduate students, postdocs and other researchers together for a workshop focusing on current topics in chemical process systems engineering. Financial support for the students was provided by NSF and the Department of Energy.

**BREGER TAKES DIABETES TECHNOLOGY BRONZE**

Graduate student Joyce Breger, co-advised by Professor Nam Sun Wang and Dr. Dan Lyle (Food and Drug Administration [FDA]), was awarded the Diabetes Technology Peterson Student Research Bronze Prize for her abstract titled “Investigation of Inflammatory Potential of Biomaterials Intended for Cell Encapsulation or Device Coating.” Her paper was selected as one of the top three among over 180 submissions.

Breger is working on the development of a bioartificial pancreas for diabetics. It consists of islets of Langerhans—groups of specialized cells responsible for producing hormones, including insulin—donated from healthy individuals, encased in a biocompatible gel called alginate. The donated cells could live in a patient’s body, producing the insulin he or she cannot, but remain protected from his or her immune system by the alginate.

The abstract Breger submitted addressed the immune system’s response to alginate and other materials used in tissue engineering. If a biomaterial is improperly formulated or contaminated, the body may attack it, leading to the failure of the artificial organ.

Breger conducts much of her research at the FDA’s Center of Devices and Radiological Health (CDRH), where she is an Oak Ridge Institute for Science and Education (ORISE) Fellow.

**DEMUTH WINS UNIVERSITY MEDAL**

For his work in the classroom, the lab and the wider community, senior (now alumnus) Peter DeMuth was named the 2008 University Medalist. The award, which recognizes a graduating senior who best exemplifies academic distinction, extraordinary character and extracurricular contributions to the university or public communities, was presented at the May 2008 Commencement.

DeMuth, who double majored in biochemistry, graduated with a 4.0 GPA and a reputation for discipline and dedication.

DeMuth began working as a student researcher during his junior year. His senior-year project involved professors from chemistry, biochemistry, mechanical engineering, cell biology, molecular genetics and pharmaceutical science. As part of the interdisciplinary team, DeMuth helped develop nanoparticles that can be used to image and deliver drugs to certain kinds of cells, including cancerous or bacterial cells.

His work led him to be published twice in major research journals, and he is also applying for two patents to protect discoveries concerning porous nanoparticles and the synthesis of fluorescently labeled nanoparticles. The advances could lead to improvements in diagnostic imaging.

DeMuth says he chose Maryland because it offered “limitless” opportunities for driven students seeking a challenge. In addition to his lab commitments, he was a University Honors student, a member of the student-run Navigators Christian Fellowship and a service volunteer on campus and in the Baltimore region.

He headed to the Massachusetts Institute of Technology this fall to begin a doctoral program in biological engineering. He hopes to forge a career as a university researcher.

**LU, WANG TAKE 2ND PLACE IN BUSINESS PLAN COMPETITION**

SymViva Technologies, a startup created by undergraduate Keran Lu and Associate Professor Nam Sun Wang, took second place in the Undergraduate Student Division of the Maryland Technology Enterprise Institute’s 2008 $50K Business Plan Competition. Lu and Wang received $2,000 in prize money to continue the development of their company.

SymViva Technologies is developing advanced transdermal insulin patch technologies to replace the use of hypodermic needles in treating diabetes. Using research on ultra deformable carriers like Transfersomes®, SymViva Technologies plans to commercialize vesicular delivery technology in an insulin delivery patch that is safe, easy to use, and inexpensive to produce.
The $50K Business Plan Competition promotes the commercialization of innovative ideas and University-created technologies by offering faculty, students, and alumni prizes for the best new venture plans. Companies active in the Competition have generated millions in revenues, grants and awards.

NARGUND WINS RESEARCHFEST

Graduate student Shilpa Nargund was selected as the winner of the 2009 ResearchFest poster contest. Her research was selected by a panel of judges including Professor Mohamad Al-Sheikhly (Materials Science and Engineering), Associate Professor Sang Bok Lee (Department of Chemistry and Biochemistry), and W. R. Grace & Company Senior Process Research Engineer Stuart Nolan. Nargund, advised by ChBE assistant professor Ganesh Sriram, was awarded first place for her poster titled “Mapping Carbon Traffic Toward Biomass Synthesis and Accumulation in Bioenergy Crops.”

GORDON NAMED DISTINGUISHED TEACHING ASSISTANT

Graduate student Brad Gordon was named a 2007-2008 Distinguished Teaching Assistant. The Center for Teaching Excellence, the Office of Undergraduate Studies, and the Graduate School recognized him for his contributions to undergraduate education, commitment, professionalism, and creativity in a reception held in May 2008 at the Samuel Riggs IV Alumni Center. Gordon, who is advised by Associate Professor Sheryl Ehrman, is considering a career in academia, and is currently a Future Faculty Fellow.

RECENT DISSERTATIONS

MAY 2008

Chi-Wei Hung: “RNA Packaging and Gene Delivery Using Tabacco Mosaic Virus Pseudo-Virions.” Advisor: William Bentley (Fischell Department of Bioengineering)

Aimee M. Ketner: “‘Smart’ Fluids: Self-Assembled Systems with Viscosity Tunable by Light.” Advisor: Srinivasa Raghavan

DECEMBER 2008


Jonghoon Choi: “Silicon Nanocrystals: Biocompatible Fluorescent Nanolabel.” Advisor: Nam Sun Wang

Joong J. Han: “Kinetics and Morphology of Metallocene Catalyzed Syndiospecific of Polymerization of Styrene in Homogeneous and Heterogeneous Reactions.” Advisor: Kyu Yong Choi

Ta-I Yang: “Low-Loss Polymer Nanoparticle Composites for Radio Frequency (RF) Applications.” Advisor: Peter Kofinas (Fischell Department of Bioengineering)

Diana M. Yoon: “Insulin-Line Growth Factor-1 Signaling in Engineered Articular Cartilage.” Advisor: John Fisher (Fischell Department of Bioengineering)

STUDENT HONORS AND AWARDS, 2008-2009

Congratulations to the following students, who were recognized at the Clark School’s 2008-2009 Honors and Awards Ceremony and at a Department ceremony held this spring. They have all demonstrated outstanding academic and research performance, and have made contributions to the Department and field.

- Adam Behrens: Outstanding ASPIRE Student Research
- Marina Feric: Exxon Mobil AIChE Award
- Mark Keibler: Outstanding Junior Award
- Nicholas Levy: Outstanding Senior Award
- Joseph Lim: David Arthur Berman Memorial Award
- Leigh Quang: Chairman’s Award
- Christopher Remavege: Outstanding Student Service Award

Congratulations to the following students who won campus, university, and professional society awards:

- Keran Lu: 2nd place in UM’s $50K Business Plan Competition (see pp. 6-7)
- Peter DeMuth: University Medalist (see p. 6)
- Nicole Dupuy: Greater Washington Institute of Chemists Award
SPECIAL FEATURE

The Gift of Education —continued from page 1

FORWARD THINKING: THE JAN AND ANNEKE SENGER FELLOWSHIP FUND

Distinguished University Professor Emeritus Jan Sengers and his wife, noted physicist and member of the National Academy of Science Dr. Anneke Sengers, first came to Maryland in 1963 after accepting positions at the National Institute for Standards and Technology (NIST). In 1968, Jan Sengers joined the University of Maryland faculty. As the chair of the (then) Department of Chemical Engineering from 1994–1999, he realized that the department had no endowed scholarships for graduate students. The Sengers decided to set a precedent in the hope that other faculty would follow. In 2000, the Jan and Anneke Sengers Fellowship Fund was established to support two doctoral students in chemical engineering. The fund was created with an initial gift of $10,000, and a plan for additional annual gifts from the donors coupled with a matched gift of $50,000 from a state of Maryland private donor incentive program, to total $100,000. Another $100,000 will be funded through an IRA.

By 2008, the fund had matured, and the first two Jan and Anneke Sengers Fellowships were awarded to Chia-Ying Chiang, advised by Associate Professor Sheryl Ehman, and Yuting Zheng, advised by Assistant Professor Ganesh Sriram.

Zheng is investigating and engineering metabolic pathways in lipid-producing photosynthetic algae. Algae are considered a potential source of biodiesel, a renewable fuel that seems particularly promising for aviation. Since algae use carbon dioxide from the atmosphere as their carbon source, algal biodiesel production entails no net carbon dioxide emissions, making it environmentally friendly as well. The Sengers fellowship has supported Zheng in her first year, giving her the ability to plan her proposed research, learn experimental and computational skills, and obtain preliminary research results.

Chiang is exploring the generation of hydrogen for use as a renewable energy source with photoelectrochemical (solar) cells. She is part of a research group designing, synthesizing and evaluating inexpensive, abundant and stable transition metal oxide semiconductor materials that could be used to make solar cells less expensive to manufacture and more resistant to corrosion.

Winning a Sengers Fellowship has made her goals possible. “The dream of studying abroad was deeply embedded in my mind,” she says, “[but] I would not be here to pursue my Ph.D. degree if I had not been given such an honor. I really appreciate this Fellowship for helping me ‘open the door to the world.’”

LOWE BEQUEST FUNDS LAB INNOVATIONS

Our Unit Operations Lab, an integral part of every chemical and biomolecular engineering major’s undergraduate education, will receive continued upgrades and new equipment thanks to a $30,000 bequest from the estate of alumnus James Blakeley Lowe (B.S. ’63).

Part of Lowe’s gift will be merged with a portion of the recent bequest from Virginia Murray (see p. 9) to create the James Blakeley Lowe and Virginia Murray Endowment for Undergraduate Laboratories, the income of which will be used for annual improvements to our undergraduate chemical, biochemical and computer laboratory facilities.

Chemical Engineering Laboratory (ENCH 437), the primary course taught in the Unit Operations Lab, gives senior chemical and biomolecular engineering majors experience with laboratory and pilot plant apparatus, preparing them to use and manage the facilities they will encounter in the field. Its experiments complement the bench-scale lab work students perform earlier in the curriculum. Students study reactors and bioreactors, separations (such as distillation), heat transfer (heat exchangers), energy conversion (fuel cells) and fluid flow (pumps and valves).

Assistant Professor Chunsheng Wang, who currently manages the lab and teaches the course, has already seen students benefit from the enhancements. “We are now able to conduct fuel cell experiments,” he explains. “Students are using a new test station to measure the performance of fuel cells they have constructed under controlled conditions such as flow, temperature, humidity and pressure. The availability of this equipment provides unique education and training opportunities.” The Lowe gift comes on the heels of the Clark School’s recent $100,000 renovation of the Unit Operations Lab, which included the installation of new floors and casework, and a revised floor plan to make more efficient use of its space. As a result, the lab can now also be used by undergraduates from the Fischell Department of Bioengineering.

“THANKS TO THE LOWE BEQUEST, WE ARE THE ONLY PROGRAM IN THE STATE TO HAVE FUEL CELL EXPERIMENTS AVAILABLE TO UNDERGRADUATES. SOME STUDENTS IN MY FALL ’08 COURSE EVEN CONDUCTED AN EXPERIMENT WHICH WE USUALLY EXPECT ONLY GRADUATE STUDENTS TO DO AFTER ONE OR TWO YEARS TRAINING.”

—ASSISTANT PROFESSOR CHUNSHENG WANG

“YOU DON’T HAVE TO BE A MILLIONAIRE TO SET UP AN ENDOwed FUND AT AN INSTITUTION THAT HAS GIVEN SO MUCH.”

—PROFESSOR JAN SENGERs AND DR. ANNEKE SENGERs

A STUDENT WORKS AT THE NEW FUEL CELL TESTING STATION IN THE UNIT OPERATIONS LABORATORY, WHICH HAS RECENTLY BENEFITED FROM AN EXTENSIVE RENOVATION AND ALUMNI BEQUESTS.
THE MURRAY BEQUEST: NEW EQUIPMENT FOR EDUCATION AND RESEARCH

Our department and the College of Chemical & Life Sciences will share equally in a $400K bequest from the estate of Mrs. Virginia Murray, made in honor of her late husband, alumnus Guy Edward Murray (B.S. ’36, chemistry). Murray worked as a chemical engineer for Western Electric for 37 years before retiring in 1973. He was born in Washington, D.C., and most recently lived in Salisbury, Md.

The Murrays designated their gift for the purchase of new equipment. The department will use the endowed funds in three ways: to continue to upgrade its Unit Operations Laboratory, an integral part of its undergraduate program; to establish and contribute to the The James Blake Lowe and Virginia Murray Endowment for Undergraduate Laboratories; and as a matching fund for Chemical and Biomolecular Engineering faculty to use in the purchase of research equipment.

ALUMNUS GIVES BACK TO AWARD HE RECEIVED...AND THEN SOME!

In the summer of 2008, Derryl York (B.S. ’67 and Ph.D. ’70) donated $1000 to the David Arthur Berman Memorial Award fund. York himself won the award in 1966.

The David Arthur Berman Memorial Award was established in 1957 by a gift from Mr. and Mrs. Herman Berman, parents of the late David Berman, a former student. It recognizes students majoring in chemical engineering at UMCP who have the highest cumulative academic averages at the end of the first semester of their junior year and who have been elected to Tau Beta Pi, the Engineering Honor Society.

When York won the award, it was $50—today it is up to $1000. His wife Martha, whom he married before he became a student, still remembers it well: “It doesn’t sound like much [money] by today’s standard,” she wrote in an e-mail, “but it really helped at the time!” (She also “well remember[s] staying up all night and helping type his dissertation the night before it was due!”)

When York contacted us again recently to make another gift, Professor and Chair F. Joseph Schork told him about the new James Blakeley Lowe and Virginia Murray Endowment for Undergraduate Laboratories. He decided to designate his gift for the fund.

York worked for Amoco Corporation for 30 years, first in research and later in petroleum production. His career saw him involved in operations for the company around the world. He feels the education he received at Maryland contributed to his success. “The broad education in chemistry, math, and related physical sciences was an excellent preparation for my work assignments,” he wrote in an e-mail, “Even today I’m still glad I chose chemical engineering as my college major.”

“THE IMPROVEMENTS TO THE SPACE AND THE EQUIPMENT [IN THE UNIT OPS LAB] TRANSLATE INTO BETTER LEARNING EXPERIENCES IN BIOCHEMICAL AND BIOMEDICAL ENGINEERING....WE’RE VERY GRATEFUL TO MR. AND MRS. MURRAY AND TO MR. LOWE FOR THAT. CHBE PRIDES ITSELF ON THE QUANTITY AND QUALITY OF THE UNDERGRADUATE RESEARCH EXPERIENCES WE OFFER OUR STUDENTS. THEIR BEQUESTS WILL ALLOW US TO IMPROVE INSTRUCTION, MOVING IT IN NEW DIRECTIONS SUCH AS ALTERNATIVE ENERGY, AND TO ENHANCE THE RESEARCH PROGRAMS OF OUR FACULTY.”

—PROFESSOR AND CHAIR F. JOSEPH SCHORK

THE McAVOY FAMILY FELLOWSHIP FUND

In 2004, the university’s Institute for Systems Research (ISR) made a gift of over $92,000 to establish the McAvoy Family Fellowship Fund, on the occasion of Professor Emeritus Thomas J. McAvoy’s retirement. McAvoy holds a joint appointment with ISR. The fund provides annual support for a doctoral student in the Department of Chemical and Biomolecular Engineering.

In 2008, the fund had matured and the department awarded the first McAvoy Family Fellowship to Szu-Ting Chou.

CHBE ABROAD: A NEW OPPORTUNITY

We have recently joined with the School of Chemical & Biomolecular Engineering at Georgia Tech to send undergraduates to Imperial College in London each summer for four weeks of intensive chemical engineering laboratory experience. This year, four of our rising seniors are participating.

We have established a new scholarship fund especially for this and other study abroad opportunities specifically designed for students majoring in ChBE. If you would like to contribute to the fund or learn more, please contact Professor and Chair F. Joseph Schork.

We hope you will consider contributing a gift of any amount to any of these great funds, to our General Scholarship Fund, or to our General Foundation Account. For more information on creative ways to give, see p. 12.
Pinar Akcora (Ph.D. ’05) has been appointed an assistant professor in the Department of Chemical Engineering at the University of Missouri. Her research interests include polymer composites, self-assembled nanostructures, and magnetic nanoparticles.

R. Joseph Bender (B.S. ’06) recently announced his engagement to Linda Brown (B.A. ’07, government and politics). The wedding is scheduled for August 2009. Bender, who works as a bioprocess engineer at Human Genome Sciences in Rockville, Md., is currently pursuing a M.S. in biotechnology at Johns Hopkins University, and plans to continue on to a Ph.D. in bioengineering.

Naveen Bhat (Ph.D. ’91) has been appointed the new vice president of Asia-Pacific sales for Ixia, a global provider of performance test systems for IP-based voice, video, data and network services.

Kimberly Brown (M.S. ’98 and Ph.D. ’05), has moved her company, Amethyst Technologies, into bwtech@UMBC, a technology incubator community at the University of Maryland, Baltimore County (UMBC). Amethyst specializes in management, implementation, and execution of current Good Manufacturing Practices (cGMP) compliance systems services for life science companies and research organizations.

Matthew Wook Chang (Ph.D. ’03) is now an Assistant Professor in the School of Chemical and Biomedical Engineering at Nanyang Technological University, Singapore. His research interests include systems and synthetic biology, bioinformatics, metabolic engineering and microbial functional genomics.

Rich Clements (B.S. ’81) has been promoted to Vice President and General Manager of Paratherm Corporation, a company that provides consulting, products, and analysis for thermal fluid systems and heat transfer fluids for the food and plastics industries.

Arthur Russell Taylor Denues (Ph.D. ’39), 93, died June 23 in Raleigh, N.C. In addition to being a chemical engineer, Denues was a gas engineer, a musician, an Episcopal priest, and a lieutenant colonel in the U.S. Army, which awarded him the Legion of Merit in 1946. His long career included a tenure as the vice president of the Sloan Kettering Institute for Cancer Research, research at the Albert Schweitzer Hospital in Lamberene, Gabon, West Africa, and his founding and presidency of the Cancer International Research Cooperative.

Claudio Filippone (Ph.D. ’96, nuclear engineering) has been named the Senior Director of Nuclear Technology Analysis for Virginia-based Thorium Power, Ltd., a company that develops non-proliferative nuclear fuel technology and provides comprehensive advisory services for emerging nuclear programs.

Ronald G. Forsythe, Jr. (M.S. ’92 and Ph.D. ’95) has been named a new member of BB&T’s (Branch Banking and Trust Company’s) Salsbury, Md.-area advisory board. Forsythe is vice president of technology and commercialization at the University of Maryland Eastern Shore.

Larry Friedman (B.S. ’80), logistics manager of the U.S. Army’s Non-Stockpile Chemical Materials Project, completed an almost 1,600 mile, 23-day solo bike trek from southern Florida to Maryland in the summer of 2008. “Physically, I now know my body can handle the day after day demands of putting in the miles,” he told U.S. Army Chemical Materials Agency reporter Sarah West in the January 2009 issue of APG News. “Spiritually, it was a rewarding experience to be able to move such great distances under my own power and take in the sights and experiences.”

Chris Konkol (M.S. ’80) has joined Cantor Colburn, an intellectual property law firm ranked nationally in the top 5% of patent practices, as counsel. Prior to joining the firm, Konkol was a senior counsel at Kodak, DuPont and Bausch & Lomb. He specializes in chemical and chemical engineering technologies, and has also worked with the pharmaceutical and health care industries. He is registered to practice before the U.S. Patent and Trademark Office.

Tekin Kunt (Ph.D. ’97) has been promoted to director of research and development for software company Aspen Technology Inc. in Houston, Texas.

Brigitte Le (B.S. ’84) was the recently the subject of a Washington Post story about her contemporary Vietnamese art gallery, Galerie Brigitte. Le, who minored in art while at the University of Maryland, opened her gallery in 2002 after working 13 years as a systems engineer for IBM. The Post highlighted her flying pig statues designed with a “Yes We Can!” theme to celebrate the election of the nation’s first African-American president.

Jermy N.A. Matthews (Ph.D. ’05) held a postdoctoral position at Howard University in Washington, D.C. from 2005-2007 before returning to campus as an Associate Editor at Physics Today, the magazine for American Institute of Physics member societies. He is the publication’s principal industry reporter.

John C. March (Ph.D. ’05), an assistant professor in Cornell University’s Department of Biological and Environmental Engineering, has been awarded a Hartwell Foundation grant to support his current research. As a Hartwell Investigator, he will receive $100,000 a year for three years to further his work. March received the funding for an innovative way to treat chronic and debilitating juvenile (type 1) diabetes. By engineering the probiotic bacteria of the small intestine to stimulate cells lining the intestine to secrete insulin into the blood circulation, he expects to “hide” the site of its production from the body’s immune response, which otherwise destroys the insulin-producing cells of the pancreas. If the approach is successful in regulating sugar metabolism, it could result in a low cost and non-intrusive alternative to current life-long dependence on injected or pumped insulin.

Thomas D. Murphy (B.S. ’57) has received the Frank W. Reinhart Award from the ASTM International Committee on Standards. He was honored for his leadership and service in terminology standardization. Murphy has served on several ASTM committees addressing topics as diverse as statistical quality control, pesticides, and pharmaceutical products, and has previously received an Award of Merit and election to fellowship for his work. When not working with ASTM, Murphy is a private consultant and the principal of T.D. Murphy Statistical Consulting LLC.

Bonnie Ramey (née Bryan, B.S. ’90) has worked for E.I. DuPont de Nemours and Co. in its Spruance Plant in Richmond, Va. since graduation, and has earned the corpora-
tion’s Engineering Excellence Award for multivariable control technology implemented in the Nomex paper process.

David R. Sadowski (B.S. ‘75, M.S. ‘77) has been appointed the assistant vice president for intellectual property management and commercialization at the University of Rhode Island. Sadowski comes to the position from the National Institutes of Health, where he served as the deputy director of technology development and transfer.

Shih-Huang Tung (Ph.D. ’07) has accepted a position as an Assistant Professor in the Institute for Polymer Science and Engineering at National Taiwan University (NTU), the most prestigious university in Taiwan. Tung’s research will be focused on the growing field of soft materials, with an emphasis on the characterization of self-assembled biomolecular nanostructures and block copolymer ultra thin films. His research group is using block copolymers and biomolecules such as lipids, bile salts and proteins to form a variety of nanostructures in solutions and in thin films. The applications of the work range from drug delivery to photovoltaic devices.

Daniel Singer (B.S. ’06) and Emily Romei (B.A. ’06 and M.A. ’08, speech-language pathology) have announced their engagement and are planning a July 2009 wedding. Singer is a simulation engineer at Telvent, Inc. and Romei is speech-language pathologist for Montgomery County (Md.) Public Schools.

Deborah Sweet (B.S. ’06) and Hirsh Goldberg (B.S. ’05 and M.S. ’07, electrical engineering) have announced their engagement and are planning an August 2009 wedding. Sweet is currently pursuing a doctorate in U-Md.’s Fischell Department of Bioengineering. Goldberg is an engineer for Northrop Grumman.

Yechun Wang (Ph.D. ’07) has been appointed an Assistant Professor in the Department of Mechanical Engineering and Applied Mechanics at North Dakota State University. Her research interests include microfluidics, biofluid mechanics, computational fluid dynamics, numerical analysis, and characterization of organic coatings.

CHBE ALUMNI DUONG, PARK WIN ALUMNI AWARDS

Anh N. Duong (B.S. ’82) and Dr. Chan Mo Park (M.S. ’64, Ph.D. ’69) have been named the recipients of the Clark School’s 2009 Distinguished Engineering Alumnus Award and the University of Maryland Alumni Association’s International Alumnus Award, respectively. The awards were presented at the 10th Annual Alumni Association Awards Gala this April.

The Clark School’s Distinguished Engineering Alumnus Award recognizes an “engineering alumnus who exemplifies the bold visions, bright future and new directions that make them a proud reflection of the leadership that is nurtured and grown at Maryland.” The university’s International Alumnus Award is presented to “a University of Maryland alumna/us who was born or lives outside of the United States, and has distinguished himself/herself by providing significant leadership to another country’s educational, cultural, social, and/or economic development.”

Duong, director of the Borders and Maritime Security Division in the Science and Technology Directorate of the Department of Homeland Security, is an internationally recognized expert in explosives currently focusing her efforts on combating terrorism. Inspired by those who helped her family flee Vietnam in 1975, she has spent the past 23 years serving the soldiers of her adopted country.

One of her most significant accomplishments was the development of the first U.S. thermobaric bomb, used in Afghanistan to destroy command posts situated in deep caves and tunnels. She is the recipient of numerous government, naval, and civilian honors, including the Meritorious Civilian Award and the Dr. Arthur Bisson Award for Naval Technology Achievement. She has been interviewed by national and international media, featured in the documentary film Why We Fight and the Discovery Channel’s Future Weapons series, and profiled in Sybil Hatch’s book Changing Our World: True Stories of Women Engineers.

Park is the Special Advisor to the President of Korea for Science and Technology, professor emeritus and immediate past president of the Pohang University of Science and Technology, Co-Chair of the Founding Committee of the Pyongyang University of Science and Technology, and an elected Fellow of the Korean Academy of Sciences and Technology. His distinguished academic career has also included professorships at the University of Maryland College Park, The Catholic University of America, and the Korea Advanced Institute of Science and Technology (KAIST). He has served as the president of numerous professional associations in Korea and the U.S. and the Accreditation Board for Engineering Education of Korea. He has been decorated by the Republic of Korea with the National Order of Camellia and the Blue Stripes Order of Merit for his contributions to the advancement and development of science and technology. Park’s research interests include IT, digital image processing, virtual reality, and system simulation.

SEND US YOUR NEWS! WE ARE VERY PROUD OF OUR ALUMNI AND ENCOURAGE EVERYONE TO KEEP IN TOUCH! PLEASE SEND YOUR ALUMNI NEWS TO blochemmse@umd.edu. YOU CAN KEEP YOUR CONTACT INFORMATION WITH THE CLARK SCHOOL AND THE UNIVERSITY OF MARYLAND UP-TO-DATE BY VISITING www.eng.umd.edu/alumni.
ABOUT THE COVER IMAGE

THE BLUE IMAGE USED ON THE COVERS IS A SCANNING ELECTRON MICROGRAPH (SEM) OF A COPPER OXIDE FILM TAKEN BY ASSISTANT RESEARCH SCIENTIST DR. RANJAN PATI. THE FILM WAS DEPOSITED IN A CHEMICAL VAPOR DEPOSITION SYSTEM AS PART OF A COLLABORATION BETWEEN ASSOCIATE PROFESSORS RAYMOND ADOMAITIS AND SHERYL EHRMAN TO DEVELOP SEMICONDUCTOR FILMS THAT CAN BE USED TO PRODUCE HYDROGEN FROM THE DIRECT SPLITTING OF WATER USING SOLAR ENERGY.

great EXPECTATIONS

Many of the gifts described in this issue of Columns have contributed to the university’s Great Expectations campaign, which transforms lives through exceptional education and research opportunities. Contributions can benefit Chemical and Biomolecular Engineering initiatives such as undergraduate scholarships, graduate fellowships, and named professorships. For more information, please visit: www.greatexpectations.umd.edu.

Are you looking for a way to help the Department of Chemical and Biomolecular Engineering or the Clark School continue to advance, but need inspiration on how to make the perfect gift within your budget? A variety of meaningful and fun ideas for supporting our students and important programs can be found online on our Creative Ways to Give page: eng.umd.edu/giving/giving_creative.html

Possibilities include funding new courses, buying books for a student, sending a prospective engineer to one of the Clark School’s summer camps, and supplying Engineers Without Borders with tools.

If you would like to donate a gift of any amount to the funds described in this issue, or make a unique contribution of your own, please contact Leslie Borak at (301) 405-0317 or lborak@umd.edu. Gifts can also be made online through the Great Expectations web site, or by check to the “University of Maryland College Park Foundation (UMCPF).” Please designate “The Department of Chemical and Biomolecular Engineering” in the memo line, and mail to:

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