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COLUMBES

CHEMICAL AND BIOMOLECULAR ENGINEERING
A. JAMES CLARK SCHOOL of ENGINEERING

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A NEWSLETTER FOR ALUMNI AND FRIENDS OF THE DEPARTMENT OF CHEMICAL AND BIOMOLECULAR ENGINEERING AT THE A. JAMES CLARK SCHOOL OF ENGINEERING, UNIVERSITY OF MARYLAND.

IN THIS ISSUE:

- 2 CHAIRMAN'S MESSAGE
- 3 EDUCATION NEWS
- 4 DEPARTMENT NEWS
- 5 STUDENT NEWS
- 7 STUDENT SOCIETIES
- 8 FACULTY NEWS
- 10 ALUMNI NEWS
- 11 RECENT DISSERTATIONS
- 12 GREAT EXPECTATIONS

Schork Appointed to Department as Professor, Chair

Please join us in welcoming Professor F. Joseph Schork, who became Chair of the Department of Chemical and Biomolecular Engineering on October 1, 2006.

Dr. Schork comes to us from Georgia Tech, where he was a professor and associate chair in its School of Chemical and Biomolecular Engineering. He taught at Georgia Tech for more than 25 years and led the effort to revise its undergraduate curriculum.

Dr. Schork's research interests and activities include polymer reaction engineering, involving the kinetics, mathematical modeling, reactor design and control of polymerization processes.

He is the author of one book and over 100 archival journal papers. He is the recipient of the Doolittle Award for the best paper in Organic Coating and Plastics Division of the American Chemical Society, the W. T. Ziegler Outstanding Teacher Award and the Omega Chi Epsilon Outstanding Teacher Award.

Dr. Schork received his bachelor's and master's degrees from the University of Louisville and his Ph.D. from the University of Wisconsin. His work has been in two primary areas: mathematical modeling and control of polymerization reactors, and dispersed phase polymerization.

His book, *Control of Polymerization Reactors*, describes techniques for

mathematical modeling of chain statistics, sensors for online measurement of the critical parameters, methods of computer control of polymer properties during polymerization. His work has resulted in the development of techniques for online measurement of monomer conversion, surface tension, and properties inferable from electrical conductivity; as well as a now commercially-available instrument for surface tension metering. He has published extensively in miniemulsion polymerization, and has recently coauthored a review of the field.

His research interests also include:

- Solventless Oil Paint
- Water-Based Varnish
- Repulpable Glues
- Miniemulsion Polymerization
- Water-Based Inks and Dyes
- Wound Dressings
- Miniemulsion and Microsuspension Polymerization
- Controlled Free Radical Polymerization
- Control of Polymerization Reactors

You can learn more about Dr. Schork's vision for the department in his *Chair's Message* on page 2.





F. JOSEPH SCHORK

2007 IS A SIGNIFICANT YEAR FOR THE DEPARTMENT OF CHEMICAL AND BIOMOLECULAR ENGINEERING (CHBE) AT THE UNIVERSITY OF MARYLAND.

For one thing, we are re-establishing

our departmental newsletter after a lapse of several years. That, of course, is why you're reading this! More personally, 2007 will be my first full year as a member of the UMD faculty. It will also be my first full year as Chair of the Department.

2
Recently, after 24 years at Georgia Tech, I found myself in search of a new challenge. The University of Maryland was it! During my first few months here, I often felt foolish for not knowing "how things are done." Many, many times, I felt like I'd walked into the middle of the movie—and everyone knew "the butler did it" except for me! But in another way, I've found that ChBE at UMD is a lot like ChBE at GT. Maybe that's because people are fundamentally alike wherever you go, and certainly, an academic department is (and should be) all about people. I've almost stopped saying "Well, at Georgia Tech we..." and people have been kind enough to be patient with me when I do. I hope you will be too.

So what's new in ChBE and the Clark School of Engineering? Former Professor and Chair **Tim Barbari** has left UMD to serve as Vice Provost for Research just down the road at Georgetown University. Before my arrival,

Associate Professor **Ray Adomaitis** served admirably for two years as Interim Chair (it just seems like ten, Ray). We wish Tim well and thank Ray from the bottom of our hearts for his stewardship of the Department.

Professors **Bill Bentley**, **Peter Kofinas**, **John Fisher** and **Helim Aranda-Espinoza** have left the Department to help found the Fischell Department of Bioengineering. Bill is chairing that Department. We look forward to great collaboration opportunities with them. That leaves ChBE with a faculty of twelve and great hopes for hiring some bright young academics. As always, there are solid performers remaining in ChBE. Professor **Kyu Yong Choi** (a labmate of mine from graduate school) has recently been appointed a Permanent Member of the Korean National Academy of Science and Technology. Associate Professor **Sheryl Erhman's** Fulbright Fellowship took her to India on sabbatical, and she also received the Clark School's E. Robert Kent Outstanding Teaching Award for Junior Faculty. She has also been named a Keystone Professor by the Clark School in recognition of her skill and dedication in teaching. Associate Professor **Srinivasa Raghavan** was recently granted tenure, and has multiple publications in the *Journal of the American Chemical Society*, quite an accomplishment for someone so early in his career. Over the past five years, ChBE has produced a phenomenal number of young academics who have taken up professorships at other universities. We are very proud of that.

We are very excited that **T.K. "Patrick" Sung** (M.S. '69 and Ph.D. '72, chemical engineering) and his wife, **Marguerite** (B.S. '70, mathematics), have pledged \$1.5 million to the Clark School

to establish two endowed professorships in chemical and biomolecular engineering. The two Clark School professorships will be named "The Patrick and Marguerite Sung Professorship in Chemical Engineering" and "The Patrick and Marguerite Sung Distinguished Professorship in Chemical Engineering." One of the true joys of being a department chair is in searching out highly talented scientists and engineers and convincing them to join your faculty. Filling these two positions in a few years should be a lot of fun. In the meantime, we are also looking for two new assistant professors for the Department—and we had over 200 applicants for the positions! We are focusing our efforts in biomolecular engineering, energy engineering, and nanotechnology, but we are interested in the BEST, whatever their areas of expertise.

So where do we go from here? The Clark School has made incredible advances in the quality of its programs in the past few years. ChBE cannot afford to be left behind. I promise to give my utmost over the five years of my tenure as Chair, and to make this very good ChBE department a GREAT ChBE department. I am sure the Faculty will do the same. You, our alumni and friends, can help us by staying interested in our programs, providing us with talent and advising us when we ask, letting us know what and how you're doing, and helping us to accumulate the financial resources necessary to take us to the next level through the University's Great Expectations Campaign.

I would love to hear from you.

F. Joseph Schork, Chair

BRINGING EXCELLENCE TO OUR UNDERGRADUATE PROGRAM



KYU YONG CHOI

*Kyu Yong Choi,
Professor and
Associate Chair,
Undergraduate
Program*

As the new director of the department's undergraduate program, I would like to introduce you to our mission statement and education objectives:

MISSION: THE EDUCATIONAL MISSION OF THE CHEMICAL AND BIOMOLECULAR ENGINEERING UNDERGRADUATE PROGRAM IS TO PROVIDE STUDENTS WITH A FUNDAMENTAL UNDERSTANDING OF PHYSICAL, CHEMICAL AND BIOLOGICAL PROCESSES AND WITH THE ABILITY TO APPLY MOLECULAR AND BIOMOLECULAR INFORMATION AND METHODS OF DISCOVERY INTO PRODUCTS AND THE PROCESSES BY WHICH THEY ARE MADE. OUR PROGRAM PROVIDES THE UNIQUE INTERDISCIPLINARY ACADEMIC FOUNDATION AND SCHOLARLY TRAINING NEEDED TO ADDRESS COMPLEX ENGINEERING PROBLEMS WITH EMPHASIS ON THE ADVANCING FIELDS OF BIOLOGICAL ENGINEERING AND NANOTECHNOLOGY.

EDUCATION OBJECTIVES: (I) PROVIDE STUDENTS WITH A SOLID FOUNDATION IN CHEMICAL ENGINEERING SCIENCE FUNDAMENTALS AS WELL AS A BROAD BACKGROUND IN SCIENCE AND MATHEMATICS TO EQUIP THEM TO ENTER PROFESSIONAL AND CHEMICAL ENGINEERING PRACTICE AND TO ENTER GRADUATE STUDY AT LEADING UNIVERSITIES; (II) PREPARE STUDENTS TO EXCEL IN TRADITIONAL CHEMICAL ENGINEERING CAREERS AND DIVERS CAREERS IN AREAS SUCH AS BIOTECHNOLOGY, NANOTECHNOLOGY, MEDICINE, LAW OR BUSINESS; (III) PRODUCE GRADUATES WHO ARE EQUIPPED WITH QUANTITATIVE PROBLEM SOLVING, TEAMWORK, COMMUNICATION SKILLS, AND A STRONG ETHICAL FOUNDATION THAT WILL SERVE THEM THROUGHOUT THEIR CAREERS.

The discipline of chemical and biomolecular engineering is facing exciting new opportunities and challenges in the 21st century: the globalization of economy, inexpensive and fast propagation and sharing of knowledge in science and technology

through information technology, nano- and biotechnology starting to make a significant impact on our lives, increasing needs for novel energy sources, and more. Our next generation of engineers needs to be educated to excel in this rapidly changing world. The Department of Chemical and Biomolecular Engineering at Maryland offers an exciting undergraduate program. Every course we teach has been designed to help students build a solid theoretical foundation and develop abilities such as identifying and solving engineering problems, applying mathematical skills to problem solving, designing and conducting experiments, applying computers and information technology knowledge, team participation, effective communication, and understanding current technological issues. Our dedicated faculty strives for excellence in teaching through innovative course content, new teaching tools, encouraging students to participate in research, and providing guidance for student career plans. We always welcome any new ideas from the students, family, friends, and alumni of the Department of Chemical and Biomolecular Engineering to further improve the quality of the educational experience we provide.

ABET ACCREDITATION

In 2005, the Department received a full six years' accreditation from ABET, the national accrediting agency for engineering education in the United States, the highest possible outcome of their review process. The ABET committee may point out deficiencies, weaknesses or concerns during the process. Weaknesses are the most significant, while concerns tend to be given for minor issues. We are proud to have had no deficiencies, no weaknesses, and only a few minor concerns.

Accreditation of the ChBE Program gives our graduates the right to sit for the Fundamentals of Engineering and Professional Engineering Examinations.

UM AMONG KIPLINGER'S "BEST VALUES"; CLARK SCHOOL RANKED 13TH IN ENGINEERING WORLDWIDE, 16TH IN NATION

The latest *Kiplinger Personal and Finance Magazine* rankings for the best value in higher education for 2006 shows the University of Maryland at No. 15—up three positions from last year. Kiplinger's also ranks the value of an education for out-of-state students. This year, UM rose from No. 20 to No. 13—another all-time best ranking.

The Institute of Higher Education and Center for World-Class Universities has ranked the Clark School 13th in the world among all engineering programs for 2007.

The institute, a unit of Shanghai Jiao Tong University in China, based the rankings on total engineering-related research expenditures, highly cited research articles, articles included in the Scientific Citation index and the percentage of articles published in the top 20 percent of engineering journals.

In *U.S. News and World Report's* annual ranking of graduate school programs, the Clark School is tied for 16th among engineering schools in the nation. The Clark School remains among the top ten public university engineering programs in the country. The Department of Chemical and Biomolecular Engineering's graduate program is ranked in the top 25 percent among public and private schools.



ASSOCIATE PROFESSOR
EVANGHELOS ZAFIRIOU
HAS BEEN APPOINTED
ASSOCIATE CHAIR FOR
GRADUATE STUDIES.



STUDENT AWARDS 2006-2007

Congratulations to the following students, who were recognized at the Clark School's 2006-2007 Honors and Awards Ceremony and at a Department ceremony held this spring. They have all demonstrated outstanding academic performance, research, and contributions to the Department and field.

- **Adeayo Adeniran:** Center for Minorities in Science and Engineering Service Award
- **Gary Cheng:** David Arthur Berman Memorial Award
- **Peter DeMuth:** Outstanding Senior
- **Vivek Dwivedi:** Teaching Assistant of the Year
- **Patrick Elder:** ASPIRE Outstanding Student Research Award (see p. 6)
- **Silvia Hou:** Russell Barch Memorial Award
- **Yi-En Huang:** Chair's Outstanding Graduating Senior Award
- **Samuel J. Lopez:** Chair's Outstanding Contribution Award
- **Michael Margolies:** Outstanding Senior
- **Leigh Quang:** Outstanding Junior
- **Paul Rueger:** ExxonMobil—NCS AIChE Award
- **Melissa Tsai:** AIChE Student Chapter Award

CHBE FACULTY JOINS SEARCH FOR NEW ENERGY ALTERNATIVES

ChBE faculty have joined a university-wide initiative focused on alternative energy issues. The University of Maryland Energy Research Center (UMERC), launched in mid-2006, is focused on developing new energy sources, evaluating and promoting dialogs on national energy policies and economics, and educating students, the public, industry and government about energy issues.

UMERC will conduct technology research in hydrogen fuel-cell systems, small-scale power systems, solar energy sources, bioprocesses for fuel production, and nuclear energy sources, including fusion. A variety of undergraduate and graduate courses in these technologies, as well as policies and economics, will also be offered across several Clark School departments

and programs. UMERC's "Transforming Energy" Lecture Series provides a forum for those in academia, industry, government and the public to share their viewpoints, breakthroughs, and challenges. The Center's ChBE faculty include:

Associate Professor **Raymond Adomaitis**, whose research in advanced materials manufacturing processes includes the development of photovoltaic cells for advanced solar energy conversion;

Professor **Kyu Yong Choi**, whose research includes fuel cells, materials for advanced solar energy conversion, and bioprocesses for fuel production and processing;

Associate Professor **Sheryl Ehrman**, whose research includes process development for production of multicomponent oxide materials for fuel cells and high surface area materials for advanced solar energy conversion; and

Associate Professor **Nam Sun Wang**, a longtime advocate of biorefineries, where material for the production of fuels and chemicals originates from a renewable biomass (such as sugarbeet) rather than petroleum.

TBP CHAPTER RANKED NATION'S MOST OUTSTANDING

In the 2005-2006 academic year, the Clark School's chapter of Tau Beta Pi (TBP), the nation's engineering student honor society, received the R.C. Matthews Award for Most Outstanding Chapter for the 11th time in its history, beating out more than 300 chapters across the country for the honor.

According to the TBP website, the award encourages and recognizes high-grade work by the chapters in both routine and special affairs. The award is based on how well chapter service projects fulfill the objectives of TBP and on the quality and promptness of chapter reports to the national headquarters.

Last year, the Clark School chapter sent students to the Gulf states over winter and spring breaks to help those who were affected by Hurricane Katrina.

NEW STAFF

Five new staff members have joined the Department since our last newsletter.

Janet Alessandrini, Executive Administrative Assistant, has worked at the University for 22 years, most recently with the Department of Civil and Environmental Engineering. She serves as our Assistant to the Chair, works with faculty candidates and seminar speakers, and manages the front office. She can be reached at (301) 405-1935.

Rachel Katz, Assistant Director of Contract Grant Accounting, "gladly returned" to the Department in October 2006 after working in another for 3 years. She handles all contract and grant budgets, including travel, for ChBE and the Department of Materials Science and Engineering (MSE), manages proposal routing, and provides budget projections and monitoring. She can be reached at (301) 405-7356.

Faye Levine, Communications Coordinator for ChBE, MSE, and the Fischell Department of Bioengineering, joined the University in January 2005, and came to ChBE in May 2006. Before UM, she worked as a print and web designer in "corporate America" and taught courses in graphic design. She handles web, print, news and collateral projects, and can be reached at (301) 405-0379.

Kathleen Lopresti, Assistant Director of Undergraduate and Graduate Studies, has worked at the University for 18 years, most recently at the Graduate School, where she managed the student information center. She has also worked for the Materials Research Science and Engineering Center (MRSEC) and the American Studies Department. She can be reached at (301) 405-5888.

Sue Pleyo, Business Service Specialist, worked for the Department of Chemistry and Biochemistry for over 23 years before joining our business office. She handles purchasing, travel, keys, parking, and telecommunications. She's excited about bringing her strong customer service experience to ChBE. She can be reached at (301) 405-8207.

POLYMER SYMPOSIUM

The Departments of Chemical and Biomolecular Engineering (ChBE), Chemistry and Biochemistry, and Materials Science and Engineering (MSE), and The Fischell Department of Bioengineering (BioE) hosted a half-day symposium on current polymer research at the University of Maryland.

Approximately 35 undergraduate, graduate, and postdoctoral students from the research groups of Professors **Al-Sheikhly** (MSE), **Briber** (MSE), **Greer** (ChBE and Chemistry and Biochemistry), **Kofinas** (BioE), **Raghavan** (ChBE), and **Sita** (Chemistry and Biochemistry) presented the results of recent projects. The goal of the symposium was to foster interactions and collaborations between students in different research groups.



POLYMER SYMPOSIUM

The cross-department, cross-school symposium was a first for those engaged in polymer research at the University, and participants were enthusiastic about its potential. Plans are in the works to make the polymer symposium an annual event, with even more research groups participating.

The symposium's subjects covered a broad range of science and engineering on polymer and biopolymer systems, including these from ChBE students:

- "New types of polymer hydrogels, organogels, and nanocomposites" –**Bani Cipriano** (ChBE) and **Peter Thomas**
- "Molecularly imprinted polymer hydrogels for selective binding of tobacco viruses" –**Linden Bolisay**

- "SAXS analysis of counterion driven folding of azoarcus and tetrahymena RNA" –**Sarvin Moghaddam** (Ph.D. '03)
- "Thermogelling and photogelling fluids based on polymers and surfactants" –**Rakesh Kumar** and **Aimee Ketner**
- "Self-assembly of polymer-like reverse micelles and fibrillar organogels" –**Shih-Huang Tung** (ChBE) and **Wei-Chi Lai**
- "Novel block copolymer electrolytes with enhanced conductivity and transference" –**Ayan Ghosh**

CASTELLANOS, GONZALES IN FUTURE FACULTY PROGRAM

Graduate students **Patricia Castellanos** and **Patricia Gonzales** were among only 20 students chosen to participate in the Clark School's new Future Faculty Program.

The Future Faculty Program (FFP), launched this year, was created to prepare students for academic careers in top-50 engineering schools. The program includes seminars, a teaching practicum, and a research mentoring practicum.

The initial noncredit component of the program was open to all graduate students interested in a career in academia. It introduced them to faculty "role models" who discussed why they chose a career in academia, how they secured tenure-track positions, and how they have achieved success.

Students who wished to stay with the program were required to apply. After a competitive selection process 20 students, including at least one representative from each of the Clark School's departments, were chosen to be Future Faculty Fellows. Fellows are awarded a supplemental fellowship, in addition to any teaching or research assistantships they may already have. Half of the funds are reserved for travel to professional conferences.

During the second, third, and fourth semesters of the program, Future Faculty Fellows attend seminars on topics such as technical writing, oral presentations, creating syllabi and curriculum, teaching and learning



BRAD GORDON

styles, identifying research areas, writing grants, and interviewing for faculty positions.

Each Fellow is also paired with a senior faculty member with whom they will teach a course and supervise an undergraduate research project, and from whom they will receive mentoring and career counseling.

GORDON ATTENDS INTERNATIONAL WINTER SCHOOL

ChBE graduate student **Brad Gordon** attended the International Winter School of Chemistry of Materials in Bangalore, India in December 2006. The school was administered by the Center for Materials Research in Santa Barbara, California, and the Jawaharlal Nehru Center for Advanced Scientific Research at the Indian Institute of Science. The week-long program, hosted by the Institute, focused on bringing students and professors together to share their knowledge of a diverse field through a series of lectures and discussions.

Gordon, who is currently modeling the diffusion of gas through porous media with advisor **Sheryl Ehrman**, was excited about the opportunity to travel to learn more about topics that could enhance his own research experience. "I was looking for expanded views, new ideas on approaching research, and connections in academia," he explained. Making academic connections is especially important—Gordon will graduate with a M.S. this spring, but will be staying with the department to pursue a Ph.D, and ultimately hopes to become a professor.

Gordon recommends the International Winter School of Chemistry of Materials to other graduate students studying any aspect of materials, regardless of their major. "The whole experience was pretty life-changing," he said. "Seeing another country and a different culture opened my eyes...it's good to get out and get exposed to something new."

FUENTEVILLA PRESENTS AT IPST, PUBLISHES IN TOP JOURNAL

ChBE Masters degree student **Daphne Fuentevilla** spoke at M.E. Fisher's Statistical Physics Seminar, held at the Institute for Physical Science & Technology (IPST) in December 2006. Her presentation was titled "Two liquid waters: secrets revealed by supercooling."

"This is very prestigious," said her advisor, ChBE Professor **Mikhail Anisimov**, who holds a joint appointment with IPST, "It's an honor for a Masters degree student to talk at this celebrated seminar."

Fuentevilla recently published her work on supercooling, a paper called "Scaled Equation of state for supercooled water near the liquid-liquid critical point," in *Physical Review Letters*, the highest-ranked journal in physics. Such an achievement is very rare for a Masters degree student, Anisimov told us. (*Physical Review Letters* 97, 195702 [2006])

KANANI'S RESEARCH RECEIVES MULTIPLE HONORS

Ph.D. student **Harin Kanani**, advised by Dr. **Maria Klapa**, has in the past year received repeated recognition for his work.

Kanani's research is in metabolomic analysis, a relatively new technology that measures the metabolic status and biochemical events associated with a cellular or biological sample from bacteria, fungi, plants, animals, or humans, producing a "metabolic fingerprint." Work in the field is rapidly expanding due to its application potential in human health, nutrition, and industry.

Kanani and Klapa have developed a novel technology, the first that greatly improves the accuracy of metabolomic analysis results. Two years ago, while reviewing their first set of data, they discovered significant problems with the accuracy and reproducibility of the information they collected using metabolomic techniques. "Luckily," Kanani explained, "we were able to come up with a very elegant solution based on an understanding of

chemical reaction kinetics and mass balance, instrument design, biological systems and statistical analysis." Their efforts to demonstrate the problem, quantify errors, and prove their approach worked ultimately earned them the University of Maryland Office of Technology Commercialization's Best Invention of the Year Award in Information Sciences in April 2006.

The project was also the runner-up in the annual 50K Business Plan Competition, in which Kanani demonstrated how their solution could be implemented commercially. A University of Maryland start-up company will use the technology as the basis to create customized software for metabolomic research and provide analysis services.

Most recently Kanani received the Best Poster Award in the Metabolic Engineering and Systems Biology poster session at the Annual Meeting of the American Institute of Chemical Engineers (AIChE) in San Francisco.

ELDER WINS RESEARCH AWARD

ChBE undergraduate **Patrick Elder** is the 2007 winner of the ASPIRE Outstanding Student Research Award, presented at the Engineering Honors and Awards Ceremony on April 19. ASPIRE, A Scholars Program for Industry-Oriented Research in Engineering, was created and is administered by the Maryland Technology Enterprise Institute (MTECH). ASPIRE introduces undergraduates to industrially-oriented engineering projects. Students perform research during the Fall and/or Spring semesters under the guidance of an engineering faculty or staff mentor.

Elder was nominated by his mentor, ChBE professor **Srinivasa Raghavan**, for his work on a group project culminating in the discovery of a new class of light-sensitive fluids, subsequently published in *The Journal of the American Chemical Society* (2007; 129[6] pp. 1553-1559). Elder has also helped present the findings at conferences, including AIChE's annual meeting in 2006.



ENGINEERS WITHOUT BORDERS: ECUADOR

COHEN JOINS EWB

In the summer of 2006, ChBE senior **Stefanie Cohen** put her engineering skills to humanitarian use when she traveled to 2 villages in Ecuador with Engineers Without Borders (EWB), a non-profit organization established in 2000 to partner with developing communities worldwide in order to improve their quality of life.

The villages in which Cohen worked, Uduzhapa and Conseco, had no sanitation systems or potable water supplies. Gastrointestinal illnesses were prevalent, particularly in the children, who suffered from parasitic infection and severe dysentery. EWB's goal was to improve sanitation by working with the villagers to build 40 pour-flush latrines. Communication was crucial, Cohen told us, in overcoming communication and other differences across 40 different installation sites so the project could be completed efficiently and successfully.

The trip was a positive learning experience. "I had the satisfaction of seeing the result of a successful project [and] knowing that I helped in the process," she told us. "[B]y the end of the trip and from the hands on experience, I fully understood the concepts of engineering and simple construction work. I worked side by side with people from a completely different culture who spoke a different language. It was also an experience being in Ecuador during the World [Soccer] Cup!"

Cohen hopes to return to Ecuador this summer, using what she's learned to make the next EWB trip a success. Possible projects include water capture, filtration-purification, chlorination, storage, and distribution systems that will provide potable water for rural communities.

CHEBES STRENGTHENS OUR GRADUATE COMMUNITY

*Patricia Gonzales, President; and
Diana Yoon, Secretary*

Graduate students have many opportunities to interact with each other during the first couple of years of their graduate careers. However, as time progresses, they become engrossed in their research and it is harder to interact with fellow students outside the



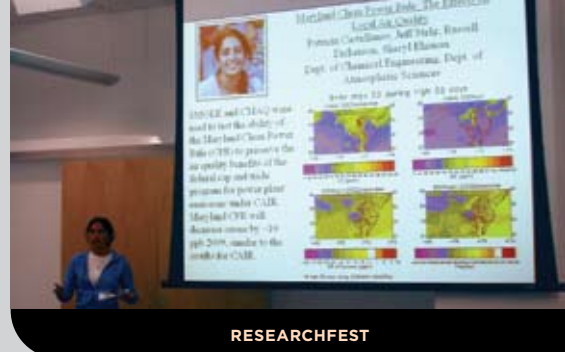
FIRST YEAR DINNER IN WASHINGTON, D.C.

laboratory. In Fall 2005, a group decided to resurrect the Chemical Engineering Graduate Students Society (ChEGS) to create a community for ChBE graduate students, and to also include students in The

Fischell Department of Bioengineering. The society has since been renamed the Chemical Engineering and BioEngineering Society (ChEBES).

The goal of ChEBES is to strengthen the graduate community within the Department of Chemical and Biomolecular Engineering and The Fischell Department of Bioengineering by organizing academic and social events. The main two academic events of the school term are ResearchFest and Maryland Day. ResearchFest showcases the various exciting research projects being conducted by current graduate students from both departments and many labs in a friendly setting. This year marked our 3rd Annual ResearchFest, which included a luncheon and a poster competition.

Our second academic event is Maryland Day, hosted annually by the University of Maryland, where our graduate students educate the public, especially young kids, about how engineering is applicable to everyday life. We accomplish this by setting up simple experiments. It is an exciting opportunity to interact with kids and parents.



Our social events give graduate students a chance to get together to relax and have fun outside the laboratory. We have several throughout the year and are continuing to add more functions to our repertoire. As always, we have barbecues, tailgate parties, and potlucks to get faculty, staff, and students out of the lab/classroom/office to mingle and eat. At the end of January 2007, ChEBES planned a weekend getaway to a nearby ski resort. We rented a house and provided discounted tickets for all those who wanted to ski, snowboard or snowtube. At the end of this semester we are planning another weekend getaway that is sure to be the talk of the graduate community.

ChEBES has come a long way and we hope that it will continue strengthening the graduate community in our departments for many years to come.

AICHE AT MARYLAND

Melissa Tsai, President

The student chapter of the American Institute of Chemical Engineers (AIChE) at the University of Maryland, College Park was founded over 66 years ago. Our primary goal is to provide undergraduate ChBE students with the resources they need in their academic and professional careers. Members receive the latest information regarding scholarships, co-ops and full-time job positions. Corporate information sessions are regularly organized to allow company representatives to interact with students and arrange for job interviews. AIChE also hosts graduate school planning seminars for those who are interested continuing their academic careers.

We also take pride in the fact that our organization helps build camaraderie among undergraduate students. Last semester, our officers recruited over 70 new members and revitalized student involvement. The ChBE curriculum can be very challenging, but upperclassmen are always willing to provide guidance and support to our younger members. Our busy student lounge provides members with a place to study, socialize, relax, and even grab a bite to eat before class.

AIChE has also been involved in numerous fundraising and social events, such as our annual barbecue, a canoeing trip, and a local brewery tour. We also sent six members on an all-expense paid trip to the

annual National AIChE conference in San Francisco, California.

This spring, AIChE will be conducting its annual election to provide a new class of officers with a chance to develop their leadership skills. Our student chapter of AIChE has been an ever-evolving organization, and we hope that its membership will continue to grow and strengthen our undergraduate ChBE community in the future.



A YEAR OF HONORS AND AWARDS FOR EHRMAN

Associate Professor **Sheryl Ehrman** has had an eventful year marked by awards, honors, and world travel. Things kicked off in May 2006, when she received a Fulbright Research Scholar Award, which she used to fund a sabbatical as a visiting professor at

the Indian Institute of Technology (IIT) in Mumbai, India, during the 2006-2007 academic year. Ehrman's project involved conducting fundamental studies that could eventually lead to better pulmonary delivery of vaccines. Inhaled vaccines can be as effective as shots, but produce far

less medical waste and reduce the risk of transmitting bloodborne illnesses.

Also participating in the project was friend and colleague Professor **Chandra Venkataraman** of IIT's Department of Chemical Engineering, who specializes in atmospheric aerosol work, air pollution toxicity, and related biological research. Now that Ehrman has returned to the United States, her and Venkataraman's labs will continue to pursue the project in parallel. Ehrman plans to return to India in 2008.

In January 2007, Ehrman was named the 2006 winner of the Clark School's E. Robert Kent Outstanding Teaching Award for Junior Faculty. She was described by those who nominated her as a recognized researcher in aerosol science and technology, and the related topic of air pollution; a passionate teacher whether offering a senior technical elective or the most introductory engineering course; and a powerful motivator of students and colleagues. She was also



SHERYL EHRMAN

facultyPLACEMENTS

The Department of Chemical and Biomolecular Engineering has a record of amazing productivity in educating future faculty. (See our related story on page 5.) Below just a sampling of recent graduates who have become faculty at top universities around the world. If you have become faculty or have recently received a promotion or tenure, please let us know!

Faculty Starting Before 2000

Won Jung Yoon (Ph.D. '92), Professor, Kyungwon University, Korea

Yang Soo Kim (Ph.D. '92), Professor, Inje University, Korea

Seong Ihl Cheong (Ph.D. '94), Professor, Hannam University, Korea

Faculty Starting in 2000

Yu Chen Hu (Ph.D. '99), Associate Professor, National Tsing Hua University, Taiwan

Faculty Starting in 2001

Ryan T. Gill (Ph.D. '99), Assistant Professor, University of Colorado-Boulder (US top 50)

Faculty Starting in 2002

Ranjan Srivastava (Ph.D. '99), Assistant Professor, University of Connecticut (US top 50)

Faculty Starting in 2003

Matthew Delisa (Ph.D. '00), Assistant Professor, Cornell University (US top 50)

Hsu-Wei Fang (M.S. '96, Ph.D. '03), Associate Professor, National Taipei University of Technology, Taiwan.

Faculty Starting in 2004

Hyunmin Yi (Ph.D. '03), Assistant Professor, Tufts University

Faculty Starting in 2005

David Green (Ph.D. '01), Assistant Professor, University of Virginia (US top 50)

John March (Ph.D. '05), Assistant Professor, Cornell University (US top 50)

Faculty Starting in 2006

Jung Hyeun Kim (Ph.D. '03), Assistant Professor, University of Seoul, Korea

Cheng-Chung Chou (M.S. '96, Ph.D. '99), Assistant Professor, National Chung Cheng University, Taiwan

Faculty Starting in 2007

Hyuncheol Kim (Ph.D. '04), Assistant Professor, Duke University

SENGERS CO-AUTHORS BOOK ON HYDRODYNAMIC FLUCTUATIONS

DISTINGUISHED UNIVERSITY PROFESSOR EMERITUS AND FORMER CHBE CHAIR **JAN V. SENGERS** HAS CO-AUTHORED A NEW BOOK WITH **JOSE M. ORTIZ DE ZARATE**, ASSOCIATE PROFESSOR, APPLIED PHYSICS DEPARTMENT OF THE COMPLUTENSE UNIVERSITY IN MADRID, SPAIN. IN THE FALL OF 2006, ELSEVIER PRESS PUBLISHED *HYDRODYNAMIC FLUCTUATIONS IN FLUIDS AND FLUID MIXTURES*, "THE FIRST COMPREHENSIVE TREATMENT OF FLUCTUATIONS IN FLUIDS AND FLUID MIXTURES THAT ARE BROUGHT OUT OF EQUILIBRIUM BY A TEMPERATURE OR CONCENTRATION GRADIENT, BUT THAT ARE STILL IN A QUIESCENT STATE WITHOUT MACROSCOPIC CONVECTION OR TURBULENCE."

recognized for her prior service as the department's graduate program director, working to recruit and retain great students; and her continuing dedication to supervising undergraduate research projects and outreach activities that target women and minorities.

In February 2007, Ehrman was honored yet again when she was selected to join Keystone: The Clark School Academy of Distinguished Professors. Keystone professors make a commitment to the improvement of education in fundamental engineering courses. The program is a renewable three-year appointment that includes a base salary increase, discretionary funds to support the recipient's activities and additional support personnel.

Keystone aims to help improve student retention and graduation rates by ensuring students the best learning experiences in the early, formative stages.

"I am honored to be a part of the program," said Ehrman. "I have always enjoyed teaching the Introduction to Engineering Design course. I look forward to working with the other Keystone professors to evolve the course into an experience that will really get students excited about engineering, as well as one that will get them off to the right start when it comes to fundamental skills they will need later on."

CROSS-DISCIPLINARY TEAM SEEKS TO IMPROVE CONTROL SYSTEM FOR CANCER DIAGNOSIS, TREATMENT

Professor **Thomas McAvoy** (Emeritus, ChBE, Institute for Systems Research, and Bioengineering) is part of a team of University of Maryland engineers, scientists, and oncologists awarded an NIH grant for a project titled "Feedback Control and Inferential Modeling for Radiotherapy." The project's goal is to develop a new approach to planning and conducting radiation treatment in cancer patients.

While receiving treatment, a patient's respiration may cause a tumor to move, making the delivery of radiation to the right place more difficult, and irradiating healthy tissue in the process. Previous attempts at addressing the problem included having the patient hold his or her breath and gating, a system in which delivery is synchronized with the patient's breathing. Holding breath can be difficult for patients, while gating increases the amount of time needed to deliver the treatment, and as a result increases the cost.

McAvoy and his team are developing a motion-synchronized "treatment couch" that uses feedback control and inferential skin markers to follow tumor movement and direct the radiation therapy. While tumors are not monitored during radiation treatment,

CHOI ELECTED TO KAST

PROFESSOR AND UNDERGRADUATE PROGRAM DIRECTOR **KYU YONG CHOI** WAS ELECTED A PERMANENT MEMBER OF THE KOREA ACADEMY OF SCIENCE AND TECHNOLOGY (KAST) IN SEOUL, KOREA ON NOVEMBER 17, 2006. HE WAS ELECTED A MEMBER OF THE KAST IN 2001, AND A MEMBER OF THE NATIONAL ACADEMY OF ENGINEERING OF KOREA (NAEK) IN 2000.

DR. CHOI HAS BEEN A MEMBER OF THE DEPARTMENT OF CHEMICAL AND BIOMOLECULAR ENGINEERING SINCE 1984. HE CURRENTLY LEADS THE POLYMER REACTION ENGINEERING LABORATORY, WHICH FOCUSES ON POLYMERIZATION KINETICS, POLYMERIZATION REACTOR/PROCESS MODELING, CONTROL, AND OPTIMIZATION.

markers on the patient's skin can be, allowing the system to estimate where a tumor is based on the markers' position. This information on tumor location is then used via a feedback control system to move the treatment couch to compensate for breathing-induced tumor motion, resulting in the tumor being effectively held in a stationary position. McAvoy has four decades of experience developing feedback control systems and also specializes in inferential sensing, making him a key member of the development process. As part of the research, the team will build a working prototype treatment couch. If ultimately put into clinical use, the couch could significantly increase the accuracy and effectiveness of treatments for lung and upper abdominal cancers.

MCAVOY ELECTED IFAC FELLOW

PROFESSOR **THOMAS MCAVOY** (EMERITUS, CHEMICAL AND BIOMOLECULAR ENGINEERING, INSTITUTE FOR SYSTEMS RESEARCH, AND BIOENGINEERING) HAS BEEN ELECTED A FELLOW OF THE INTERNATIONAL FEDERATION OF AUTOMATIC CONTROL (IFAC).

THE CITATION READS, "FOR CONTRIBUTIONS TO PROCESS CONTROL, PARTICULARLY PIONEERING WORK ON NEURAL NETWORK APPLICATIONS, AND FOR SERVICE AS EDITOR IN CHIEF OF THE JOURNAL OF PROCESS CONTROL." DR. MCAVOY RECEIVED THE HONOR AT THE IFAC COUNCIL MEETING IN HEIDELBERG, GERMANY IN FALL 2006.

EHRMAN (RIGHT) WITH STUDENTS AT IIT, INDIA



MILLER APPOINTED TO NRC OFFICE

The Nuclear Regulatory Commission (NRC) has appointed alumnus **Charles Miller** (Ph.D. '74) the director of a new program office, tentatively called the Office of National Materials Program. The office will combine the Office of State and Tribal Programs with segments of the current Office of Nuclear Material Safety and Safeguards, including the Division of Industrial and Medical Nuclear Safety, where Miller has served as director since 2003. Miller has worked for the NRC since 1980, in positions involving reactor regulation, emergency preparedness and response, and materials regulation.

BRIERLEY JOINS BOARD OF DALLAS DESIGN FIRM

Harold Brierley (B.S. '65) was recently elected to the Board of Directors of Rees Associates, Inc., an architecture, interior design, and planning firm located in Dallas, Texas. Brierley is the Chairman and CEO of The Brierley Group, LLC, which specializes in creating and implementing customer loyalty programs. Brierley is also the CEO of e-Rewards, Inc., the country's largest online research panel; and e-Miles, LLC, an online advertising channel. A very active member of his community, he also serves on the Board of Directors for the Dallas Center for the Performing Arts, the Executive Board of the Dallas Symphony Association, and the Board of KERA-TV. He is one of the Dean's Advisors for Harvard Business School, where he received his MBA; and also serves on the Board of the National Forest Foundation.

YUNG PUBLISHES WORK ON ARTIFICIAL ORGANS

Chong W. Yung (Ph.D. '05) has published new research on biohybrid artificial organs (BAOs) that could change the way patients with cancer and other diseases receive treatment. The article, "Counteracting apoptosis and necrosis with hypoxia

responsive expression of Bcl-2Delta" was recently published in *Metabolic Engineering*, 2006;8(5):483-90.

Biohybrid artificial organs are medical devices made from synthetic materials and living cells that, once implanted into a patient's body, make and release therapeutic drugs. Since BAOs typically do not have a blood supply, their supply of oxygen and nutrients is limited. This reduces the length of time they are able to function properly. Eventually, BAO cells tend to suffer from hypoxia, a lack of oxygen, which results in decreased activity and functioning, or worse, death.

To address this problem, Yung and his colleagues experimented with a BAO designed to produce interleukin 2 (IL2), a cancer-fighting drug. By inserting a genetic switch called 5HRE, they engineered the BAO's cells to also manufacture a protein called Bcl2-Delta, which helps them stay healthy and productive. When low oxygen conditions are sensed by the cells, 5HRE activates the production of Bcl2-Delta, giving the BAO the ability to manage and correct its level of stress. Results were promising: cells with the 5HRE/Bcl2-Delta combination "showed an increased level of protein production as the oxygen was decreased" when compared with those without Bcl2-Delta, or those using a different genetic switch.

We caught up with Yung, who is now a postdoctoral fellow at the Harvard Medical School in the Ingber Laboratory, Children's Hospital Boston, to ask him how his experiences at the University of Maryland prepared him for his current work. "I would say that it was one of my most gratifying experiences," he told us. "I was lucky to be co-advised by two great scientists and friends, [Former ChBE Professors] Bill Bentley and Tim Barbari, who enthusiastically injected their expertise into my project on creating biohybrid artificial organs...[they] were able to blend intellectual freedom with practical boundaries that allowed me to develop myself as a creative and independent researcher."

IN MEMORIAM: DICK DUFFY

Dick Duffey (Ph.D. '56), 89, died in North Manchester, Ind., on November 10, 2006.

Duffey came to the department in 1954 as an instructor after seven years with the U.S. Atomic Energy Commission. That same year he established the nuclear engineering program, followed by nuclear reactor project in 1957, serving as its director through 1967. Along the way he was promoted to professor in the Department of Nuclear Engineering, and afterward became an emeritus professor. He was the author or co-author of over 100 articles in technical and professional journals.

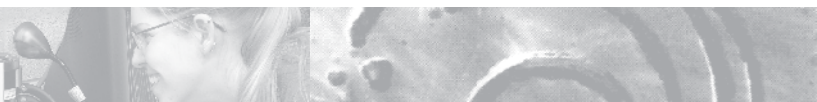
During World War II, Duffey's assignments with the U.S. Army included work on the Manhattan Project. He received an Army Commendation Ribbon for "outstanding service in connection with the development of the Atomic Bomb." He retired as a Lieutenant Colonel from the Army Reserves and the Corps of Engineers.

Duffey was a licensed professional engineer who consulted for the Atomic Energy Commission, the National Science Foundation, and the Department of Energy. He conducted research at many nuclear sites, including Hanford, Argonne, Los Alamos and Oak Ridge. He was a charter member of the American Nuclear Society and a life member of many other organizations including the American Institute of Chemical Engineers; the honor societies Sigma Xi, Tau Beta Pi, and Alpha Nu Sigma; and the New York Academy of Sciences.

IN MEMORIAM: ALICE FOREMAN

Alice Gillette Forman (B.S. '99), 30, died in Charleston, Sc., on July 13, 2006.

After graduating from the University of Maryland, she worked as a chemical engineer with paper producer P.H. Glatfelter Company in York, Pa., then joined MeadWestvaco, where she worked as a paper process engineer. Foreman was regarded by her colleagues as an expert in



2004-2006 PH.D. GRADUATES

December 2004

Youngsoon Um: Isolation and Characterization of Polycyclic Aromatic Hydrocarbon-Degrading Micro Organisms Under Methanogenic Conditions.

August 2005

Pinar Akcora: Synthesis and Characterization of Diblock Copolymer Templated Iron Oxide Nanoparticles.

Kimberly A. Brown: An Analysis of a New Approach to Sol-Gel Synthesis the Reaction of Formic Acid with TEOS.

Kedar H. Dave: Analysis of Rheological Properties and Molecular Weight Distributions in Continuous Polymerization Reactors.

December 2005

Isaac Koh: Fictionalization of Nanoparticles for Biological Applications.

John Mahle: Adsorption Humidity Effects Microparticle Rate Behavior and Thermal Swing Adsorption.

Oluwatosin Ogunsola: Synthesis of Porous Films From Nanoparticle Aggregates and Study of Their Processing Structure Property Relationships.

Chong W. Yung: Tissue and Metabolic Engineering of Biohybrid Artificial Organs.

May 2006

Jing Chen: Development of an Object-Oriented Framework for Modular Chemical Process Simulation with Semiconductor Manufacturing Applications.

Inuka D. Dissanayake: Relaxation and Stiffening Dynamics of a Single Semiflexible Polymer Chain.

Jae-Ho Lee: Soft Materials Based on Vesicles and Biopolymers.

August 2006

Seonmin Kim: Surface Modification of Metal Oxide Nanoparticles by Capillary Condensation and its Applications.

Jingtao Wang: The Nature of Asymmetry in Fluid Criticality.

December 2006

Marwan Charrouf: On the Fluid Dynamics of Virtual Impaction and the Design of Slit Aerosol Sampler.

Rinku P. Parikh: Simulation Based Design Optimization and Control of Silicon Carbide and Gallium Nitride Thin Film Chemical Vapor Deposition Reactor Systems.

packaging, structural cardboard, clean paper manufacturing and mill troubleshooting.

Foreman is remembered by friends and faculty as a quiet, confident student, but she also had a vibrant side not everyone got to see. Fellow alumna and close friend **Tracey Check** (nee Squires) told us, "We often joked that we spent so much time together that we should be given one diploma instead of two... with the name 'Tralice Squorman' on it. I feel lucky that I got to know the other parts of Alice...the sarcastic, witty, and fun parts. She was a warm and generous friend and I will miss her."

Foreman was an active member of AIChE, the Alpha Chi Sigma chemistry fraternity, and Tau Beta Pi. She was also an officer in the Society of Women Engineers. In these roles, she was a mentor to other young women majoring in ChBE.

A scholarship in her name for women students of ChBE is being planned.

Contributions may be made in the form of checks payable to:

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Scholarship Fund
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University of Maryland
College Park MD 20742-1531

FANG RECEIVES TENURE

Hsu-Wei Fang, (M.S. '96, Ph.D. '03), was promoted to Associate Professor in the Department of Chemical Engineering and Biotechnology at National Taipei University of Technology, Taiwan. He is the chief of foundation development of the Alumni Liaison Center of NTUT, and in 2005 accepted an invitation from the Taiwanese Cabinet to serve a 2-year appointment as a BioTaiwan Committee Member. His research interests include artificial joints, biotribology and mechnobiology of cartilage, boundary lubrication of interfacial biomolecules, and biodegradable nanocomposite materials.

greatEXP_ECTATIONS

T.K. "Patrick" Sung (M.S. '69 and Ph.D. '72, chemical engineering) and his wife, Marguerite (B.S. '70, mathematics), have pledged \$1.5 million to the Clark School to establish two endowed professorships in the Department of Chemical and Biomolecular Engineering. The Sungs made their gift through the University's *Great Expectations* campaign, which supports our mission to transform lives through exceptional educational and research opportunities. Your contributions can support ChBE initiatives such as graduate fellowships, undergraduate scholarships, and discretionary funds for professors. Please see the Chair's Message on p. 2 and visit www.greatexpectations.umd.edu to learn more.

Gifts may be made by check to "University of Maryland College Park Foundation (UMCPF)." Please designate "Chemical and Biomolecular Engineering" in the memo line, and mail to:

F. Joseph Schork, Professor and Chair
Department of Chemical & Biomolecular Engineering
2113D Chemical and Nuclear Engineering Building
University of Maryland, College Park, MD 20742

You can help make a difference with a gift of any amount!

COLUMNS is published for alumni and friends of the Department of Chemical and Biomolecular Engineering at the A. James Clark School of Engineering.

Your alumni news and comments are welcome. Please send them to: Editor, Department of Chemical and Biomolecular Engineering, 2113 Chemical and Nuclear Engineering Building, College Park, MD, 20742. Visit our web site at: <http://www.chbe.umd.edu>

Department Chair: Dr. F. Joseph Schork
Editor: Faye Levine

RAGHAVAN RECEIVES TENURE

SRINIVASA RAGHAVAN WAS PROMOTED TO ASSOCIATE PROFESSOR WITH TENURE EFFECTIVE AUGUST 23, 2007. RAGHAVAN STUDIES COMPLEX FLUIDS, POLYMERIC AND BIMOLECULAR SELF-ASSEMBLY, AND SOFT NANOSTRUCTURES. OUR COVER IMAGES SHOW MICRO-SIZED, BIPOLYMER CAPSULES FOR THE DELIVERY OF DRUGS, VACCINES, AND COSMETIC AND FLAVOR INGREDIENTS, CREATED IN RAGHAVAN'S COMPLEX FLUIDS AND NANOMATERIALS LABORATORY. FOR DIFFERENT APPLICATIONS, THE CAPSULES' STRUCTURE AND SURFACE PROPERTIES MUST BE TAILORED AT THE NANOSCALE.

FOR MORE FACULTY NEWS, SEE PP. 8-9.



A. JAMES CLARK

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