Dear Alumni and Friends of the Department:

The past year was one of progress and growth for our department. We have become more accustomed to our new name, the William G. Lowrie Department of Chemical and Biomolecular Engineering, but for our 160 sophomores, it is all they have ever known. Those students completing our first courses in Material and Energy Balances comprise the largest class we have ever seen. Our faculty and graduate students who serve as teaching assistants are doing their very best to provide a quality education even though they are coping with fairly large section sizes. Last year we went to three sections with enrollments of 54, 57 and 67 students in our first course, ChBE 200, Chemical Process Calculations. Our graduating class was also large with 72 students earning their degrees last year and for the next several years we expect graduating classes of over 100.

To help with the increased enrollment and to add a new dimension to our research capabilities, we have added one new faculty member, David Wood, who comes to us from Princeton University. David is a chemical engineer with research interests in applied molecular biology, and we are most pleased to welcome him as our 18th faculty member. Additionally, John Corn, who was helping us as an instructor in our summer lab and design courses, retired. We were able to replace him with Carlo Scaccia. Both Carlo and John had distinguished careers at Ashland Chemicals and both were on hand last summer to lead our unit operations course taken by 118 of our juniors and seniors. Profiles of David Wood and Carlo Scaccia can be found in this Annual Report.

The Department continues to be very research intensive. Research expenditures last year were at an all time high of more than $13.3M or $780K/ faculty member on average. Large grants were won by Jim Lee in the area of nanotechnology, and several grants related to energy research were won by L.S. Fan, Winston Ho and Umit Ozkan. This was the third consecutive year that research expenditures exceeded $12M and was only made possible by having our entire faculty very active in research along with their postdocs, graduate students and undergraduate researchers.

Finally, plans for our new building are proceeding along the promised timetable of having us occupy a new Koffolt Laboratories by the end of 2014. The site will be just West of our current location with the buildings Boyd, Johnston, Aviation and Haskett, (which are not in good condition) being torn down and replaced by a large Chemical and Biomolecular Engineering and Chemistry (CBEC) complex devoted to a collaborative chemical sciences research and education environment. The building will be more than 210,000 gross square feet with 109,000 assignable square feet for our two departments. The Koffolt Laboratories portion of the complex will occupy 60% of the space. Most of the research in Chemistry’s Evans Laboratory will be relocated to the new building. We are excited about the possibilities of increased research cooperation with our colleagues in Chemistry. Meanwhile the total building cost is $126M, including our fund raising obligation of $17.5M. We are making good progress in this capital campaign and thank all those alumni and friends who have given or pledged gifts for the building. Progress to date takes us to about 75% of our goal, though a good number of space naming opportunities remain.

Best wishes on behalf of our faculty, staff and students.

Stuart L. Cooper
Professor and Chair
coopers@chbmeng.ohio-state.edu
614-247-8015
Table of Contents

Letter from the Chair

News

2 Professor Fan's Clean Coal Research Recipients
3 Distinguished Alumnus Award Recipients
4 Jeffrey Chalmers-Tumor Cell Research
5 Stuart Cooper Receives Stimulus Grant
5 NSEC Receives Grant
5 Umit Ozkan Receives WIC Mentorship Award
6 Bhavik Bakshi's Energy Life Cycle Research
7 Advancing Production of Biofuel
7 New Instructor Carlo Scaccia
8 Oxygen-Carrying Solutions for Transfusion Medicine-Andre Palmer
9 Winston Ho and Group Develop High-Flux Desalination Membranes
10 Lowrie Lectures
11 2009 Advisory Board Meeting

Undergraduate Program

12 Course Enrollment
13 Cooperative Learning Experiences
14 2009 Placement Record
17 Department Graphs
18 Undergraduate Scholarship Information

Graduate Program

20 Ranking
20 Faculty Productivity
21 Graduate Degrees Granted
21 Graduate Student Fellowships
21 Research Expenditures
22 Graduate Program Seminar Series
23 Graduate Student Awards

24 2009 Alumni Donors

26 Faculty

37 CBE Faculty and Staff

Photography: Geoff Hulse
University recognizes generosity with first-ever named department.

The U.S. Department of Energy has awarded a $5 million grant to professor L.S. Fan for research related to clean coal technology. Fan’s grant is part of $151 million awarded through the Department of Energy’s recently-formed Advanced Research Projects Agency-Energy (“ARPA-E”).

L.S. Fan, internationally recognized for his expertise in energy and environmental reaction engineering, will use the grant to further develop a process he invented to convert coal and biomass to electricity while capturing carbon dioxide emissions.

Dr. Fan has successfully demonstrated the process, called syngas chemical looping, on a small pilot scale. With the new grant, he will scale up the process to a 250 kW pilot plant to obtain performance data to prove the process eventually can be commercialized for coal-based power plants, contributing to the United States’ efforts toward energy independence and greenhouse gas emission reductions.

The syngas chemical looping process Fan and his research group developed uses an iron oxide-based chemical looping medium to indirectly and flexibly convert carbonaceous fuels such as coal and biomass into hydrogen and/or electricity while at the same time capturing and separating the carbon dioxide. The process is simpler and more efficient compared to conventional gasification processes. Moreover, the pollutant and greenhouse gas management cost for the syngas chemical looping process is minimal compared to conventional process schemes.

Fan’s 250 kW pilot plant demonstration will be at the National Carbon Capture Center, which the U.S. Department of Energy formed this spring in Wilsonville, Ala., for a combined operating time of more than 3,000 hours. Fan expects the testing of the new pilot plant to finish by early 2013, with the next scale up to follow immediately.

Fan’s team will work with the Particulate Solids Research Institute to design and operate a cold flow model for the plant; Shell/CRI in preparing the iron oxide-based chemical looping medium; Babcock and Wilcox Co., Air Products and Chemicals Inc., and IWI Inc. for the design and construction of the plant; and CONSOL Energy, which will independently perform techno-economic analysis and collaborate with Ohio State and other partners on the commercialization plan.
Congratulations to the following Chemical Engineering Alumni
Recipients of the 2009 Distinguished Alumnus Award!

James F. Dietz
Jim Dietz, a native of Botkins, Ohio, received both a Bachelor of Chemical Engineering degree in 1969 and a Master of Science in Chemical Engineering in 1970 from The Ohio State University.

In 1969, Dietz began his career with Standard Oil of Ohio (Sohio) at the Vistron Chemical Plant in Lima, Ohio. He worked in various engineering and production supervisor positions in the nitrogen fertilizer facilities until 1980, when he transferred to Vistron’s new grassroots chemical plant near Victoria, Texas. After construction and startup of this new complex, Dietz continued to work there as operations manager until 1989. In 1986 British Petroleum (BP) acquired Standard Oil of Ohio, and in 1989, Dietz accepted a position in London as project director of a new European chemical plant. After one year, the project was shelved and he became production manager at BP Chemicals chemical complex in Grangemouth, Scotland. In 1993, Dietz resigned from BP after 24 years of service to take the position of vice-president of manufacturing with Arcadian Corporation in Memphis, Tenn. When Arcadian was purchased in 1997 by Potash Corporation of Saskatchewan (PCS), he was named executive vice president, PCS Nitrogen. In November 2000, Dietz was named executive vice president and chief operating officer for Potash Corporation. In addition to responsibility for Potash Corporation’s worldwide operations, he has responsibility for the company’s safety, health and environment performance and procurement functions.

Dietz and his wife, Patricia (Pat), reside in Northfield, Illinois, a suburb of Chicago. They have four children, Anita, Bradley, Douglas, and Marcia, and five grandchildren.

F. William Hauschildt
After receiving his bachelor’s degree in chemical engineering from Ohio State in 1967, Bill Hauschildt began his career at Amoco R&D.

Over the years, Hauschildt developed an extensive technical, operational and commercial background. Among his posts with Amoco, he has been a refining process and catalysis researcher; technology manager at R&D (Process, Catalysis & Environmental Research), Operations; operations manager at the Whiting Indiana Refinery; health safety and environment regional manager (supporting Refineries, Pipeline, Marketing and Chemical plant operations); and refining planning manager (Capital Spending and Business Planning), all in the Chicago area. From 1996 to 1998, he was based in London, and was responsible for an Off-Shore North Sea Oil Brent system joint venture focused on late life reservoir and platform operations management. He was also responsible for technical and environmental preparations and acted as liaison with the UK government in planning for decommissioning of the field. After the BP-Amoco merger, Hauschildt’s last BP assignment was on the ARCO Merger Integration Team, where he was responsible for the integration of the ARCO Refining operations and related technology development and support into the BP Amoco refining system.

Hauschildt also holds a master’s degree in chemical engineering from the Illinois Institute of Technology and participated in Harvard’s Program for Management Development. He holds five U.S. patents in refining process and catalysis and was responsible for implementing technical developments and later in his career, operations management at Amoco. He was active in the advisory group for Ohio State’s departments of chemistry and chemical engineering, in the area of catalysis. He was also involved with the advisory group to Northwestern University’s Catalysis Center.
Professor Jeffrey Chalmers and colleagues have developed devices to detect circulating tumor cells from patients with head, neck, breast, and other cancers. Jeff’s team has earned eight patents based on this technology, as well as created jobs and attracted multimillion dollar funding. Ultimately this capability has the potential for saving lives. Their medical invention is just one example of how Ohio State innovation bolsters the state’s economy.

For example, in collaboration with Professor Ratnasingham Sooryakumar, of OSU’s Department of Physics, the device was developed from a tiny piece of square-centimeter silicon inlaid with rows of zigzagging magnetic wires. At each corner, the wire behaves like two magnets pointed north to north or south to south. The fields of the two magnets create a point of strong attraction just above them. A nearby magnetic object, such as a magnetically-tagged cell is attracted to the corner and gets stuck there.

To get the particles moving, the researchers then place two magnetic fields around the chip one in the plane of the chip and the other perpendicular to it. By flipping the direction of these fields, the researchers can guide tagged cells along the zigzagging wire and even make them jump from one wire to the next. The researchers computerized the magnetic field switching so that a user can steer the cells by simply handling a joystick. Chalmers and colleagues put the device through its paces with magnetically-tagged T-cells, the body's guardians against infection. They snapped the cells to attention at one end of the chip, marched them down to the other end, and made them hop from one wire to another, reaching speeds of about 20 micron, or about a one-fifth the width of a human hair, per second.

Chalmers said that the device would be ideal for examining tumor cells. “Part of the problem with cancer is that it's our own cells going haywire, so it's a heck of a lot harder to figure out what's different,” Chalmers said. With this method, he said, researchers could magnetically tag the well-understood healthy cells and then remove them from a sample, leaving only the cancerous cells. Chalmers said this would be a boon to both a researcher studying a specific type of cancer or a clinician diagnosing a patient.

The small magnetic fields are gentle on specimens; the device works on a flat surface, an improvement over other methods; and it's also cost-effective with the whole set-up costing only about $200.
Stimulus Grant Funds Health Testing Research

A team of Ohio State researchers has received federal stimulus money to develop a test for detecting rare cells that are among the most promising potential biomarkers of vascular health and aging.

Stuart Cooper, Professor and Department Chair, and Nicanor Moldovan, an investigator with the Davis Heart and Lung Research Institute, received a $1.2 million, two-year Grand Opportunities award from the American Recovery and Reinvestment Act "stimulus package" of the National Institute of Aging at the National Institutes of Health.

Current testing for the concentration of these cells, called endothelial progenitor cells, takes about a month. Cooper, Moldovan and colleagues are working to develop a much faster process — requiring just one to two days — that would use specially designed peptides from proteins that would adhere to the progenitor cells. The peptides would be connected to magnetic nanobeads so that once they adhere to the progenitor cells, they could be separated from the rest of the blood cells magnetically. The progenitor cells would then be grown into cell colonies for further analysis.

The researchers plan to use the method to test blood of populations of children, adults and seniors to determine whether various disease states could be detected via the concentrations of the cells. The research is estimated to have a combined direct and indirect economic impact of $3.3 million and 10 full-time jobs over its two-year period.

The Nanoscale Science and Engineering Center (NSEC) wins a $12.5M 5 year renewal from NSF

The Nanoscale Science and Engineering Center (NSEC) for Affordable Nanoeengineering of Polymeric Biomedical Devices (CANPBD) was recently awarded a $12.5M grant by the National Science Foundation in support of the Center’s renewal through Phase II (10/01/2009-09/30/2014). Professor James Lee continues as the Principal Investigator.

The research vision of CANPBD is to revolutionize medical diagnosis and medicine by establishing an affordable multiscale synthesis and fabrication protocol leading to nanofluidic and polymer therapeutic devices for personalized nanomedicine. An important emphasis of Phase II is to commercialize the developed technologies in close collaboration with end users.

The broader impacts of the activities planned for Phase II are to (1) commercialize nanoengineered biomedical devices through affordable manufacturing methods and novel design, (2) extend research results from medical/biology applications to functional nanocomposites, water treatment, homeland security, environmental protection, and food industry toxicology, (3) establish new products and new industries to create high-paying jobs in the US, and (4) train the 21st century workforce in economically important and critical high-tech fields.

Umit Ozkan Receives WIC Mentorship Excellence Award

Dr. Umit Ozkan is the 2009 recipient of AIChE’s Women’s Initiative Committee (WIC) Mentorship Excellence Award. This award recognizes Dr. Ozkan’s dedication and contributions to the development of the next generation of chemical engineers through outstanding mentoring and teaching. Dr. Ozkan joined our faculty in 1985. As stated in the award announcement her success in research, teaching and administration and her personal interactions with students have provided a role model for a great many female students as they embark on their professional careers. Dr. Ozkan received the Mentorship Excellence Award of $5,000 at the WIC Lunch at the National AIChE meeting in Nashville on November 9th.
Bhavik Bakshi’s Energy Life Cycle Research

Bhavik Bakshi, professor of chemical and biomolecular engineering, aims to change the practice of implementing breakthrough technologies without first examining the entire energy life cycle — from obtaining the raw material through disposing of the product.

“We need to think about the scale of use and broader applications,” says Bakshi, who is research director of the university's Center for Resilience. “Omitting this step is one of the root causes of the unexpected surprises that often come with new technologies.”

With funding from the National Science Foundation and Environmental Protection Agency, Bakshi is examining the environmental burden of carbon nanofibers, desired in various manufacturing applications for their mechanical strength, thermal and flame resistance, barrier properties, electrical conductivity and resistance to chemical attack.

To determine the life cycle energy use of those carbon nanofibers, he examined each stage of their cycle. First, he and L. James Lee, along with doctoral student Vikas Khanna, compared the manufacture of nanofibers with that of traditional materials on an equal mass basis. “The best carbon nanofiber currently requires 300 times more energy than steel for production on a per-kilogram basis. That’s the killer,” Bakshi says. Since processes using nanomaterials are in nascent stages, he expects the ratio to improve as new technologies are developed.

In addition, energy savings resulting from the use of carbon nanofibers in products as well as the increase or decrease in demand for those products will be deciding factors when comparing the materials. Bakshi and Khanna continued the research by evaluating the carbon nanofibers when they are used in polymer nanocomposites for automotive body parts. In an analysis of the materials from the natural resources to the factory gate, they found that vehicles with polymer nanocomposite parts, depending on the quantities of carbon nanofibers and the other materials in the resulting composites, use 1.4 to 10 percent less energy than a conventional car, mainly because the lighter nanocomposites result in less fuel consumption as the lighter car is driven. This corresponds to driving 9,000 to 13,000 miles less during the life of an average car.

Faculty Member—David Wood

David Wood joined the faculty this past fall as an associate professor. His work focuses on protein engineering, bioseparations and biosensing. Originally from El Paso, Texas, he completed a double major in Chemical Engineering and Molecular Biology as an undergraduate at Caltech in 1990. He then spent some time in industry before going on to graduate school. His Ph.D. work at Rensselaer Polytechnic led to the generation of an engineered, evolved self-cleaving protein subunit for applications in recombinant protein purification. He then joined the Chemical Engineering faculty at Princeton University as an assistant professor in 2001. At Princeton, he combined this self-cleaving element with two novel self-cleaving purification tags to create powerful and convenient non-chromatographic bioseparation technologies. In addition, he has created new hybrid proteins that allow simple bacterial cells to react to human hormones and hormone-like chemicals. These cells are now being used to discover new drugs for various disorders, as well as detect hormone-like pollutants in the environment. These technologies have now been requested by over 100 laboratories worldwide, and have the potential to significantly impact the way protein-based pharmaceuticals are manufactured worldwide.
Engineers at Ohio State are testing a new biobutanol fermentation technology at a recently constructed pilot plant in Gahanna, Ohio. 

Shang-Tian Yang, professor of chemical and biomolecular engineering, and his colleagues developed a way to double the production of the biofuel butanol, which might someday replace gasoline in automobiles. With support from a $1 million grant from Ohio Department of Development Third Frontier Advanced Energy Program, Yang partnered with ButylFuel, a start-up company, to build the pilot plant.

Yang’s process improves on the conventional method for producing butanol in a bacterial fermentation tank. Normally, he explains, bacteria could only produce a certain amount of butanol — perhaps 15 grams of the chemical for every liter of water in the tank — before the tank would become too toxic for the bacteria to survive. Yang and his colleagues developed a mutant strain of the bacterium clostridium beijerinckii in a bioreactor containing bundles of polyester fibers. In that environment, the mutant bacteria produced up to 30 grams of butanol per liter.

Once developed as a fuel, butanol could potentially be used in conventional automobiles in place of gasoline while producing more energy than another alternative fuel, ethanol. “Today, the recovery and purification of butanol account for about 40 percent of the total production cost,” explains Yang. “Because we are able to create butanol at higher concentrations, we believe we can lower those costs and make biofuel production more economical.”

Instructor-Carlo Scaccia

Carlo Scaccia joined the Department last summer, bringing with him thirty years of experience in the Chemical Industry as researcher and executive officer. His research interests encompass polymers, composites, adhesives/sealants/coatings, three-phase reactor dynamics, electronic chemicals, fermentation/biochemistry, rheology, thermal oxidation, water treatment, instrumentation and bench scale-pilot plant-commercial operations. After receiving his Ph.D. from SUNY, he joined Dow/Union Carbide where he conducted and directed research on new process/product development. He subsequently joined Ashland Inc. as VP of Research and later as Officer-VP and General Manager of the Specialty Polymers & Adhesives Division. Most recently, he held the concurrent positions of General Manager US Operations and VP of Global Technology at Sensient Technologies in the food and beverage flavors industry. The eleven patents he was granted have been commercialized. He has published several articles and previously taught undergraduate courses at SUNY and OSU. He holds a registered professional engineer license and is a graduate of the Harvard Business School- Advanced Management Program.
Oxygen-Carrying Solutions for Transfusion Medicine

Associate professor, Andre Palmer, and his research team are developing oxygen-carrying solutions for transfusion medicine. One area of focus is on synthetic red blood substitutes, which may one day lead to a universal blood supply.

In the United States, allogeneic red blood cell (RBC) transfusion has long been considered an important treatment option for patients suffering from blood loss. However, the recent emergence of infectious agents such as the H1N1 influenza virus and others has put the blood supply at risk.

Currently, the American Red Cross tests donated blood for hepatitis B and C viruses, human immunodeficiency virus (HIV), human T-cell lymphotropic virus, syphilis, West Nile virus and the agent of Chagas disease. As a result the safety of the U.S. blood supply, in terms of transfusion, transmitted diseases is quite good. However as new infectious agents emerge the costs of a unit of blood increases; since additional screening tests may have to be conducted before blood can be distributed to health care providers. Of more concern is the fact that donated blood may contain yet to be identified infectious agents. In addition there are new concerns regarding the safety of blood transfusions following extended durations of storage.

The safety of the blood supply in developing countries is even more problematic, since serious concerns still exist about the risks associated with blood transfusion including: potential contamination by blood-bourn pathogens; fatal immunological reactions; acute lung injury and even mistransfusion. To further compound the problem, the availability of human blood is even more limited in emergency situations such as wars or natural disasters. Therefore, it has been a long-term goal of scientists and engineers to develop an efficacious and safe universal RBC substitute for use in transfusion medicine.

Toward this goal, Palmer is developing a wide range of hemoglobin-based oxygen carriers (HBOCs) including: polymerized hemoglobins, vesicle encapsulated hemoglobins and recombinant hemoglobins. These HBOCs can be used as RBC substitutes in transfusion medicine and oxygen delivery vehicles in tissue engineering.
Professor Winston Ho and Group Develop High-Flux Desalination Membranes

Professor Winston Ho and his group members have developed an advanced membrane fabrication technique, shown schematically in Figure 1, for the synthesis of high-flux water desalination membranes. In this approach, a selected hydrophilic additive is incorporated into the interfacially polymerized thin film to increase the hydrophilicity of the membrane. As shown in this figure, the aqueous solution containing the selected hydrophilic additive and a diamine (m-phenylenediamine) is coated on the surface of microporous polysulfone support with a typical pore size of 50 nm. An interfacial polymerization is then carried out between the aqueous amine solution and a hydrocarbon solution containing trimesoyl chloride to synthesize the high-flux reverse osmosis (RO) membrane. The hydrophilic additive incorporated in the membrane has provided an additional pathway for water transport across the membrane, resulting in a very high flux of water along with a high salt rejection both for brackish water (with 0.2% sodium chloride solution at 225 psi (1.55 MPa) pressure) and seawater (with 3.28% sodium chloride solution at 800 psi (5.51 MPa) pressure) desalination applications. The fluxes have been significantly higher (about 100%) than those for the state-of-the-art membranes in brackish water and seawater desalination.

The membrane has exhibited good stability. Figure 2 shows the constant flux and salt rejection for a run of 30 days in brackish water desalination.

Fig. 1. The schematic of the advanced membrane fabrication technique – incorporating hydrophilic moiety in interfacial polymerization.

This group has also developed a fouling resistant coating based on crosslinked poly(ethylene glycol) for the high flux membranes. The coating on the top of the high flux membrane not only provides strong fouling resistances to tannic acid, a common foulant encountered in brackish water desalination and to the sodium salt of alginate acid derived from seaweed in seawater desalination, but also can protect the membrane during the rolling operation in the fabrication of a membrane element. The membrane will be evaluated by the US Navy for the future shipboard desalination. This work has been sponsored by the Office of Naval Research.

Fig. 2. Membrane stability showing constant flux and salt rejection for a run of 30 days in brackish water desalination.

Fig. 3. No significant changes of the membrane from the stability test detected by FTIR.
Lowrie Lectures

The 2009 Lowrie Lectures were held on May 7-8, with this year’s lecturer being Dr. Gabor A. Somorjai, a University Professor in the Department of Chemistry at the University of California, Berkeley. Dr. Somorjai received his Ph.D. degree in Chemistry from the University of California, Berkeley in 1960 and after 4 years at IBM, he returned to Berkeley as an Assistant Professor where he has been Professor of Chemistry since 1972. He was designated University Professor in 2002 and also serves as Director of the Surface Science and Catalysis Program at the Center of Advanced Materials at the Lawrence Berkeley National Laboratory.

Professor Somorjai has educated 125 Ph.D. students and more than 250 postdoctoral fellows, about 100 of them hold faculty positions and many more are leaders in industry. He is the author of more than 1,000 scientific papers in the fields of surface chemistry, heterogeneous catalysis, and solid state chemistry. He has written three textbooks, Principles of Surface Chemistry, Prentice Hall, 1972; Chemistry in Two Dimensions: Surfaces, Cornell University Press, 1981; and Introduction to Surface Chemistry and Catalysis, Wiley-Interscience, 1994; and a monograph, Adsorbed Monolayers on Solid Surfaces, Springer-Verlag, 1979.

Among his many honors are the National Medal of Science, membership in the National Academy of Sciences and the American Academy of Arts and Sciences, the Langmuir Prize, the Wolf Prize, the Henry Albert Palladium Medal, and a number of research awards from the American Chemical Society including the Priestley Medal and 8 Honorary Doctorates.

Lecture I: Molecular Foundations of Catalytic Selectivity by Metals

Heterogeneous metal catalysts are nanoparticles that carry out reactions at high reactant gas pressures or in the liquid phase. Model surfaces were used to study heterogeneous catalytic reactions in order to control and monitor the atomic surface structure, composition and reaction intermediates while simultaneously measuring reaction rates and selectivities. To obtain quantitative correlations between catalytic reaction kinetics and the molecular factors that control reaction dynamics. Reactions were found to induce restructuring of the metal surfaces and mobility of adsorbed molecules. Nanosize transition metal catalysts achieve facile restructuring and rapid change in surface composition under reaction conditions as their low atom coordination permits rapid bond rearrangements. Improved techniques for molecular studies of surfaces that provide better time resolution and spatial resolution will enhance our ability to study the dynamics of surfaces, which are key to both activity and selectivity during catalysis. The control of metal nanoparticle size and shape provides opportunities to achieve superior reaction selectivity.

Lecture II: Surface Science: Creator of Health, Wealth and New Sources of Energy

The catalytic converter on automobiles greatly improved the air quality of Los Angeles. Air separation to oxygen and nitrogen is at the heart of water purification technologies. Chemical manufacturing to produce the desired product selectively without waste byproducts is the challenge of chemical process technologies and biotechnologies which are commonly called “green chemistry”. The chemical, mechanical, optical, electrical and magnetic properties of surfaces studied on the molecular scale led to developments of new high technology industries that have enriched the United States.
The Advisory Board Meeting was held March 19, 2009, with attending board members Linda Broadbelt, Terry Chern, Nancy Dawes, Karen Murphy, John Sallisay, Sunil Satija, Bob Tatterson, Drew Weber, and Mike Winfield.

Department Chair Stuart Cooper discussed department highlights, new faculty hire David Wood, the increasing enrollment numbers of the undergraduate program, and the University's plan to switch from quarters to semesters.

Rosemary Hill, Director of Engineering Career Services, informed the group that the Department's career services program is one of the best in the nation and CBE students are very pleased with the services they receive.

Brian Endres, Coordinator of Academic Advising, talked about recruitment and outreach and how the Department is doing a better job engaging female and minority students.

Dean Greg Washington discussed changes being made by the College of Engineering and plans for the Koffert Building Campaign.

Faculty member Jim Rathman discussed possible revisions to the B.S. program's educational objectives. Board members liked the focus of the new objectives on expected accomplishments of alumni and suggested adding volunteerism (non-professional service) to the list. Board members also suggested putting more emphasis on the ability of graduates to integrate knowledge from different fields and the expectation that alumni will be successful in a wide range of diverse careers.

Faculty Member Dave Tomasko and Brian Endres addressed the group regarding undergraduate research noting that there has been an increase in undergraduate research opportunities and an effort to increase the number of CBE students who graduate with honors distinction. The next speaker was faculty member Barbara Wydziewicz who presented her research on how aerosols affect the environment, health and various technologies.

The meeting concluded with a discussion among board members and Stuart Cooper regarding undergraduate enrollment pressure, interactions with industry and department resources.
# Undergraduate Program

## Course Enrollment

### Winter 2009

<table>
<thead>
<tr>
<th>Students</th>
<th>Course</th>
<th>Instructor</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>66</td>
<td>200</td>
<td>Dr. Kurt Koelling</td>
<td>Chemical Processes &amp; Calculations I</td>
</tr>
<tr>
<td>84</td>
<td>201</td>
<td>Dr. Jessica Winter</td>
<td>Chemical Processes &amp; Calculations II</td>
</tr>
<tr>
<td>0</td>
<td>489</td>
<td>Dr. James Rathman</td>
<td>Professional Practice in Industry</td>
</tr>
<tr>
<td>24</td>
<td>508</td>
<td>Dr. Umit Ozkan</td>
<td>Thermodynamics I</td>
</tr>
<tr>
<td>91</td>
<td>509</td>
<td>Dr. Isamu Kusaka</td>
<td>Thermodynamics II</td>
</tr>
<tr>
<td>32</td>
<td>521</td>
<td>John Clay (Adjunct)</td>
<td>Transport Phenomena II</td>
</tr>
<tr>
<td>118</td>
<td>522</td>
<td>Dr. S.T. Yang</td>
<td>Transport Phenomena III</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. L.S. Fan</td>
</tr>
<tr>
<td>15</td>
<td>713</td>
<td>Dr. Umit Ozkan</td>
<td>Fuel Cell Catalysis</td>
</tr>
<tr>
<td>16</td>
<td>733</td>
<td>Dr. Jeff Chalmers</td>
<td>Novel Separation Processes</td>
</tr>
<tr>
<td>39</td>
<td>764</td>
<td>Dr. Bhavik Bakshi</td>
<td>Process Design</td>
</tr>
<tr>
<td>10</td>
<td>769</td>
<td>Dr. S. Lee</td>
<td>Biomedical Nanotechnology</td>
</tr>
<tr>
<td>22</td>
<td>771</td>
<td>Dr. Barbara Wyslouzil</td>
<td>Air Pollution</td>
</tr>
<tr>
<td>11</td>
<td>777</td>
<td>Dr. L. James Lee</td>
<td>Polymer Nano Engineering</td>
</tr>
<tr>
<td>72</td>
<td>779</td>
<td>Dr. James Rathman</td>
<td>Experimental Design</td>
</tr>
<tr>
<td>6</td>
<td>693</td>
<td>Various</td>
<td>Undergraduate Research</td>
</tr>
<tr>
<td>7</td>
<td>H783</td>
<td></td>
<td>Undergraduate Honors Research</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(Thesis Track)</td>
</tr>
</tbody>
</table>

### Spring 2009

<table>
<thead>
<tr>
<th>Students</th>
<th>Course</th>
<th>Instructor</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>63</td>
<td>201</td>
<td>Dr. Jack Zakin</td>
<td>Chemical Processes &amp; Calculations II</td>
</tr>
<tr>
<td>121</td>
<td>420/520</td>
<td>Dr. Martin Feinberg</td>
<td>Transport Phenomena I</td>
</tr>
<tr>
<td>0</td>
<td>489</td>
<td>Dr. James Rathman</td>
<td>Professional Practice in Industry</td>
</tr>
<tr>
<td>23</td>
<td>509</td>
<td>Dr. Michael Paulatis</td>
<td>Thermodynamics II</td>
</tr>
<tr>
<td>115</td>
<td>523</td>
<td>Dr. John Clay (Adjunct)</td>
<td>Unit Operations</td>
</tr>
<tr>
<td>122</td>
<td>610</td>
<td>Dr. Umit Ozkan</td>
<td>Kinetics</td>
</tr>
<tr>
<td>24</td>
<td>734</td>
<td>Dr. James Rathman</td>
<td>Molecular Informatics</td>
</tr>
<tr>
<td>110</td>
<td>750</td>
<td>Dr. Stuart Cooper</td>
<td>Profession of Chemical &amp; Biomedical Engineering</td>
</tr>
<tr>
<td>83</td>
<td>762</td>
<td>John Corn</td>
<td>Process Development</td>
</tr>
<tr>
<td>43</td>
<td>764</td>
<td>Dr. Jeffrey Chalmers</td>
<td>Process Design</td>
</tr>
<tr>
<td>24</td>
<td>772</td>
<td>Dr. Bhavik Bakshi</td>
<td>Principles of Sustainable Energy</td>
</tr>
<tr>
<td>10</td>
<td>774</td>
<td>Dr. W.S. Winston Ho</td>
<td>Polymer Membranes</td>
</tr>
<tr>
<td>8</td>
<td>775</td>
<td>Dr. Kurt Koelling</td>
<td>Rheology of Fluids</td>
</tr>
<tr>
<td>11</td>
<td>693</td>
<td>Various</td>
<td>Undergraduate Research</td>
</tr>
<tr>
<td>9</td>
<td>H783</td>
<td></td>
<td>Undergraduate Honors Research</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(Thesis Track)</td>
</tr>
</tbody>
</table>

### Summer 2009

<table>
<thead>
<tr>
<th>Students</th>
<th>Course</th>
<th>Instructor</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>118</td>
<td>630</td>
<td>John Corn</td>
<td>Unit Operations Lab</td>
</tr>
<tr>
<td>19</td>
<td>755</td>
<td>Bob Johnson (Adjunct)</td>
<td>Chemical Process Safety</td>
</tr>
<tr>
<td>3</td>
<td>693</td>
<td>Various</td>
<td>Undergraduate Research</td>
</tr>
<tr>
<td>0</td>
<td>H783</td>
<td>Various</td>
<td>Undergraduate Honors Research</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Thesis Track)</td>
<td></td>
</tr>
</tbody>
</table>

### Autumn 2009

<table>
<thead>
<tr>
<th>Students</th>
<th>Course</th>
<th>Instructor</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>110</td>
<td>200</td>
<td>Dr. Umit Ozkan</td>
<td>Chemical Processes &amp; Calculations I</td>
</tr>
<tr>
<td>29</td>
<td>420</td>
<td>Dr. Andre Palmer</td>
<td>Transport Phenomena I</td>
</tr>
<tr>
<td>0</td>
<td>489</td>
<td>Dr. James Rathman</td>
<td>Professional Practice in Industry</td>
</tr>
<tr>
<td>110</td>
<td>508</td>
<td>Dr. Michael Paulatis</td>
<td>Thermodynamics I</td>
</tr>
<tr>
<td>106</td>
<td>521</td>
<td>Dr. Isamu Kusaka</td>
<td>Transport Phenomena II</td>
</tr>
<tr>
<td>114</td>
<td>624</td>
<td>Dr. Bhavik Bakshi</td>
<td>Process Dynamics &amp; Controls</td>
</tr>
<tr>
<td>77</td>
<td>760</td>
<td>Dr. L.S. Fan</td>
<td>Engineering Economics &amp; Strategy</td>
</tr>
<tr>
<td>10</td>
<td>761</td>
<td>Dr. Jack Zakin</td>
<td>Chemical Process Plants</td>
</tr>
<tr>
<td>31</td>
<td>765</td>
<td>Dr. Jessica Winter</td>
<td>Principles of Biochemical Engineering</td>
</tr>
<tr>
<td>13</td>
<td>773</td>
<td>Dr. Stuart Cooper</td>
<td>Introduction to High Polymer Engineering</td>
</tr>
<tr>
<td>84</td>
<td>790</td>
<td>Dr. James Rathman</td>
<td>Colloids &amp; Surfaces</td>
</tr>
<tr>
<td>9</td>
<td>693</td>
<td>Various</td>
<td>Undergraduate Research</td>
</tr>
<tr>
<td>2</td>
<td>H783</td>
<td>Various</td>
<td>Undergraduate Honors Research</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(Thesis Track)</td>
</tr>
</tbody>
</table>
Cooperative Learning Experiences: 
Autumn 2008 through Autumn 2009

The Engineering Cooperative Education & Internship Program (ECIP) helps undergraduate students to obtain career-related employment of two types: cooperative education (co-op) positions and internships. A co-op experience provides an opportunity to apply what is learned in the classroom in career-related positions by alternating quarters of full-time coursework with periods of paid, full-time employment. Internships involve one work period with an employer. A work period may last for one quarter or for two consecutive quarters. Summer internships are the most popular among students and employers.

Students meet with Brian Endres and Holly Prouty to evaluate different schedule arrangements before interviewing because many employers hire for specific “rotations”. For instance, students may work full-time during the summer quarter, attend full-time classes in autumn, and return to work for full-time work in the winter. The most popular term to work is the winter. Last summer we had 28 students at internships and 31 at co-ops (as reported to ECS).

Students hired for internships and co-ops:

Anderson International Corporation: Eric Stilbora
Batelle Memorial Institute: Thomas Grimme, Jessica Rittner
Bigler LP: Yuki Uchida
BioLOC LLC: Kyle Dy
BP: Joseph Lollini, Brittany Niles, Christopher Thurber
Cargill: Nariman Alkhathib, Shilp Antani, Cory Johnston
Camp Dresser & McKee (CDM): Samantha Spano
Chemical Abstracts Service: Dylan Silbiger
Cornerstone Research Group: Melissa Grigger, John Larison, Mary-Margaret Williamson
Cummins Engine Co., Inc.: Chelsea Liao
Delta Airlines: Michael Birkmeyer
Diamond Innovations: Anand Ramanathan, Whitney Wutzler
DNV (formerly CC Technologies): Stephen Necamp
Dow Chemical: Adam Kowalak, Barrett Richter, Kevin Sutton, David Tarai
Emerson Climate Technologies: Wai-Meng Lei
Entrotech: William Brugode, Steven Ottobre, David Sesher, Emily Smith
Equity Engineering Group, Inc.: David Lovano
ExxonMobil: Allison Payne, Steve Schwab
Genentech, Inc.: Stephen Rosegger
General Electric Corp.: Ryan Bradstreet, Robert Comer, Annemarie Fox, Anita Mallik, Jessica Tufts, Laurin Turowski
Glatfelter: Adam Brandt, Caleb Kingsley, Trevor Morlan
Honda: Mark Foster, Trenton Mueller, Nathan Reed, Timothy Regan, Jeffrey Kentfrow
International Specialty Products (ISP): Jacob Bethel, Danielle Hartley
Kansas Life Sciences Innovation Center, Research Internship: Leslie VanderKolk
Kenexis Consulting Corp: Brett Grygo, David Webster
Laird Technologies: Daniel Wimiewsaki
Lockheed Martin Corp.: Steven Adams
Marathon Petroleum, LLC: Alexander Anssey, Alexander Haas, Nicholas Koenig
Douglas Knape, Crystal Martin, Steven Ottobre, Matt Tackett
NASA Undergraduate Student Research Program (USRP): Edward De Cruz
Nucor Steel: Justin Spitzer
Ohio State University, Research Internship: Michael Yingling
Omegadyne: Kelley Crum, Jeanne Durell
OMINOVA Solutions Inc.: Brian Axel
Peacocks Energy and Technology (PET): Pradeep Kanakaryan
Procter & Gamble: Else Pergsion, Katherine Kinstedt, Rebecca Murphy, Brittany Niles, Kelly Ramos, Evan Smith
RoviSys Co.: Danielle Jensen
Scotts Company: Adam Granitto, Thaddaus Huber, Sara Mihalcew, Greg Shawmaker, Jeanne Skebo, Alexander Vermejan
Tedia Co., Inc.: Michael Klimek
TKS Industrial Co.: Abdullah Ali
Tseng Chen: Luke Barbara
University of Florida, Research Internship: Frederick Crawford
University of Washington, Research Internship: Christina Elias
Yancey Technologies Inc.: Jeffrey Kentfrow, Michael Turner
Whirlpool Corp.: William Murch
Worthington Industries: Matt Berbower
Wright Patterson Air Force Base: Paul Gardner
2009 Placement Record for Undergraduates

Graduates of our program continue to have a strong placement record both within industry and within graduate and professional programs. The percentages provided here are based on senior exit surveys at the time of graduation.

Thirty-seven percent of our graduates will be going directly to industry with their B.S. degrees. About 20% of our students will be going on to graduate or professional school. Close to 17% of our students have accepted positions in Ohio and will stay in the state to pursue their post graduation plans. Students will be working at various corporations such as Exxon Mobil, the Dow Chemical Company, Procter and Gamble, and DuPont.

A number of our graduates received Latin Honors, With Distinction Honors or With Honors in Engineering. Latin honors are defined as follows: a cumulative grade point average (GPA) of 3.5-3.69 is Cum Laude; 3.70-3.89 is Magna Cum Laude; and 3.90-4.00 is Summa Cum Laude. Thirty-seven percent of our students graduated with some level of Latin Honors. A student who graduates “With Distinction” is an honors student (greater than a 3.4 GPA) who has completed a senior honors research thesis. A student who graduates “With Honors in Engineering” has completed a three-prong program consisting of completing a required number of honors courses, participation in community service, leadership and outreach as well participation in “investigational studies” which typically includes completing a research paper or thesis or completing a minor. Thirteen students graduated with Honors in Engineering and nine students graduated With Distinction in various disciplines.

Engineering Career Services (ECS) welcomes all employers to register, to recruit Ohio State engineering students and graduates. There is no cost to register and no fees for ECS services. If you, or someone you know, is interested in hiring Ohio State students for co-op experiences, internships or for full time placement, please contact Rosemary Hill, Director of Engineering Career Services at (614) 292-6651. You can read more about the services offered through ECS by visiting http://career.eng.ohio-state.edu.

### 2009 B.S. Graduates:

#### Autumn 2008 (December 2008)

- **Matthew Ehrman**
  - Graduated Cum Laude, With Honors in Engineering;
  - Hired by Procter & Gamble, Ohio

- **Paul Gardner**
  - Seeking Employment

- **Bryan Gebhart**
  - Seeking Employment

- **Jeffrey MacLean**
  - Seeking Employment

- **Laura Werner**
  - Hired by Exxon Mobil, Texas

#### Winter 2009 (March 2009)

- **Antonius Gondo**
  - Returned to Homeland

- **Conor Hawkins**
  - No information provided

- **Christopher Potts**
  - Pursuing J.D., Seton Hall University

- **Zachary Smith**
  - Seeking Employment

#### Spring 2009 (June 2009)

- **Carol Udoh**
  - Graduated Cum Laude, With Honors in Engineering;
  - Hired by General Mills, Ohio

- **Edward Aprahamian**
  - Hired by Capital One, Virginia

- **Joseph Braucher**
  - Hired by Labs, Pennsylvania

- **Craig Buckley**
  - Graduated Summa Cum Laude, With Distinction in Engineering, With Honors in Engineering; Pursuing Ph.D. in Chemical Engineering, Stanford University

- **Kyle Dy**
  - Seeking Employment

- **Serra Elliott**
  - Graduated Magna Cum Laude, With Distinction Engineering; Pursuing Ph.D., University of California, Santa Barbara

- **Laura Fisher**
  - Seeking Employment

- **Mark Foster**
  - Seeking Employment

- **Jaykumar Grandhi**
  - Further Education, not specified
John Groman  Graduated Cum Laude; Hired by RoviSys Co., Ohio
Joseph Grosszer  Seeking Employment
Tad Grubbs  Graduated Magna Cum Laude; Hired by Procter & Gamble, Ohio
Kimberly Hoang  Graduated Summa Cum Laude, With Honors in Engineering; Pursuing Ph.D. in Chemical Engineering, Auburn University
Alexander Hodge  Pursuing Ph.D. in Chemical Engineering, Auburn University
Jeffrey Hook  Hired by James Hardie Building Products, California
Donna Jeffers  Hired by Entrotech, California
Cory Johnston  Hired by Cargill, Georgia
Brandon Jonas  Graduated Cum Laude; Hired by Exxon Mobil, Texas
James Knight  Graduated Magna Cum Laude, With Distinction in Engineering, With Honors in Engineering; Pursuing Ph.D. in Chemical Engineering, University of Texas, Austin
Jennifer Kovach  Graduated Cum Laude; Hired by Accenture, Ohio
Arthur Lee  Graduated Cum Laude; Hired by Owens-Illinois (O-I), Ohio
Samuel Lentz  Graduated Magna Cum Laude, With Distinction in Engineering, With Honors in Engineering; Hired by Dow Corning Corp, Kentucky
Christopher Lewe  Graduated Magna Cum Laude; Hired by Marathon Oil
Jonathan Lin  Seeking Employment
Cathryn Marshall  Graduated Magna Cum Laude; Pursuing Ph.D in Chemical Engineering, University of Wisconsin
Crystal Martin  Seeking Employment
Samantha Moermond  Hired by Scotts Co., Ohio
Samuel Moore  Hired Battelle Memorial Institute, Ohio
Zachary Murnane  Hired by Campbell, Dresser, and McKee, Florida
Halle Murray  Seeking Employment
Joshua Nye  Seeking Employment
Amanda Pchoebe  Seeking Employment
Anand Ramanathan  Hired by Arcelor Mittal, Minnesota
Jordan Redman  Seeking Employment
Shannon Rogers  Seeking Employment
Eric Sacia  Graduated Summa Cum Laude, With Distinction in Engineering, With Honors in Engineering; Pursuing Ph.D. in Chemical Engineering, University of California, Berkeley
Brian Setzler  Graduated Cum Laude; Pursuing Ph.D. in Chemical Engineering, Georgia Tech University
Leslie Shumaker  Graduated Magna Cum Laude; Hired by Procter & Gamble, Ohio
Jeanne Skebo  Hired by Scotts Co., Ohio
Nicholas Smith  Seeking Employment
Brittany Stechschulte  Hired by Cargill, Ohio
John Titone  Graduated Magna Cum Laude, With Distinction in Engineering, With Honors in Engineering; Hired by Bettis Atomic Power Laboratory
Andrew Vail  Hired by Schlumberger, Arkansas
Kathleen Vermeersch  Graduated Cum Laude, With Honors in Engineering
Yao Wang  Seeking Employment
David Webster  Pursuing Ph.D. in Chemical Engineering, Auburn University
Steven Welch  Seeking employment
James Westerfield  Seeking employment
Henry White  Graduated Cum Laude; Pursuing M.D., not specified
Patrick Wilson  Graduated Cum Laude; Hired by Battelle Memorial Institute, Ohio
Thomas Yeh  Graduated Cum Laude, with Distinction in Engineering, with Honors in Engineering; Pursuing a Ph.D. in Chemical Engineering, University of Michigan

Summer 2009 (August 2009)

Abigail Brown  Graduated Cum Laude, With Honors in Engineering; Hired by General Mills, Ohio
Thomas Czechowski  Seeking Employment
Brett Grygo  Hired by Sunoco, Inc., Ohio
Ahmed Hassan  Seeking Employment
Mark Hilbert  Further Education, not specified
Matthew Kanzitz  Seeking Employment
Jennifer Kirian  Graduated Cum Laude; Pursuing M.B.A., Bowling Green State University
Michelle Koegler  Seeking Employment
Daniel Lamone  Pursuing M.S. in Chemical Engineering, The Ohio State University
Karl LaPointe  Graduated Cum Laude; Hired by Dow Corning Corp, Michigan
2009 B.S. Graduates Continued

John Meister  Hired by Univenture, Ohio
Jeremy Mink  Graduated Magna Cum Laude;
Seeking Employment
Eric Neidig  Seeking Employment
Alana Pevts  Hired by Procter & Gamble, Ohio
Nathan Reed  Seeking Employment
Katie Reinkke  Graduated Cum Laude;
Hired by Exxon Mobil, Texas
Elis Robinson  Graduated Magna Cum Laude,
With Honors in Engineering;
Pursuing Ph.D. in Chemical Engineering, Carnegie Mellon University
Dennis Stoltz  Seeking Employment
Leeza Thompson  Graduated Magna Cum Laude;
Hired by Dow Chemical, Michigan
Man Tran  Seeking Employment
Lindsay Volpenhein  Graduated Magna Cum Laude,
With Honors in Engineering;
Hired by Dow Chemical, Texas
Blake Washington  Hired by General Mills, Illinois
Jean Wheasler  Graduated Summa Cum Laude, With
Distinction in Engineering, With Honors in Engineering; Pursuing Ph.D. in Chemical Engineering, University of Wisconsin
Katherine Wilson  Graduated Cum Laude;
Hired by Exxon Mobil, Texas
Cameron Wohleber  Hired by Owens-Illinois, Ohio

Autumn 2009 (December 2009)

Abdullahi Ali  Pursuing M.S. in Chemical Engineering, The Ohio State University
Ryan Bradstreet  Seeking Employment
Michael Heller  Graduated Magna Cum Laude;
Seeking Employment
Mohamed Keyse  Seeking Employment
James Mekker  Seeking Employment
Joseph Taris  Seeking Employment

Undergraduate student, Aaron Nimrick, experiments with DNA extraction.
Undergraduate Enrollment (number of students)

<table>
<thead>
<tr>
<th>Year</th>
<th>Pre-Majors</th>
<th>Majors</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td></td>
<td></td>
<td>200</td>
</tr>
<tr>
<td>2007</td>
<td></td>
<td></td>
<td>205</td>
</tr>
<tr>
<td>2008</td>
<td></td>
<td></td>
<td>250</td>
</tr>
<tr>
<td>2009</td>
<td></td>
<td></td>
<td>300</td>
</tr>
<tr>
<td>2010</td>
<td></td>
<td></td>
<td>350</td>
</tr>
</tbody>
</table>

Number of B.S. Degrees Per Year
Shows Total Students, Number Granted to Women and Number Granted to Ethnic Minorities

<table>
<thead>
<tr>
<th>Year</th>
<th>Women</th>
<th>Ethnic Min</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>112</td>
<td>23</td>
</tr>
<tr>
<td>2007</td>
<td>120</td>
<td>38</td>
</tr>
<tr>
<td>2008</td>
<td>172</td>
<td>52</td>
</tr>
<tr>
<td>2009</td>
<td>163</td>
<td>51</td>
</tr>
</tbody>
</table>

Tracking ChBE 200 Enrollment
ChBE 200 is the department's first major course. This table shows total enrollment in that course and the breakdown enrollment of women and ethnic minority students. Previous years include only students who passed the course with a C- or better.

Female and Ethnic Minority Trends in Total Department Enrollment

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Students</th>
<th>Women</th>
<th>Ethnic Min</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>138</td>
<td>6</td>
<td>23</td>
</tr>
<tr>
<td>2007</td>
<td>152</td>
<td>6</td>
<td>38</td>
</tr>
<tr>
<td>2008</td>
<td>172</td>
<td>6</td>
<td>52</td>
</tr>
<tr>
<td>2009</td>
<td>172</td>
<td>6</td>
<td>51</td>
</tr>
<tr>
<td>2010</td>
<td>170</td>
<td>6</td>
<td>51</td>
</tr>
</tbody>
</table>
A total of 153 students were awarded undergraduate scholarships in the Chemical & Biomolecular program. The vast majority of those students were current majors, although a small amount went to recruit high ability first year students as well. A total of $109,600 was awarded to students heading into the 2009-2010 school year. This year the department awarded more scholarships but gave out less money than the previous year. This has resulted in a lower average award per student than in previous years. Huge increases in enrollment and variability in many endowments have caused these trends.

Trends in data from financial aid show that the number and amount of both student and parent loans have been increasing. Both Ohio State tuition and University financial support have increased yearly. However, since the increase in scholarship support hasn’t been able to keep up with tuition increases, engineering students and their families have had to increase their debt levels to cover the additional costs. In the Chemical & Biomolecular Engineering Department, department scholarships from alumni and corporate donors help defray a small part of the loan burden for many of our students.

Department scholarships are determined mainly by merit, however, when a scholarship specifies that a student’s need be considered, both merit and need are taken into account. We thank those of our alumni who have established scholarship endowments for this purpose as well as our corporate donors who provide scholarships on an annual basis.

2009-2010 Undergraduate Scholarship Information

DOW Chemical Company -
Dow Outstanding Junior Award
Chris Thuerber

Allan I. Gordon Undergraduate Scholarship for Study in Biochemical Engineering
Christina Elias Emily Smith
Katherine Kolakowski Michael Yingling

Todd David Harris Memorial Scholarship
Benjamin Douc Stephen Necamp
Daniel Valsco

The Howard R. Steele Memorial Scholarship in Chemical Engineering
Ashley Fortman John Logue
Ryan Gallagher Tiarah Tanyhill
Stephen Kinsey Laura VanVliet

Harry B. Warner Scholarship
Nicholas Koenig Alexander Vermejan

The Michael D. Winfield Scholarship
Elise Ferguson

Paul Bates Scholarship
Steven Adams Ibrahim Bamba
David Diaz-Rivera Justin Mason
Japheth Pritchett Darian Richardson
Alexander Sarmiento

Milton & Karen Hendricks Scholarship
Nathan Arroyo Beth Johnson
Brooke Laing Charles Lorenz
Scott Shaheen

Smith E. Howland Scholarship
Yuki Uchida

Webster B. Kay Scholarship in Chemical Engineering
Robert Kappers Amanda Janasov
Robert Wensing

Lubrizol Foundation Scholarship
Beth Johnson Steven Ottobre

Aldrich Syverson Scholarship
Adam Granitto David Schnell
Tanner Williams Zhi Zheng

Fred H. Winterkamp Memorial Scholarship
Nicholas Cotton Alexander Haas
Daniel Morris Cory Noyes
Mark Politz Derek Reichel

H. Richard Unkel Chemical Engineering Class of 1941
Lukas Brooks Olivia Kindshuh
Sarah Koop Joshua Martin
Sara Vinson Amy Zuo

David H. George Chemical Engineering Scholarship
Roxanne Demarest Joseph Fahrenkamp
Natasia Haupt Anthony Kaiser
Gina Manacci Daniel Manning
Daniel Marinian Aaron Nimrick
Amber Owens Terhi Reponen
Madeline Shirk Douglas Stauffer
Zachary Tangeman Shuyang Wang
Ling-Shun Wong

William R. & Doris M. Harris Scholarship in Chemical Engineering
Samuel Bayham Stephen Berling
William Brugode Robert Ensouen
Annemarie Fox Vincent Frascello
Michael Hartman Thaddaus Huber
Richard McConnell Allison Payne
Jason Porter Kevin Sutton
Christopher Thuerber Jessica Tufts

Harold W. Almen Scholarship
Dmitry Burdjakov Michael Frangiamore
Thomas Grimme Jean Johnson
Katherine Kinstedt Daniel Kromer
Rebecca Murphy Timothy Regan
Brian Setzler Mandy Still
Matt Tackett Robert Waters
Graduate Program

Ranking

The 2010 U.S. News and World Report rankings of engineering graduate programs placed the Lowrie Department of Chemical and Biomolecular Engineering at #27. The College of Engineering was also ranked #27 in the nation. While the college rankings are based in good part on objective measures such as research funding, number of Ph.D. graduates, number of publications, etc., the departmental rankings are based on subjective surveys of deans of engineering and industrial executives. In 2010, we expect the National Research Council to publish a listing of departmental rankings that will be more quantitatively based. We have submitted our data for the NRC exercise and are guardedly optimistic that our department will receive a higher ranking from that analysis compared to the U.S. News survey. In any case, these findings in the table are good news for the Department.

Faculty Productivity

The following table, relating to faculty research and our PhD program, reinforces that our faculty are highly productive. Since 2005, we have averaged a graduation rate of 15.4 PhD students per year and a ratio of 0.94 Ph.D. degrees per faculty member. It is significant that in 2005 and 2006, we were fifth in the nation in the graduation of chemical engineering doctoral students. This is noteworthy as the leading departments in this category typically have many more faculty members than Ohio State.

(Data from the Ohio State University Foundation (fiscal year))
Graduate Degrees Granted

**Winter Quarter 2009**

**Master of Science**
Zhengzheng Fei
Hua Song
David Winkel, Jr (non-thesis)

**Doctor of Philosophy**
Wu Ge
Fangxue Li
Juan Sanz-Valero
Rustin Sheneman
Yuan Wen
An Zhang

**Spring Quarter 2009**

**Master of Science**
Megan Balog
Patrick Bennett
Claudia Berdugo
Elizabeth Daly
Ching-Suei Hsu
Xiaoxi Jin
Vikas Khanna
Ning Liu
Manish Talreja
Jia-Peng Xu
Chaofang Yue

**Doctor of Philosophy**
Jeffrey Ellis
Hua Song
Yun Wu

**Summer Quarter 2009**

**Master of Science**
Brian Fraley
Huyng Kim
Quassai Marashdeh

**Doctor of Philosophy**
Vikas Khanna
Lawrence Zimmerman

Autumn Quarter 2009

**Master of Science**
Mettej Liu

**Doctor of Philosophy**
Michael Boehm
Zhengzheng Fei
Christopher Kagarise
Zhao Yu

Research Expenditures

For the past three years, our research expenditures (data from the Ohio State Research Foundation) have been outstanding, especially since they are based on the efforts of 17 faculty. On a per-capita basis, expenditures averaged over $700k per year during fiscal years 2007-2009. Our faculty are among the most productive at Ohio State and near the top of all Chemical Engineering departments in the nation.

Graduate Student Fellowships

**University Fellowships**

Uddyalok Banerjee
Niranjani Deshpande
Jorge Fontes
Daniel Knight
Erin Landers
Kalpesh Mahajan
Hrishikesh Munj

**Distinguished University Fellowship**
Yinming Du
Graduate Program Seminar Series

Winter 2009

01/22 William J. Mitsch, Professor of Environment and Natural Resources, Director, Wilma H. Schiermeier Olentangy River Wetland Research Park, The Ohio State University, "Ecological Engineering: Saving the Planet with a Sustainable Engineering"

02/05 Michael Deem, John W. Cox Professor of Bioengineering, Professor of Physics & Astronomy, Rice University, "Vaccine Design for Influenza and Dengue Fever"

02/12 Glenn Lipscomb, Professor and Chair, Chemical and Environmental Engineering, The University of Toledo, "Membrane Module Design"

02/19 Gary Patterson, Professor Emeritus, Chemical and Environmental Engineering, Missouri University of Science and Technology, "Correlation for Yield of Competitive Reactions in Reactors with Turbulent Mixing"

02/26 Subhas Sikdar, Associate Director for Science, National Risk Management Research Laboratory, US Environmental Protection Agency, "Process or Product Sustainability and Applicable Metrics"

03/05 Ying Liu, Research Engineer, BP America, "Computational Fluid Dynamics: Modeling of Multiscale Chemical Reactors"

03/12 John S. Olson, Ralph and Dorothy Looney Professor, Department of Biochemistry and Cell Biology, Rice University, "Hemoglobin Gates and Tunnels: Different Ways to Capture O2 and Detoxify NO"

Spring 2009

04/02 Doug Goetz, Professor, Department of Chemical and Biomolecular Engineering, Ohio University, "Engineering Novel Vascular-Based Therapeutics and Diagnostics"

04/09 Chien Ho, Director, Pittsburgh NMR Center for Biomedical Research, Professor, Department of Biological Sciences, Carnegie Mellon University, "Tracking Immune Cell Migration In Vivo by MRI: A New Non-invasive Approach to Detect Graft Rejection After Transplantation"

04/16 Ted Knowlton, Technical Director, Particulate Solid Research, Inc., Chicago, IL, USA, "When Gas Bypassing Occurs in Deep Fluidized Beds of Geldart Group A Particles and How to Prevent It"

04/23 Safety Seminar

04/30 Sankaran Sundaresan, Professor, Department of Chemical Engineering, Princeton University, "Constitutive Modeling of Slow Flows of Dense Granular Assemblies"

05/07 Gabor Somorjai, Lowrie Lecture I - 11:30 a.m., Knowlton Hall, Room 250, 275 W. Woodruff Avenue, Professor, Department of Chemistry and Lawrence Berkeley National Laboratory, University of California, Berkeley, "Molecular Foundations of Catalytic Selectivity by Metals"

05/08 Gabor Somorjai, Lowrie Lecture II - 10:30 a.m., Physics Research Building, Room 1080, 191 W. Woodruff Avenue, "Surface Science. Creator of Health, Wealth and New Sources of Energy"

Summer 2009

07/20 C. B. Mullins, Professor, University of Texas at Austin, "Surface Chemistry of Model Catalysts"

08/4 Y. (Ishi) Talmon, Department of Chemical Engineering, Technion-Israel Institute of Technology, "State-of-the-Science Electron Microscopy of Nanostructured Liquid Systems"

08/28 An Ping Zeng, Institute of Bioprocess and Biosystems, Hamburg University of Technology, "From Systems Biology to Biosystems Engineering"

Autumn 2009

09/24 Di Gian, Assistant Professor and W. K. Whiteford Faculty Fellow, Department of Chemical and Petroleum Engineering, University of Pittsburgh, "Virtual Reality: Durable Superhydrophobic Coatings for Anti-icing and Drag Reduction"

10/08 Chih Ming Ho, Ben Rich – Lockheed Martin Professor, UCLA Distinguished Professor, Director of Center for Cell Control, Department of Mechanical and Aerospace Engineering, Henry Samueli School of Engineering and Applied Science, "From Materials, Devices, Systems to Control of Complex Systems"
Jayajit Das, Assistant Professor, Battelle Center for Mathematical Medicine, The Research Institute at Nationwide Children’s Hospital, Biophysics Graduate Program and Department of Pediatrics, “Membrane Proximal Signaling in Lymphocytes: An interplay between co-operative processes and stochastic fluctuations”

Mariah S. Hahn, Assistant Professor, Department of Chemical Engineering, Texas A&M University, “Programming Mesenchymal Stem Cell Lineage Progression”

Aravind Asthagiri, Dow Chemical Company Foundation, Assistant Professor, Chemical Engineering Department, University of Florida

Graduate Research Initiative Program (GRIP) SEMINAR:

Manish Talreja, “Towards Understanding CO2 Assisted Nanoscale Processing of Polymer Thin Films”

Michael Vilt, “Separation of Cephalexin using Supported Liquid Membranes with Strip Dispersion”

Andrew Tong, “Design, Construction and Preliminary tests of the Sub-Pilot scale Syngas Chemical Looping System”

Ashutosh Bhabhe: Won an NSF travel award to attend the 18th International Conference on Nucleation and Atmospheric Aerosols that will be held August 10 – 14th, 2009 in Prague, Czech Republic. He will be presenting the work he did together with Somnath Sinha and Hartawan Lakmono on the condensation of Ar in supersonic nozzles.

Elizabeth Biddinger: First Place in the Graduate Division of the Ohio Fuel Cell Symposium poster competition held May 27-28, 2009; North American Catalysis Society Kokes Travel Awards to attend the 21st NACS Conference in San Francisco to present her work; AIChe CRE Division Travel Award for travel to the 2009 Annual AIChe meeting in Nashville, TN; Ohio State University Council of Graduate Students Ray Travel Award to attend the AIChe National meeting in Nashville, TN; Ohio State Women in Engineering Distinguished Graduate Student Award; Department of Chemical and Biomolecular Engineering Dow Fellowship.

Hyunkyu Choi: Best Poster Award at the 2009 IMR Materials Week.

Kelley Distel: Accepted to attend the 2009 National School on Neutron and X-ray Scattering. Kelley will spend one week in Oak Ridge National Laboratory learning about neutron scattering and doing sample experiments on the High Flux Isotope Reactor and/or Spallation Neutron Source. She will then go to the Advanced Photon Source at Argonne National Lab to learn about X-ray scattering and to do more sample experiments. The entire two week course including travel and accommodation is paid for.

Nandita Lakshminarayanan: North American Catalysis Society Kokes Travel Awards to attend the 21st NACS Conference in San Francisco to present her work.

Hartawan Lakmono: Travel award from the American Association for Aerosol Research to attend the Annual Meeting in Minneapolis, MN October 26 – 30th.

Ning Liu: Won the Alumni Grants for Graduate Research and Scholarship from The Ohio State University Graduate School.

Shreyas Rao: Third Place in the Edward F. Hayes Graduate Research Forum Poster Presentation at The Ohio State University, April 2009.

Hua Song: North American Catalysis Society Kokes Travel Awards to attend the 21st NACS Conference in San Francisco to present her work.


Chi Yen: Winner of the 2009 Travel Award from the North American Membrane Society.
1936 - Joseph G. Mravec
1939 - Ira Joseph Kail
1940 - Charles Boardman III
1941 - Thomas E. Lavery, David Thomas, Earl Godfrey Anderson
1942 - Donald S. Arnold, Randal E. Bailey
1943 - Halvor S. Christianson, Dalton F. Drake, James R. Randall, Roy E. Schneider, Carlyle E. Shoemaker, James C. Wynd
1944 - Wallace L. Bostwick, Clarence A. Haverly, Jr., Edward W. Powell
1947 - William K. Fell, Thurman L. Graves, Lewis C. Hullinger, Herbert G. Krane, J. Bruce Martin, Bryce H. McMullen, Donald F. Stauffer
1949 - Paul E. Bates, Gordon G. Cross, J. Howard Kerstetter, Jr., Donald R. Roberts, Roland I. Spencer
1952 - James F. Froning, Donald E. Haupt, C. Richard Heil, Charles J. Schmitz
1953 - Robert A. Bates, G. Clyde Bazell, Roger L. Briggs, Donald E. Findlay, Wilfred C. Ling, Dr. Manoj Kumar D. Sanghvi, Harold I. Stelzer Jr., James Lloyd Wilson
1954 - Gilbert E. Raines
1955 - Wendell B. Hammond, Jr.,
1956 - Robert A. Cody, William David Coe, Herbert H. Fanning
1957 - Walter R. Andrews, Jr., Walter A. Flack, Jon D. Helms, Sung Ho Hong
1959 - Lee W. Addie, James O. Alberty, Ronald M. Kovach, Darryl J. Von Lehsmden, Gerald A. Walsom
1961 - Paul R. Bigley, Richard B. Cooper, Ronald L. Follmer, Jack Arnold Hammond, Ronald D. Harris, John N. Rapach, Larry E. Woodworth
1962 - David E. Bidstrup, Kenneth J. Fulk, Richard L. Hoffman, Dean Snider, Michael J. Seroceak, Michael D. Winfield
1963 - Nelson W. Barnhill, Gary L. Beeler, Robert P. Kasper, Fred A. Shaffstall, Kay Logan Snider
1964 - Michael B. Cutlip, William R. Ferris, Alan K. Kochsiek, James B. Sapp
1965 - Oliver L. Davies, Frederick H. Flor, Jr., John P. Gepner, Arthur H. Morth, Frederick J. Rerko, Gary L. Street, Michael C. Roey, Eugene N. Wheeler
1966 - William F. Deehake, Thomas E. Fitz, Sr., William G. Lowrie, Glenn L. Mckee
1968 - Dean Howell Reber, John M. Salladay
1970 - Bradford F. Dunn, David R. Grove, Charles A. Klingensmith, Richard B. Strait, Rosa Uy
1972 - John A. Thomas
1973 - John C. Bost, Thomas E. Claugas, David A. Dargan
1974 - Steven M. Brown, John E. Myers George L. Ott, Michael A. Patterson,
1975 - John T. Erikson, Stephen L. Grant
1976 - James M. Delabar
1979 - Kevin R. Cole, Darice Ann Davis, Karen T. Murphy, Randy W. Schumaker, David J. Wasela, Tad K. Williams
1980 - Frederick T. Clark, Matthew J. Galosi, Mark A. George, Gary R. Prok, Timothy L. Strickler, David G. Vutetakis
1981 - Nancy Coultrip Dawes, Ronald A. Gibson, William E. Naseman, James A. Telljohann
1982 - Dan Lambert, Andrew M. Weber
1983 - Michael Brian Begland, Tracy Flora Begland, Thomas D. Burns, Samuel D. Fink, Carolyn Marie Lin, Keith R. Nowak
1984 - Wendell E. Harkins, Gregory M. Masica, George W. Miller, Roger W. Nelson, Patrick A. Renner
1985 - Douglas J. Ball, Roger G. Facer, Rongher Jean, Timothy A. Johnson, David J. Moonay
1986 - Robert M. Canright, Michael L. Gilles, Rajeev L. Gorowara, Tharuvai S Ramesh, Dave Vance, Brian A. Yanok
1987 - Jeffrey D. Adams, Karen S. Johnson, D. Brian Noe
1988 - Amy Schmidt Doty, Craig L. Shoemaker, Annette Brough Ventura
1989 - Stuart F. Doty, Amy Reynolds Pressly
1990 - Craig M. Kehres, James V. Lombardi, Timothy F. Mathis
1991 - Rick Wright
1992 - Scott D. Blatter, Samir Kumar, Frank E. Seipel
1993 - John Dee Clay, Christopher W. Voight
1994 - Nanette Lynn Nardi Triplett, Michael D. Triplett II
1995 - Beth Gibson, Jack R. Reese II, Liping Zhang
1996 - Aravind Rajaappa Asthagiri
1997 - James William Holder
1998 - Regis Paul Geisler III
1999 - Thomas J. Jaynes, Eric S. Jensen
2002 - Jun Luo, Nihar Arvind Patel
2004 - Angela N.D. Carlson, Jeffrey L. Ellis, Lori Ann Engelhardt, Erica Nicole Jones, Marisa A. LaPalamonte,
2005 - Michael G. Klidas
2008 - Jeffrey Ross Skinn


*Donations listed were received during the 2009 calendar year.*
Faculty

Bhavik Bakshi

Books and Book Chapters


Current Projects and Grants
$70,881 Bakshi, Bhavik R. 2009-2010 CANPBD: Evaluating the environmental impacts of nanomanufacturing via thermodynamic and life cycle analysis, subcontract from Nano Science and Engineering Center grant from National Science Foundation


$175,000 Bakshi, Bhavik R. 2005-2010 Matching funds from OSU Transportation Research Endowment Program (TREP)

$12,000 Bakshi, Bhavik R. 2006-2010 Supplementary funds from NSF Research Experience for Undergraduate Program.

$375,000 Bakshi, Bhavik R. 2006-2010 Evaluating the Impacts of Nanomanufacturing via Thermodynamic and Life Cycle Analysis, (co-PI: Prof. L. James Lee), Environmental Protection Agency

$200,000 Fiksel, Joseph, Resilient Enterprise Consortium, Center for Resilience (co-PI: Bhavik R. Bakshi)

$300,000 Bakshi, Bhavik R. (co-PI William J. Mitsch) 2009-2011 Toward Integration of Industrial Ecology and Ecological Engineering, National Science Foundation


$100,000 Bakshi, Bhavik R. 2008-2010 Comparative Study of Thermodynamics Based Life Cycle Assessment of Nano-Materials with Conventional Technologies, Environmental Protection Agency

Refereed Papers


Robert S. Brodkey

Jeffrey Chalmers
Professor, Ph.D., Cornell U., 1988. Bioengineering, Biochemical Engineering, Biomedical Engineering, mixing.

Books and Book Chapters

Refereed Papers
Balasubramanian, P., Yang, L., Lang, J.C., Jatana, K.R., Schuller, D., Agrawal, A., Zborowski, M., Chalmers, J.J. 
"Confocal images of circulating tumor cells obtained using a methodology and technology that removes normal cells." Molecular Pharmaceutics 6(5):1402-1408, 2009. PMID: 19445481


Current Projects and Grants
$153,535 Jeffrey Chalmers 2008-2010
(PI of subcontract) Cell Selection by magnetic flow; NIH, subcontract from CCF

$3,500,000 Jeffrey Chalmers 2006-2010
Advanced biomedical devices for disease diagnosis and therapy; Ohio Department of Development

$2,350,349 Jeffrey Chalmers (Investigator) 2004-2009
OSU Comprehensive Cancer Center Support Grant; NCI

$1,086,000 S.L. Cooper, (Co P.I.s) 2009-2011
"Cell Trap: A Novel Solid Phase Platform for Analysis of Stem/Progenitor Cells", NIH

Stuart Cooper

University Scholar Professor and Department Chair, Ph.D., Princeton University, 1967. Polymer Science and Engineering, Properties of Polyurethanes and Ionomers, Blood-Materials Interactions, Tissue Engineering.

Refereed Papers

Current Projects and Grants
$46,375 Stuart L. Cooper 2009-2014
Center for Affordable Nanoengineering of Polymer Biomaterials, Development of polymer materials for combination therapy, Sponsorship of 1 Ph.D. student, National Science Foundation (P.I. James Lee)

$1,086,000 S.L. Cooper, (Co P.I.s) 2009-2011
"Cell Trap: A Novel Solid Phase Platform for Analysis of Stem/Progenitor Cells", NIH

Liang-Shih Fan

Distinguished University Professor, Ph.D., West Virginia University 1978. Clean Coal Technologies, Multi-Phase Flow and Reaction Engineering.

Awards & Honors
Elected as a Foreign Member of Chinese Academy of Engineering (2009).

Best Paper Award in Fluidization and Fluid-Particle System presented at Particle Technology Forum AIChE (2009).

Charles Ellison MacQuigg Award for Outstanding Teaching, College of Engineering (2009).

Western Distinguished Engineering Lectureship, The University of Western Ontario (2009).


Books and Book Chapters


Current Projects and Grants
$3,000,000 Fan, Liang-Shih 2009-2011 Coal Direct Chemical Looping Retrofit for Pulverized Coal-Fired Plants with In-situ CO2 Capture, Department Of Energy.
$300,000 Fan, Liang-Shih 2009-2011 Process/Equipment co-simulation on syngas chemical looping process, Department Of Energy.
$408,801 Fan, Liang-Shih, Rizzoni, Giorgio 2008-2010 Carbon negative chemical looping process for hydrogen or liquid fuel synthesis using refuse derived fuel, biomass and/or Ohio coal, Ohio Department of Development.
$159,996 Fan, Liang-Shih 2008-2010 Chemical looping combustion, Ohio Coal Development Office.
$81,222 Fan, Liang-Shih 2008-2009 Phase 1 SCL process - fabricated equipment, Ohio Coal Development Office.
$238,339 Fan, Liang-Shih 2008-2011 Development and implementation of 3-D, high speed electrical capacitance tomography for imaging large-scale, cold-flow circulating fluidized bed, Department of Energy.
$100,000 Fan, Liang-Shih 2008-2009 Development of 3-D electrical capacitance volume tomography (3-D ECVT), Department of Energy.
$160,000 Fan, Liang-Shih 2007-2009 Integrated fuel cell with chemical looping, Ohio Coal Development Office.
$1,564,206 Fan, Liang-Shih 2007-2010 High purity hydrogen production with in-situ carbon dioxide and sulfur capture in a single stage reactor, Department of Energy.
$5,000,000 Fan, Liang-Shih 2009-2013 Pilot Demonstration of the Chemical Looping Systems ARPA-E/Department of Energy

Martin Feinberg
Morrow Professor, Ph.D., Princeton University, 1968, Complex Chemical Systems

Refereed Papers

Current Projects and Grants
$381,826 Feinberg, Martin 2008-2013 Collaborative Research: Multistability in Biological Networks, National Institutes of Health - General Medical Sciences

W.S. Winston Ho
Awards & Honors
Elected a Fellow of the American Institute of Chemical Engineers (2009).
American Institute of Chemical Engineers’ Excellence and Appreciation Award (2009), Meeting Program Chair for the AIChE 2009 Annual Meeting, Nashville, TN, Nov. 8 -13, 2009.


First Place Graduate Research Poster Paper Award, the American Chemical Society, Charleston, SC, June 21-24, 2009.

Books and Book Chapters


Current Projects and Grants
$150,000 Ho, W. S. Winston 2006-2010 National Science Foundation, Carbon Dioxide-Selective Membranes, OSURF Project No. 60008308.

$12,000 Ho, W. S. Winston 2008-2010 National Science Foundation, REU Supplement for Current Grant NSF CBET-0625758, Carbon Dioxide-Selective Membranes, OSURF Project No. 60017278.

$639,696 Ho, W. S. Winston 2008-2011 Office of Naval Research, Advanced Membranes for Reformate Hydrogen Sulfide Clean-up, OSURF Project No. 60014815.

Ho, W. S. Winston 2008-2011 National Science Foundation, Liquid Membranes in Nanopores with Strip Dispersion for Antibiotic Recovery, OSURF Project No. 60020609.


$48,874 Ho, W. S. Winston 2007-2010 Ohio State University Residual Funds, Polymer Membranes, OSURF Project No. 60015086.

$233,268 Ho, W. S. Winston 2004-2010 National Science Foundation, Center for Affordable NanoeDing of Polymer Biomedical Devices, NSEC Project sponsoring 1 Ph.D. Student, with L. James Lee (PI), OSURF Project No. 6009015.

M. Mahboob, C. Kagarise, K.W. Koelling, S.E. Bechtel, “Quantitative 3D measurement of the nanostructural features that dictate mesoscale performance properties of nanocomposites”, Polymer Composites, published online (2009)

Current Projects and Grants
$400,000 Tomasko, David, Koelling, Kurt, Kusaka, I., Lee, L.J. 2006-2009; Scalable Nanomanufacturing of High Performance Nanocomposite Foams, National Science Foundation.

$365,000 Koelling, Kurt, Lee, L.J., 2005-2009
Industry/University Cooperative Research Center (I/UCRC) for Advanced Polymer and Composite Engineering (CAPCE), National Science Foundation.

$39,800 Koelling, Kurt, Vodovotz, Yael 2008-2010
Biobased Polymer Films, I/UCRC Center for Advanced Packaging and Processing Studies.

$50,000 Koelling, Kurt, Vodovotz, Yael 2007-2009
Processing of Biopolymer Films, Institute for Materials Research.

STTR Phase II: Microfluidic cd biochips for enzyme-linked immunosorbent assays, National Science Foundation.

$118,348 Koelling, Kurt 2008-2010
Properties of Carbon Nanotube Fibers and Bucky Papers, Battelle Memorial Institute.

Kusaka, Isamu, Associate Professor, Ph.D., Caltech 1998. Statistical mechanics, Thermodynamics, Nucleation


Current Projects and Grants
$400,000 Tomasko, David, Koelling, Kurt, Kusaka, I., Lee, L.J. 2006-2009; Scalable Nanomanufacturing of High Performance Nanocomposite Foams, National Science Foundation.

L.James Lee
Professor, Ph.D., University of Minnesota, 1979. Polymer and Composite Engineering, Nanobiotechnology, BioMEMS, Microfluidics, BioMEMS/ NEMS.

Books and Book Chapters

Refereed Papers


L.J. Lee, L. James (co-PI) 2007-2010 Commercialization of High-Performance Nano-Tailored Structural Composites for Energy and Survivability Applications, Ohio Department of Development Third Frontier Program $8,000,000

L.J. Lee, L. James (co-PI) 2006-2009 Evaluating the Impacts of Nanomanufacturing via Thermodynamic and Life Cycle Analysis, EPA $360,000


L.J. Lee, L. James (co-PI) 2008-2013 Targeted Lipopolymers for Oligonucleotide Delivery to AML, National Institute of Health (NCI) $2,886,763

Books and Book Chapters

Refereed Papers


Current Projects and Grants


$160,000 Ozkan, U.S., 2008-2010 Sulfur and coke resistant novel anode catalysts in reduced temperature coal gas-fed SOFC systems, Ohio Coal Development Office

$162,057 Ozkan, U.S., 2009-2011 Internal Steam Reforming of Natural Gas for SOFC, Rolls-Royce/OH Department of Development

André Palmer
Associate Professor, Ph.D., The Johns Hopkins University, 1998. Bioengineering & Hemoglobin-Based Oxygen Carriers

Refereed Papers


$400,000 Tomasko, David (PI) 2006-2009
Scalable Nanomanufacturing of High Performance Polymer Foams, National Science Foundation, Co-PIs: I. Kusaka, L.J. Lee, K.W. Koelling

$1,982,000 Tomasko, David (Co-PI) 2004-2009
Track 2, GK-12, Optimization and Institutionalization of the Science Fellows Supporting Teachers (SFST) Program, National Science Foundation, Ph. S. Olesik, Co-PIs: G. McKenzie, K. Irving

$12,000,000 Tomasko, David (Co-PI) 2004-2009
Center for Affordable Nanoeengineering of Polymeric Biomedical Devices, National Science Foundation, Ph. L.J. Lee, Co-PIs: A.T. Conlisk, J.J. Chalmers, R. Lee

$100,000 Tomasko, David (PI) 2008-2010
Development of Melt Extrusion Processes for Pharmaceutical Applications Using Chemical Engineering Perspectives Hoffmann-La Roche

$12,000,000 Tomasko, David (Co-PI) 2004-2009
Center for Affordable Nanoeengineering of Polymeric Biomedical Devices, National Science Foundation, Ph. L.J. Lee, Co-PIs: A.T. Conlisk, J.J. Chalmers, R. Lee

Jessica Winter
Assistant Professor, Ph.D., University of Texas at Austin, 2004. Nanobiotechnology, Tissue Engineering.

Awards & Honors
Elevated to Senior Member status of IEEE

Semi-finalist Innovator of the Year, Columbus Tech Innovation Awards

Refereed Papers


Current Projects and Grants
$300,000 Winter, Jessica O., Sarkar, Atom 2009-2012
Brain Mimetic Materials for Cancer Cell Migration Studies, National Science Foundation


$44,604 Winter, Jessica O. 2009-2011
Multifunctional Hybrid Nanomaterials: Synthesis, Manipulation and Device Arrays, National Science Foundation (OSU MRSEC, subaward)

$37,500 Winter, Jessica O., Sooryakumar, R. 2009-2010
Multiprojective Hybrid Nanomaterials: Synthesis, Manipulation and Device Arrays, National Science Foundation (OSU MRSEC, subaward)

$44,604 Winter, Jessica O. 2009-2011
Magnetic-Fluorescent Nanoparticles for Cellular and Molecular Separations, National Science Foundation (OSU NSSEC, subaward)

David Wood
Associate Professor, Ph.D., RPI 2000.
Biochemical Engineering, Bioseparations, Biosensing, Protein Engineering, Drug Discovery.

Books and Book Chapters


Refereed Papers


Current Projects and Grants
$400,000 Wood, David 2004-2010
Protein Switches for Biotechnology, National Science Foundation

$250,000 Wood, David 2008-2010
Bacterial Biosensors for Identification of Endocrine Disruptors Associated with Autism Spectrum Disorder, Nancy Lurie Marks Family Foundation, Christina and Jeffrey Lurie Family Foundation
$275,000  Wood, David  2008-2010  
Bacterial Biosensors for Endocrine Disrupting Compounds, National Institute of Environmental Health Sciences.

$273,404  Wood, David  2008-2011  

$160,000  Wood, David  2008-2010  
Commercialization of CA Enzyme (with Carbozyme, Inc.), New Jersey Commission on Science and Technology.

Current Projects and Grants

Barbara Wyslouzil
Professor, Ph.D., Caltech, 1992. Aerosol Science, Nanotechnology, Growth and Structure, Biomedical Applications of Aerosols

Awards & Honors
College of Engineering, 2009 Lumley Research Award

Refereed Papers


Current Projects and Grants

$198,705  Wyslouzil, Barbara E. 2004-2009  
Controlled drug delivery via solid lipid nanoparticles, National Science Foundation (OSU NSEC, subaward)

$90,000  Wyslouzil, Barbara E., 2007-2010  
Multicomponent droplet growth in supersonic natural gas separators, Petroleum Research Fund

$519,000  Wyslouzil, Barbara E., 2005-2010  
The formation rates and structure of nanodroplets, National Science Foundation

$450,000  Wyslouzil, Barbara E., 2009-2012  
Nanodroplet aerosols: Nucleation rates and structure, National Science Foundation

$45,479  Wyslouzil, Barbara E., 2004-2009  
Multifunctional nanoparticles: Formation and fundamental studies, National Science Foundation (OSU NSEC, subaward)

$399,961  Bohrer, Gil, Zhao, LingYing, Wyslouzil, Barbara E., 2010-2012  
Large eddy simulations of PM dispersion to quantify the effects of windbreaks on air quality around CAFOs, U.S. Department of Agriculture

Shang-Tian Yang
Professor, Ph.D., Purdue University, 1984. Bioprocess engineering, biochemical engineering, tissue engineering, metabolic and structure, Biomedical Applications of Aerosols

Books and Book Chapters


Refereed Papers


Current Projects and Grants

$90,000  Yang, Shang-Tian  2006-2009  
Production of Organic Acids and Esters from Plant Biomass by Extractive Fermentation and Enzymatic Esterification, The Consortium for Plant Biotechnology Research, Inc. (DOE)

$131,179  Yang, Shang-Tian  2007-2009  
Microfluidic CD Biochips for Enzyme-Linked Immunosorbent Assays, National Science Foundation, STTR Phase II, BioLOC

$300,000  Yang, Shang-Tian  2007-2009  
Production of butanol from sugar wastes in a fibrous bed bioreactor, EnerGenetics International, Inc.

$108,000  Yang, Shang-Tian  2007-2009  
An Integrated Fermentation-Ultrafiltration Process for the Production of Xanthan Gum from Whey Lactose, Bioprocessing Innovative Company, Inc., USDA SBIR Phase II
$185,500 Yang, Shang-Tian 2008-2009
Metabolic engineering of C. tyrobutyricum and C. acetobutylicum for butanol and hydrogen production, Nagarjuna (India)

$1,000,000 Yang, Shang-Tian 2008-2010
Engineering Clostridia for economic production of biobutanol as a biofuel, Ohio Department of Development Third Frontier Advanced Energy Program

$215,144 Yang, Shang-Tian 2008-2010
Production of fumaric acid and ethanol from soybean meal, United Soybean Board

$ 65,550 Yang, Shang-Tian 2008-2009
Engineering clostridial fermentation for biobutanol production, National Science Foundation, STTR Phase I, Bioprocessing Innovative Company, Inc.,

$110,000 Yang, Shang-Tian 2009-2010
Production of fumaric acid from sugars and starch by filamentous fungal fermentation, The Consortium for Plant Biotechnology Research, Inc. (DOE)

Jacques Zakin
Drag Reduction, Enhanced Heat Transfer, Rheology and Nanostructure Studies of Dilute Surfactant Solutions.

Referred Papers


Current Projects and Grants
<table>
<thead>
<tr>
<th>Professors</th>
<th>James F. Rathman</th>
<th>Milky Agarwal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bhavik R. Bakshi</td>
<td>David L. Tomasko</td>
<td>Bo Fang</td>
</tr>
<tr>
<td>Jeffrey J. Chalmers</td>
<td>Barbara Wyslouzil</td>
<td>Baley Akemi Fong</td>
</tr>
<tr>
<td>Stuart L. Cooper</td>
<td>Shang Tian Yang</td>
<td>Iraj Ghazi</td>
</tr>
<tr>
<td>Liang Shih Fan</td>
<td></td>
<td>Iwabata Hartman</td>
</tr>
<tr>
<td>Martin Feinberg</td>
<td></td>
<td>Faxing Li</td>
</tr>
<tr>
<td>Winston Ho</td>
<td></td>
<td>Jingang Li</td>
</tr>
<tr>
<td>Kurt W. Koelling</td>
<td></td>
<td>Wei Liu</td>
</tr>
<tr>
<td>L. James Lee</td>
<td></td>
<td>Qassai Mohammad</td>
</tr>
<tr>
<td>Umit Ozkan</td>
<td></td>
<td>Marashdeh</td>
</tr>
<tr>
<td>Michael E. Paulaitis</td>
<td></td>
<td>Res. Mirkelamoglu</td>
</tr>
<tr>
<td>Emeritus Professors</td>
<td>Robert S. Brodky</td>
<td>Koki Miyazono</td>
</tr>
<tr>
<td>Isamu Kusaka</td>
<td>Harry C. Hershey</td>
<td>Huangquin Qian</td>
</tr>
<tr>
<td>Andre Palmer</td>
<td>Thomas L. Sweeney</td>
<td>Gang Ruan</td>
</tr>
<tr>
<td>David Wood</td>
<td>Jacques L. Zakin</td>
<td>Rustin Matthew Shenkman</td>
</tr>
<tr>
<td>Associate Professors</td>
<td>Isamu Kusaka</td>
<td>Saju Varghese</td>
</tr>
<tr>
<td>Jessica Winter</td>
<td></td>
<td>Da-Ming Wang</td>
</tr>
<tr>
<td>Assistant Professor</td>
<td></td>
<td>Yi Wang</td>
</tr>
<tr>
<td>John Corn</td>
<td></td>
<td>Wan-Yi Wu</td>
</tr>
<tr>
<td>Carlo Scaccia</td>
<td></td>
<td>Chuang Xue</td>
</tr>
<tr>
<td>Instructors</td>
<td></td>
<td>Mingrui Yu</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Zhao Yu</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Chuanxiao Zhang</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Jingbo Zhao</td>
</tr>
<tr>
<td>Post Doctor and Research Associates</td>
<td></td>
<td>Yang Zhao</td>
</tr>
<tr>
<td>Visiting Scholar</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post Doctoral Researcher</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Visiting Scholar</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Visiting Scholar</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Visiting Scholar</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Academic Staff</td>
<td>Angela Bennett</td>
<td>David Cade</td>
</tr>
<tr>
<td>Graduate Program Coordinator</td>
<td></td>
<td>Bill Cory</td>
</tr>
<tr>
<td>Human Resources Manager</td>
<td></td>
<td>Mike Davis</td>
</tr>
<tr>
<td>Systems Specialist</td>
<td></td>
<td>Brian Endres</td>
</tr>
<tr>
<td>Academic Advising Coordinator</td>
<td></td>
<td>Leigh Evrard</td>
</tr>
<tr>
<td>Design Engineer</td>
<td></td>
<td>Lynn Flanagan</td>
</tr>
<tr>
<td>Department Business Office</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Laboratory Supervisor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Joint Computing Lab</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Senior Support Engineer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Administrative Associate (NSFC)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Communications Coordinator</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Administrative Fiscal/HR Administrator (NSFC)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Undergraduate Academic Advisor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Director of Development</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fiscal Associate</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>