MichiganEngineering
Chemical Engineering

University of Michigan
College of Engineering

ChE News

FALL 2003

The Newsletter of the Department of Chemical Engineering

Nano Is Big At Michigan

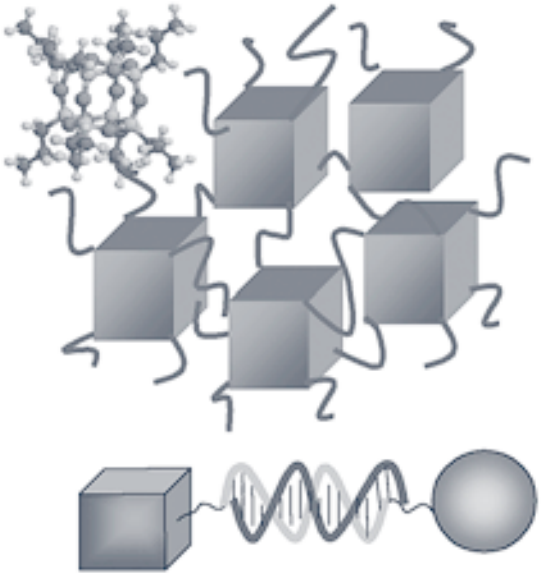


Figure 1. Biomolecules and polymers can be used to assemble nanoscopic building blocks into exotic and useful patterns.

The emerging field of nanoscale science, engineering and technology is revolutionizing the design and engineering of new materials and devices. By manipulating matter at nanometer length scales, researchers in the Chemical Engineering Department at Michigan are finding novel ways of assembling structures from the bottom up. Many of our faculty work extensively in the area, including Sharon Glotzer, Nicholas Kotov, Joerg Lahann, Mike Solomon, and Ralph Yang. In this issue we highlight the work of Sharon Glotzer, associate professor of chemical engineering, materials science and engineering, macromolecular science and engineering, and physics, and her students, who are discovering the fundamental principles of *self-assembly* in nanomaterials using computer simulation. Self-assembly is generally regarded as the most promising means for designing and controlling bottom-up assembly of nanometer-scale objects such as the super carbon molecules known as Buckyballs, and tiny semi-conducting nanocrystals, or "quantum dots," into structures such as sheets, tubes, wires, and shells needed as scaffolds and structures for catalysis, hydrogen storage, photonic and nanoelectronic devices, and drug delivery. By constructing models of nanoscale building blocks (Figure 1) and their interactions, Glotzer's research group simulates the assembly of thousands of building blocks into useful structures like nanotubes, nanowires, nanoshells and nanosheets.

The Glotzer group's work has appeared in *The New York Times* and is featured in the August 2003 issue of *Nano Letters*. Professor Glotzer, who has published 75 research and review articles, is co-founder and the vice-chair of the AIChE's Nanoscale Science and Engineering Forum and has presented over 100 invited talks around the world. She regularly advises the Department of Energy in the development of new programs and initiatives in computational nanoscience and large-scale scientific computing, and advised the National Academy of Sciences on an upcoming report

CONTINUED ON PAGE 13

INSIDE

CHEMICAL ENGINEERING NEWS
is published by:

Chemical Engineering
University of Michigan
3074 H.H. Dow Building
2300 Hayward Street
Ann Arbor, MI 48109-2136

(734) 764-2383
(734) 763-0459 fax
cheme@umich.edu

Department Chair
Professor Ronald G. Larson

Newsletter Staff
Sandra G. Swisher, Editor

Lahann Joins Faculty

We welcomed Joerg Lahann to our faculty as an assistant professor this fall. Joerg received his Ph.D. in 1998 in macromolecular chemistry from Aachen University in Germany where he worked with Dr. Hartwig Hoecker. Most recently he has been doing postdoctoral work with Professor Robert Langer in the Chemical Engineering Department at MIT. His research is broadly related to surface engineering with strong ties to biomedical engineering and nano-technology. He has already published over 20 scientific publications and has contributed to more than 10 patent applications. Earlier this year, his research on reversibly switching surfaces was featured in an article in *Science* (J. Lahann, et al., A Reversibly Switching Surface. January 17, 2003, 299, 371-374.) (described on page 5). These "smart surfaces" can reversibly switch properties in response to an external stimulus. To demonstrate these findings, a surface design was developed that can be changed from water-attracting to water-repelling with the application of a weak electric field. Designed as a switch, single-layered molecular-level machines are aligned on a surface using self-assembly and are then flipped between defined microscopic states. This type of surface design may offer a new paradigm for interfacial engineering as it amplifies reversible conformational transitions at a molecular level to macroscopic changes in surface properties without altering the chemical identity of the surface. Lahann has also developed a novel class of polymers with potential for biomimetic and spatially directed surface engineering. This "reactive coating" technology uses chemical vapor deposition (CVD) polymerization to deposit a wide range of chemical signatures on various substrate materials. Its simplicity in providing chemically reactive groups and its applicability to three-dimensional geometries (e.g. for microfluidics) enables the exact tailoring of surface properties and the preparation of biologically relevant microenvironments. Reactive coatings

Note From the Chair

There have been so many great things happening this year in the department that there is no room for my usual letter! Enjoy this year's issue, and best wishes!

— Ron Larson

CONTINUED ON PAGE 5

Kotov is New Associate Professor

Nicholas Kotov joined our department in September as an associate professor. He received B.S. and Ph.D. degrees in chemistry from the Moscow State University (Moscow, Russia) in 1987 and 1990, respectively, where he worked on the modeling of bacterial photosynthesis at the macroscopic interface. Following graduation, Dr. Kotov accepted a postdoctoral appointment at Syracuse University in the laboratory of Professor Janos Fendler, where he began research on layered nanostructures. In 1996, he joined the Chemistry Department at Oklahoma State University as an assistant professor. While at Oklahoma State, Kotov developed preparation methods and applications for layer-by-layer assembled nanoparticles and other materials. In addition to his research activities, he was also one of the founders of a unique NSF-funded graduate program in photonics–a joint endeavor between the Departments of Chemistry, Electrical Engineering, and Physics at Oklahoma State. This program trains students for careers in the high-tech information, semiconductor, and biomedical industries.

Recently, Kotov's research group, which comprises 20 students and postdoctoral scholars, has made several breakthrough discoveries in the preparation of ultrastrong composites that can be used for biomedical and space applications. They have also found a simple and universal method for the preparation of semiconductor nanowires for the emerging field of nanoelectronics. Articles about his research have been published in scientific and popular magazines such as *Nature*, *Science*, *Chemical and Engineering News*, *The New York Times*, *Popular Mechanics*, and *Science News*.

Professor Kotov has received several awards and honors, including the Mendeleev Stipend, the CNRS Stipend, the NSF CAREER award, the Humboldt Fellowship, and the Award for Scholarly Excellence. He has authored more than 70 research papers in chemistry and engineering journals and has presented over 100 papers at professional meetings. Presently, he is editing a volume on nanoparticle superstructures that will be published by Marcel Dekker next year, in which several well-known researchers will address the fundamental problems of organization at nanoscale.

Dr. Kotov also maintains active industry ties. The processes developed in his labs are currently used in R&D labs at Avery-Dennison and Ciba Vision (Novartis, AG). A start-up company in Stillwater, OK, Strala Materials, is commercializing the applications of ultrastrong materials. Strala is a spin-off of Nomadics Inc., which specializes in nanotechnology research and development.

Kotov will continue his research in nanostructured composites at Michigan with an emphasis on biomedical and automotive applications. His other research interests include: interactions of living cells with nanostructured surfaces, nanoparticles as agents for cancer treatment and diagnostics, nanoscale electronic circuits, and carbon nanotube and natural clay composites for a new generation of vehicles.

As soon as he gets settled in at Michigan, Nick also plans to work with local middle schools to introduce students to new advances in nanotechnology and to assist educators in providing early opportunities for science and engineering education.

Interdisciplinary Hires Yield Two Faculty

Jinsang Kim

Michael Mayer

We welcome two additional faculty members to our department this year, Jinsang Kim and Michael Mayer. Dr. Kim joined our faculty as an assistant professor in September and has a joint appointment in the Department of Materials Science and Engineering. He comes to Michigan from California Institute of Technology, where he was conducting research on the bacterial synthesis, chemical modification, and self-assembly of genetically engineered proteins with Professor David Tirrell. His work there involved the expression of artificial genes to determine the extent to which artificial genetic information can be used to encode supramolecular assembly in macromolecular systems.

Dr. Kim earned his Ph.D. in 2001 in materials science and engineering from the Massachusetts Institute of Technology with Timothy Swager of chemistry, where he studied the synthesis of conjugated polymers, their supramolecular assembly, and their function as advanced fluorescence sensors. To complete his research, Kim manipulated conjugated polymers at the molecular and the nanostructural level to control optoelectronic properties of the conjugated polymers. He used this in a bio-inspired energy harvesting strategy for directing energy transport within conjugated polymer thin films with the ultimate goal to fabricate high performance solid-state fluorescence chemosensors. His Ph.D. thesis work won several prestigious awards and resulted in papers in *Nature, Angew. Chem., JACS, and Macromolecules.* He holds a M.S (1993) and a B.S. (1991) from Seoul National University, both in Fiber and Polymer Science.

At Michigan, Kim plans to combine his interest in biomaterials, biosensors, optoelectronic polymers, and nanostructural assembly for a variety of applications, such as supramolecular assembly of genetically engineered proteins for photo- or electro-active gels, hybrid synthetic/natural polymers for biosensors, and ordered organic/inorganic composites for photovoltaic cells.

Michael Mayer, who has a joint appointment in the Departments of Chemical Engineering and Biomedical Engineering, will come to Michigan in January 2004. Dr. Mayer received his bachelor's and master's degrees in biotechnology from Technical University Carola Wilhelmina in Braunschweig, Germany. He completed his doctoral studies at the Swiss Federal Institute of Technology (ETH), Lausanne, Switzerland in biophysical chemistry in 2000, where he worked with Horst Vogel. Currently, he is doing post-doctoral research in biophysics, microfabrication, and nanobiotechnology with George Whitesides in the Department of Chemistry and Chemical Biology at Harvard University.

Dr. Mayer's primary interests lie in transport processes through biomembranes, molecular sensor systems of living cells, and cellular communication. His research focuses on three areas: 1) Employing micro- and nanofabrication to assemble biosensors for functional assays of membrane proteins. These assays are used to elucidate details of the cellular machinery for signaling across membranes and between cells. 2) Using multiplexed versions of these biosensors for screening of new therapeutic drugs. 3) Applying the working mechanisms of the protein machinery for membrane transport and signaling to engineer biomimetic, nanoscale sensors, amplifiers, valves, and motors.

Lahann

CONTINUED FROM PAGE 2

are compatible with soft lithographic processes, allowing for patterning of proteins, DNA, cytokines, and mammalian cells.

As he begins his career at Michigan, Lahann is looking forward to continuing his research of the interface between man-made materials and cellular systems. He sees the importance of both innovation and applied science in his research. "Although it is immensely important to push the fundamental boundaries of research permanently," Lahann says, "it is equally critical not to lose sight of potential applications that may help us to justify our efforts."

Lahann's research featured in January 17, 2003 issue of Science

Text excerpted with permission from R. Service, "Chemists Concoct Quick-Change Surface," Science, 299:321-323 (2003). Copyright (2003) American Association for the Advancement of Science.

A novel material, described in the January 17, 2003, issue of *Science*, has a unique love-hate relationship with water. With a flip of a switch, it alternates between attraction and repulsion. The secret to the switchable material, which scientists say could have a variety of uses, is electronically twisting molecules arrayed on the surface. Teams have been able to switch surface properties before, but only by laboriously adjusting their chemistry. Physical chemist Joerg Lahann, a former post-doctoral student in the lab of chemical engineer Robert Langer at the Massachusetts Institute of Technology, wanted something easier. Lahann and colleagues turned to chainlike polymers called alkanethiols, which naturally assemble into what looks like rows of tightly packed cornstalks. If they could synthesize alkanethiols with different chemical properties on their tops and sides and then attach them to a plate, the researchers thought, they could alter the surface properties of the plate simply by making the molecules stand straight or bend over. Getting the alkanethiols to stand up was easy. Sulfur atoms at one end of the molecules naturally bind to gold surfaces, and the molecular stalks stick straight up if packed in tightly. To bend over, however, the alkanethiols needed breathing room, which Lahann supplied by synthesizing novel alkanethiol stalks with bulky mushroom-like heads. As the surfactant-like amphiphilic molecules latched onto the gold surface, the bulky heads prevented them from packing tightly together. Lahann and his colleagues then used a standard chemical reaction to lop off the tops of the mushrooms, leaving each molecular cornstalk tipped with a negatively charged, water-loving carboxylic acid group. To persuade molecules to bend over, Lahann and his colleagues needed only to wire up the gold surface to a power supply. When the researchers applied a positive electric potential, the plate yanked down on the carboxylic acids, exposing their water-repelling hydrocarbon chains.

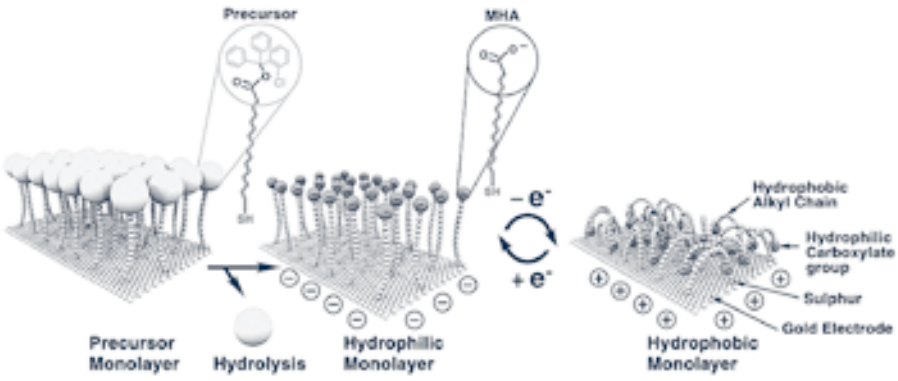
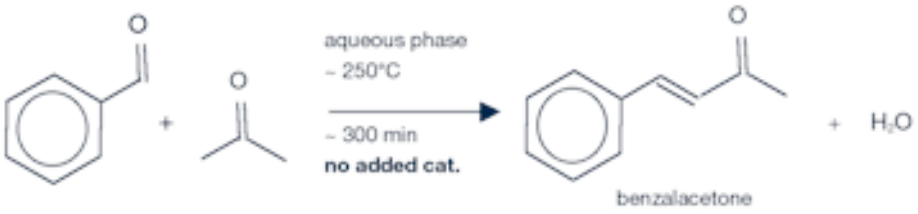


Photo reprinted with permission from J. Lahann et al., "A Reversibly Switching Surface," 299:317-374 (2003). Copyright (2003) American Association for the Advancement of Science.

Cleaning up with Hot Water

Water is plentiful, inexpensive, and non-toxic. It can be more environmentally benign to use water for industrial chemical reactions than to use organic solvents. Of course, most organic compounds aren't miscible with water, which is why organic solvents are typically used. But that "fact" is based on our experience with room-temperature liquid water. If water is heated to about 250 – 300°C, it becomes a very good solvent for organic compounds. In fact, high-temperature liquid water possesses solvent properties that are similar to those of polar organic solvents such as acetone. This behavior allows one to envision a simple chemical process wherein organic reactants and water are mixed together, heated to form a single phase, fed to a reactor, and the reaction products separated from the water by reducing the temperature and decanting the organic and aqueous phases. The potential environmental and economic advantages that accompany chemical processing in high-temperature water are leading Professor Phil Savage and several of his graduate students to conduct research in this area.

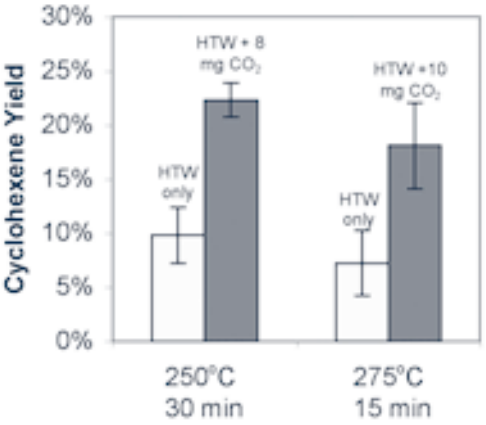
One of the properties of high-temperature water (HTW) that can be exploited to do industrial chemistry is its dissociation into H^+ and OH^- ions. The concentration of H^+ ions naturally present in liquid water at room temperature is 10^{-7} mol/kg (pH = 7). High-temperature liquid water boasts a concentration of H^+ and OH^- ions that is nearly 100 times higher. These naturally elevated levels of H^+ and OH^- provide opportunities to do acid- and base-catalyzed reactions in HTW without the addition of any traditional acids or bases, which would reduce greatly the amount of waste byproduct associated with such catalyzed reaction processes.



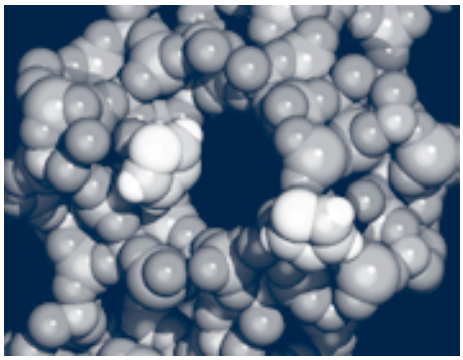
Graduate student Craig Comisar is using the higher level of OH^- ions naturally present in HTW to do base-catalyzed C-C bond formation without adding any base catalyst. Among the reactions he has investigated is the condensation of benzaldehyde and acetone to form benzalacetone, which is shown in the figure on the left. At typical reaction conditions of 250°C, the reaction reaches an equilibrium product yield of about 25% after five hours.

Graduate student Shawn Hunter is boosting even higher the level of H^+ in HTW by adding CO_2 to the reactor. Carbon dioxide forms carbonic acid in water, which then dissociates to produce even more H^+. Hunter, an NSF Fellow, has shown that this environmentally benign way to do acid-catalysis can substantially increase rates for alkylation and dehydration reactions. The chart below shows the advantage of including CO_2 in the dehydration of cyclohexanol to make cyclohexene.

CONTINUED ON PAGE 8



Cost-Effective Fuel Technology



Schematic of two thiophene molecules adsorbed in a cavity of CuY zeolite. The light-colored atom represents sulfur.

Professor Ralph Yang and his research team have announced the discovery of a promising new cost-effective technology that they hope can soon be used commercially to remove nearly all sulfur from transportation fuels (gasoline, diesel fuels and jet fuels), and could also be extremely useful for fuel cell applications (*Science,* July 4, 2003, 301, 79–81). Tougher U.S. and foreign regulations for diesel fuel, which will be phased in beginning in 2006, require a drastic reduction in sulfur content from the current average of 500 parts per million (ppm) to 15 ppm. EPA standards for gasoline, also now averaging at 500 ppm, will soon require sulfur levels to be reduced to 30 ppm.

The most common method of removing sulfur today from liquid fuels, hydrodesulfurization, which has been around since the 1930's, uses a catalyst, such as Co-Mo/Al_2O_3 or Ni-Mo/Al_2O_3, to break down sulfur compounds under high pressures of hydrogen (20-100 atm) and elevated temperature (300-340°C), forming hydrogen sulfide gas. Many industry analysts predict that the new EPA standards will significantly raise refining costs due to the need for higher temperatures and pressures, and the larger reactors that will be required to do the job. For fuel cell applications, the required sulfur tolerance is not achievable by hydrodesulfurization.

Researchers have been looking for adsorbent materials that are highly selective toward sulfur compounds for five decades without much success. Professor Yang believes a new zeolite sorbent could be just the material the petroleum refining industry and fuel cell developers need. The new sorbent, which costs about $2 per pound, is produced by a simple ion exchange reaction, in which Na^+ ions in zeolite Y are replaced with Cu^+ or Ag^+ ions. The resulting product is capable of reducing the sulfur content in commercial diesel fuel from 430 ppm to less than 0.2 ppm by weight, and each gram has the ability to clean 34 cc of diesel.

"The new sorbent is regenerable," says Professor Yang, who developed the new sorbent with the help of his "outstanding PhD student," Arturo Hernández-Maldonado and postdoctoral fellow, Frances Yang. "The new sorbent is highly selective toward aromatic sulfur compounds, such as thiophene and its derivatives, which are not effectively removed by hydrodesulfurization. The Cu^+ and Ag^+ zeolites form a weak chemical bond with the thiophene compounds, so it is reversible," Professsor Yang says. The sulfur compounds can therefore be removed, allowing the sorbent to be reused.

Yang believes the new sorbent also has great potential for use with fuel cells, which require hydrogen. Liquid fuels are ideal energy sources for fuel cells. When used to produce the hydrogen, a fuel processor is needed to convert the liquid fuel into hydrogen. "The fuel processor requires liquid fuel that has less than 0.1 or 0.2 ppm sulfur. Otherwise the sulfur will poison the catalyst," Yang says. The new sorbent could be just what is needed to remove any traces of sulfur from the gasoline.

Yang was interviewed by the BBC, MSNBC, C&E News, and Environmental Science & Technology (EST), among others about this new technology. Portions of this article are taken from an EST interview with Britt E. Erickson ("Cutting the Cost of Sulfur Removal," *EST Online*, July 24, 2003.) To read more about Professor Yang's research, visit www.engin.umich.edu/dept/cheme/people/yang.html.

Stacy Bike Leaves for Grove City

We were sad to see Stacy Bike and her family leave Ann Arbor in June, but wish her well in her new position at Grove City College. Bike, who had been at the university since 1988, was an associate professor of chemical engineering, and macromolecular science and engineering. During her time with the department, she taught the undergraduate fluid mechanics and heat and mass transfer courses, the graduate fluid mechanics course and a special topics course on colloid and surface chemistry.

Her research focused on quantifying microscopic interactions in colloidal (nanoparticle) dispersions, and mapping those interactions into the macroscopic behavior of materials fabricated from colloidal systems. Through experiments and modeling, her research group quantified electrostatic interactions, van der Waals interactions, and steric interactions, toward the precise control of these interactions to achieve the desired material behavior.

Professor Bike and her research group developed an experimental technique, total internal reflection microscopy (TIRM), which allowed them to quantify single-particle dynamics in liquid systems with a resolution of nanometers. With this technique they could measure the interaction forces between a single colloidal sphere and a flat plate, and to study the interactions of biological colloids such as lipid vesicles with biomaterial surfaces.

My husband, William Birmingham, and I are leaving U-M this summer for faculty positions at Grove City College, a small private college in northwestern Pennsylvania. I will be teaching in the Mechanical Engineering Department and my husband will be teaching in the Math and Computer Science Department.

I have greatly enjoyed my years at U-M. I particularly have fond memories of teaching undergraduate students, both in the classroom and in my laboratory. Certain memories stand out—the unlimited ways in which a glass of water can be used to illustrate concepts in fluid mechanics and using cooking videos to reinforce the concepts of conduction, convection and radiation in heat and mass transfer. All of my children still enjoy dancing to the 'duck' music and the younger two still play with the rubber duck in the bathtub (thanks, Fall 2001 ChE 342 class!).

As we move to Grove City College, we will still root for the Wolverines—the Grove City Wolverines, that is!

Stacy Bike

Green Chemistry

CONTINUED FROM PAGE 6

BP is sponsoring a project to explore the feasibility of synthesizing terephthalic acid from p-xylene in high-temperature water. Terephthalic acid is a monomer used to make polyethylene terephthalate (PET), which is used in beverage containers and fibers. The selective oxidation reaction is homogeneously catalyzed by $MnBr_2$. Jennifer Dunn, a graduate student, has identified reaction conditions that give very high yields of terephthalic acid. She has also assessed the economics and environmental impact of an aqueous phase synthesis process for this commodity chemical, and found that it can be superior to the existing process on both counts. Jennifer has been awarded fellowships to participate in two international green chemistry conferences (in Oxford and in Tokyo), and she recently received an EPA STAR graduate fellowship.

To read more about Professor Savage's research group, visit www.engin.umich.edu/dept/cheme/people/savage.html.

Scott Fogler Named Arthur F. Thurnau Professor

From the Office of the Provost and Executive Vice President for Academic Affairs

H. Scott Fogler, Vennema Professor of Chemical Engineering and professor of chemical engineering, has been named to an Arthur F. Thurnau Professorship, an award that recognizes and rewards faculty for outstanding contributions to undergraduate education. The term of the professorship is July 1, 2003-June 30, 2006.

Scott's teaching career, during which he has helped train multiple generations of undergraduate chemical engineering students, has been exemplary. His textbook, *The Elements of Chemical Reaction Engineering*, is the dominant undergraduate text in this field in the world.

Devoted to undergraduate education, he has a wide range of impressive accomplishments in the classroom, in the preparation of educational materials, in innovations, and in scholarly contributions related to teaching and learning. An early-adopter of new teaching methods, he has familiarized himself with best practices and has implemented them in his teaching of the undergraduate chemical engineering course, Reaction Engineering and Design. Skillfully using in-class problem solving, real-life examples, and out-of-class activities, he holds students' interests and demonstrates the relevance of the material. He has championed the use of "open-ended problems" as a method for students to develop creativity and "out-of-the-box" thinking skills, a significant enhancement to traditional rote memory and equation manipulation so commonly used in many courses. Most significantly, he works tirelessly to bring international students, especially those with disadvantaged backgrounds, to the university, where they can learn the latest methods to take back to their home countries and influence the next generation of educators.

Established in 1988, the professorships are named after Arthur F. Thurnau, a Michigan alumnus, and are supported by the Thurnau Charitable Trust. Other ChE faculty who have been named to the Thurnau professorship are James O. Wilkes (1989-1992) and Phillip E. Savage (1997-2000).

Ron Larson Elected to NAE

Ronald G. Larson, the George Granger Brown Professor of Chemical Engineering and chair of the department, was recognized by the National Academy of Engineering (NAE) "for elucidating the flow properties of complex fluids at the molecular and continuum levels through theory and experiment." He is widely regarded as a leading researcher in chemical engineering. Dr. Larson's work in the rheology of complex fluids has broad implications for the polymer, pharmaceutical and electronics industries. In 2002, he received the Bingham Medal, the highest annual award bestowed by the Society of Rheology.

Dr. Larson received all of his degrees in chemical engineering from the University of Minnesota. After completing his Ph.D., he took a position as a member of technical staff at Bell Laboratories in New Jersey. There, in addition to pursuing his basic interests in complex fluids and fluid mechanics, he worked on applied engineering problems in the manufacture of integrated circuits, optical fibers, optical storage devices, and laptop computers.

Larson was among the 77 new members NAE honored this year, for a total U.S. membership of 2,138. There are now 20 College of Engineering faculty members who have received this honor.

Mike Solomon Receives Henry Russel Award

Martin Vloet, U-M Photo Services

Mike Solomon with University of Michigan President, Mary Sue Coleman, at the Russel Award ceremony in March 2003.

From The University Record and the Office of the President

Michael J. Solomon has received the Henry Russel Award, one of the highest honors the University bestows upon junior faculty members. Dr. Solomon has been at the University since 1997. "Mike has built a successful research program in the area of experimental methods for polymer and colloidal science, and his ideas have attracted substantial support from government and industrial sources," said a letter from Chemical Engineering Chair, Ronald Larson, "He has a strong service and publication record, and is a superb advisor to his graduate students."

As an undergraduate at the University of Wisconsin, Madison, Solomon graduated with degrees in both chemical engineering and economics. Later, he spent a year in Aix-en-Provence, France, as an International Rotary Fellow in economics. Following his graduate work at the University of California at Berkeley and postdoctoral work at the University of Melbourne, Dr. Solomon joined the faculty at the University of Michigan in 1997. Since his arrival, he has provided stellar contributions in teaching and research.

Dr. Solomon combines an elegance of research methodology with a true affinity and dedication to teaching. Many of his colleagues at the university have noted with admiration his devotion to students at all levels, from those in his introductory course in chemical engineering, to the graduate students he mentors. He is legendary for memorizing the names of over 100 students in the first week of a semester, and for the intensive individual attention he provides. One colleague notes that he "makes a real effort to impart the joy of learning and discovery to each student."

Both the Henry Russel Award and the Henry Russel Lectureship were established in 1925 with a bequest from Henry Russel of Detroit, who received three degrees from the University of Michigan.

Schwank Speaks To Congress

By Mark Burnham, U-M Washington, D.C. Office

Johannes Schwank, testifying before a House committee on May 20, urged Congress to consider creating a university-based hydrogen research program to capitalize on the expertise at U.S. universities in creating a hydrogen fuel economy.

Dr. Schwank told members of the House Energy and Commerce Committee that while research on hydrogen fuel cells is ongoing at U-M and elsewhere, a larger, better federal research program is needed.

"The scope and scale of the federal effort to overcome the important technical challenges is sorely inadequate," he said. "If we as a nation are going to see the transition to a hydrogen economy, securing our technical leadership in the world, then we must create a more comprehensive and coordinated program."

Dr. Schwank urged the committee to look at creating an Energy Research Initiative (ERI) either at the National Science Foundation or the Department of Energy. The ERI would focus on hydrogen fuel research and would select a group of six to 10 universities that would undertake an integrated set of basic research and education projects focusing on resolving the technological challenges that impede hydrogen fuel cell development.

Kudos

Faculty

Scott Fogler received the 2003 University of Missouri-Rolla Named Lectureship. This lectureship, which is analogous to the our department's Katz Lectureship, was presented on April 23 and 24, 2003. His lecture topics were "Fused Chemical Reactions: From Pharmacokinetics of Acute Toxicology to Wax Removal in Sub-Sea Oil Pipelines" and "Using Senior Unit Operations Laboratory to Develop Trouble Shooting Skills and to Ease the Transition to the Work Place." Professor Fogler has also received named lectureships from University of Oklahoma, Vanderbilt, North Carolina State, Oklahoma State, University of Puerto Rico, and Michigan State University.

Susan Montgomery received a College of Engineering Teaching Excellence Award, given annually to a non-tenure track faculty member who exhibits outstanding or unusual teaching skills.

This year **Dr. Montgomery** also received a Society of Women Engineers (SWE) Teaching Award and an American Society for Engineering Education's (ASEE) Spread the Word/Campus Representative Zone award for recruiting the highest percentage of students into the local chapter.

An article by **Mike Solomon** and recent Ph.D. graduate, **Priya Varadan**, appeared in and was profiled on the cover of the February 4, 2003, issue of *Langmuir*. The article, titled "Direct Visualization of Long-Range Heterogeneous Structure in Dense Colloidal Gels," was based on the research done at Michigan by Dr. Varadan and Dr. Solomon.

Levi Thompson was selected to receive the 2003 GEM Outstanding Alumni in Academia Award in recognition of his outstanding achievements in the field of education. GEM is the National Consortium for Graduate Degrees for Minorities in Engineering and Science.

Robert Ziff was elected Fellow of the American Physical Society. Dr. Ziff received this honor for his sustained contributions to understanding the kinetics of aggregation and fragmentation, nonequilibrium chemical reactions, kinetic phase transitions and percolation theory.

Graduate Students

Jennifer Dunn, from **Phil Savage's** research group, received an EPA Science to Achieve Results (STAR) fellowship from the EPA's National Center for Environmental Research. The center awards fellowships to students in environmental science and engineering disciplines who were selected by an independent peer review process. During the fellowship term, she will continue studying the partial oxidation of alkyl aromatics in high-temperature water, an environmentally benign solvent.

Alumni

Stuart W. Churchill, the Carl V.S. Patterson Professor Emeritus of Chemical and Biomolecular Engineering, University of Pennsylvania, received the National Academy of Engineering's 2002 NAE Founders Award, which recognizes an NAE member who has made lifelong contributions to engineering and whose accomplishments have benefited the people of the United States. Dr. Churchill was recognized "for outstanding leadership in research, education, and professional service, and for continuing contributions in combustion, heat transfer, and fluid dynamics for over half a century."

The Council of the National Academy of Sciences has selected **Peter Lederman** as a National Associate in recognition of his service to the organization. The national academies serve as advisors to the nation in science, engineering, and medicine.

HandyLab, Inc, a spin-off of **Mark Burns'** research lab formed by two former ChE graduate students, **Kalyan Handique** and **Sundaresh Brahmasandra**, was featured in the March 17, 2003 issue of *The Wall Street Journal.* (www.handylab.com/news/wsj_03172003.html) HandyLab develops and manufactures portable, low-cost nucleic acid and protein-based analysis systems. The patented, self-contained microfluidic systems are capable of integrating and automating multiple laboratory processes on a single chip.

Gifts from our Alumni, Friends, and Research Partners

July 2002 to June 2003

Thank you for your generous gifts to the Department of Chemical Engineering. If we have missed someone, please accept our apology, and also let us know so we can correct our records.

Cache-Computer Aids for Chemical Engineering Education
Brice Carnahan, Ph.D.

Chemical Engineering Alumni-Faculty Merit Scholarship
Dr. George T.S. Chen
Pamela Maker
Merck Research Laboratories

Chemical Engineering Fellowships Fund
Warren D. Gilbert
Clarence J. Young Family Trust

ChE Special Fund
Abbott Laboratories Fund
Air Products Foundation
Lyle F. Albright, Ph.D.
BASF Corporation-Headquarters
B. Karl Bussey
Dan Chapel
ChevronTexaco
S. Thomas Cleveland
Gus Constan, Ph.D.
Consumers Energy Company
DaimlerChrysler Fund
Thomas G. DeJonghe, J.D.
W. Nicholas Delgass
DePriester 1990 Trust
Dow Corning Corporation
DTE Energy Foundation
Steven P. Dugan
John F. Dydo
Dr. Earl A. Ebach
Jacob Eichhorn, Ph.D.
ExxonMobil Foundation
Nicholas Fatica, Ph.D.
Robert C. Fisk
Fluor Foundation
Ford Motor Company Fund
General Motors Foundation
Martin E. Gluckstein, Ph.D.
Thomas W. Gougeon
Sharon Grabois
Great Lakes Chapter of ISPE
Darryl T. Hansen TTEE
William G. Harrison
Mr. David B. Harwood
Martin A. Javinsky, Ph.D.
Prof. Ronald G. Larson
Lubrizol Foundation
Mr. Benjamin S. Maxey
Merck Research Laboratories
Dr. Donald A. Nast
Mr. Alfred A. Nuttall
Michael S. O'Donnell
Pharmacia Foundation, Inc.
Mr. Rudolph W. Pomper III
Procter & Gamble Fund
Dr. Roger K. Rains
Donald J. Ray
Mr. Charles J. Sawyer
Dr. Jerome S. Schultz
Shell Oil Company Foundation
James R. Street, Ph.D.
Tenho S. Connable Trust
Laura Thomson
Ms. Katherine R. Valentine
Van J. Wolf Estate
Mr. Joseph H. Vavra
Hanh X. Vo
H. Ray Wortman
Winfred C. Zacharias

Chemical Engineering Undergraduate Scholarship
BASF Corporation-Headquarters
BP Amoco Foundation
ExxonMobil Foundation
Merck Research Laboratories
Minnesota Mining and Manufacturing Company
Dr. Ralph H. Schatz
Donald Schriver
UOP LLC

Clifton S. Goddin Fund in Chemical Engineering
BP Foundation, Inc
Clifton S. Goddin, TTEE Rev Trust

Cosmo Oil Co.
Cosmo Oil Co. LTD

Dow Chemical Discretionary
The Dow Chemical Company Foundation

Dow Chemical Grant Fund in Chemical Engineering
Dow Chemical Company Foundation

Exxon Education Foundation Grant Fund
ExxonMobil Corporation

G. Brymer Williams Student Aid Fund
Bristol-Myers Squibb Foundation, Inc.
Finis E. Carleton III, Ph.D.
ChevronTexaco
James A. Craig, Ph.D.
Dr. Earl A. Ebach
David W. Haartz
Dr. Hua-Tie T. Kau
Mr. Thomas H. Laity
Richard S. Mayer, Ph.D.
Dorothy Maxwell
Robert H. Miller, Ph.D.
Mr. Garry M. Mlot
Dr. George J. Quarderer
Dr. Roger K. Rains
Robert Weis
Leonard A. Wenzel, Ph.D.
James O. and Mary Ann Wilkes

Industrial Affiliates Program in Flow and Reaction in Porous Media
Baker Hughes Business Support
Chevron Texaco
ConocoPhillips Company
Schlumberger
Shell International E & P, Inc.
Total E&P USA, Inc.

James O. Wilkes Undergraduate Scholarship
ExxonMobil Foundation
Charles E. Fivelson
Dr. Jeremy M. Hales

CONTINUED ON NEXT PAGE

Michelle A. Rasulis
Dr. Bernard J. Schorle
Sharon H. Thatcher
Dr. Antonio Valle
Prof. Brymer Williams
Finis E. Carleton III, Ph.D.
Joseph P. Greene, Ph.D.
Marathon Ashland Petroleum LLC
Donald K. McCord
Mr. Richard L. Peterson
Dr. Jude Thomas Sommerfeld
Dorothy Maxwell

Jane & Howard M. TenBroeck Scholarship in Engineering
FBO TenBroeck Irrevocable Trust

Lloyd L. Kempe Scholarship in Chemical Engineering
Theodore H. Elferdink, Jr.
Roger A. Frederick
Dr. William B. Woods

M Eng Pharmaceutical Engineering Program
Pfizer, Inc.

Margaret I & G. William Richards Memorial Scholarship
Marathon Oil Company Foundation
Mr. William B. Richards, P.E.

Merck Company Foundation Fellowship Support
Merck & Co., Inc.
Merck Company Foundation

Procter and Gamble Department Grant in Chemical Engineering
Procter & Gamble Fund

Shell Fellowship Fund in Chemical Engineering
Shell Oil Company Foundation

Pharmaceutical Manufacturing Symposium
Amgen, Inc.
Merck Research Laboratories
Pfizer, Inc.

Nanotechnology

CONTINUED FROM FRONT PAGE

Figure 2. Short polymers attached to nanocrystals produce new types of macromolecules that can be assembled into designer materials.

on chemical sciences in the 21st century. Sponsored by grants from the National Science Foundation and the Department of Energy, Professor Glotzer and her students are inventing new ways of using computer simulation to model nanoscale assembly. By elucidating the myriad of structures that can be formed by different types of nano building blocks, how the structures assemble, and under what conditions certain structures will form, the simulations provide fundamental information critical to designing new materials and devices. For example, the group is studying how DNA, proteins, and viruses attached to strategic locations on nanocrystals can be used to assemble gold nanospheres and silver nanocubes into regularly-spaced patterns. By exploiting the "lock-and-key" recognitive capabilities of complementary strands of DNA, tiny nanoparticles can be reversibly attached to one another to form ordered arrays needed for nanoelectronic circuits and chemical and biological sensors. How to use recognitive, biomimetic interactions to obtain specific predictable structures for particular applications is one mystery the Glotzer group is trying to solve.

The research group is also attaching synthetic organic molecules or polymers to model inorganic nanoparticles shaped like spheres, rods, disks, cubes, and triangles (Figure 2) to create hybrid tethered nanobuilding blocks that self-assemble into amazing tunable structures such as nanowires and nanoshells. Their simulations suggest that tethered nanoparticles may constitute a new class of "macromolecules" for nanomaterials assembly. Glotzer has just been awarded a new grant from the Department of Energy to apply her group's self-assembly strategies to the design and fabrication of molecular electronics devices.

To read more about Professor Glotzer's research or that of any of the other faculty doing nanotechnology research, visit the faculty webpages at www.engin.umich.edu/dept/cheme/people/dirfac.html.

College Celebrates 150th Birthday

One hundred fifty years ago, the University of Michigan College of Engineering began educating engineers, with the first class session held on January 20, 1854. This fall, the college will begin a celebration of a century and a half of learning and leadership.

Some of the activities planned during the next year include:

Saturday, September 6
Football Halftime Show, Michigan vs. Houston
Come hear the Michigan Marching Band and Michigan Engineering students as they celebrate 150 years of engineering excellence with a tribute to the College of Engineering.

Distillation column used in the ChE 460 laboratory, with Brymer Williams on right.

Tuesday, September 9
North Campus Day Festival and Anniversary Day
Join the entire CoE community during the Pierpont Commons North Campus Day Festival as we recognize the College's 150th anniversary. Enjoy a slice of birthday cake at the diag adjacent to Lurie Tower.

Thursday, October 16-Saturday, October 18
Michigan Engineering Alumni Weekend featuring the Sesquicentennial Deans' Forum
The traditional homecoming celebration offers a special treat on Friday afternoon as Dean Director and five former Michigan Engineering deans share their experiences as leaders of the College. Don't miss this rare gathering. For more information go to http://www.engin.umich.edu/alumni/events/weekend/ or call 734-647-7042

Friday, October 3 - Monday, October 27
Michigan Engineering History Display
The college will chronicle 150 years of engineering education in a display in the Gallery at the Media Union in October. Artifacts and photos from the 11 college departments will be featured in the display. A reception officially opening the display will be held on Friday, October 3.

Jerry with ChE Chair Ron Larson at the Katz Lectureship Dinner.

Schultz Gives Katz Lecture

On April 10 and 11, we had the pleasure of a visit from Jerome S. ("Jerry") Schultz and his wife Jane. Jerry was the 2003 recipient of the Donald L. Katz Lectureship, and his two talks were entitled "Learning from Biology: From Membranes to Sensors" and "Making Sense Out of Biosensors." Jerry, who did his undergraduate work at Columbia University and his graduate work at Wisconsin, joined our faculty in 1971. His contributions to bioengineering while at Michigan were recognized by the College of Engineering's Research Award in 1983 and the AIChE Food, Pharmaceutical and Bioengineering Award in 1984. Jerry left Michigan in 1987 for the University of Pittsburgh, where he became director of the Center for Biotechnology and Bioengineering. He was elected to the National Academy of Engineering in 1994. A presentation was made to Jerry at the accompanying annual Katz dinner, which also recognizes those of our doctoral students whose graduation is imminent.

The Reviews Are In and They're Great!

Our 662-page hard-cover history book with its 560 photographs, *A Century of Chemical Engineering at the University of Michigan*, was published in March 2003. Thanks largely to the kind and trusting people who prepaid before publication, we now have fewer than 300 copies remaining of the print run of 850. The book looks good, and has been exceptionally well received, as evidenced by the following comments we have received:

> "You should be very proud of it . . . I want to tell you how much I enjoyed reading this book - I read it from cover to cover. . . Marvelous book . . . I love the ChE history book . . . I can't say enough about the book, it's so intriguing . . . You've done such a wonderful job!. . . Your opus is superb, you have brought our department to life . . . Congratulations on putting it all together! . . . It is a fascinating history, a delight to read and cherish . . . I stayed up very late last night to read, page by page, all the history of this so special department . . . It truly is a monumental work . . . Infinite attention to detail . . .The project has been brought to an excellent conclusion . . .The work symbolizes the high standard of excellence associated with chemical engineering at the U-M . . . What an accomplishment . . . Absolutely marvelous job!. . .It brought back many treasured memories . . ."

If you don't already have a copy of *A Century of Chemical Engineering at the University of Michigan*," it can be yours for just $25, including postage, if you will just take a minute to complete the coupon below and mail it to us. Thank you!

James O. Wilkes, compiler of *A Century of Chemical Engineering at the University of Michigan* and "Organist for Hire" (1974).

Chemical Engineering History Book

If you wish to purchase a copy of the book, please complete and return this form. *The cost is $25.00 per copy, including postage.*

Name _____

Address _____

_____

Home Phone _____ E-Mail _____

☐ Payment Enclosed

Make check payable to the University of Michigan
Send to: Claire O'Connor, Department of Chemical Engineering,
The University of Michigan,
3074 H.H. Dow Bldg., Ann Arbor, MI 48109-2136

Undergraduate Scholarships

Every year we have many undergraduates who depend on our scholarships to help with their finances. This year some students are in particular need of assistance because of tuition increases and reduced financial aid packages. Three endowed funds established in honor of ChE faculty and another general undergraduate scholarship fund for undergraduate assistance, the Faculty/Alumni Scholarship, are among the accounts used to fund our undergraduate awards.

The Faculty/Alumni Scholarship fund relies entirely on donations. An endowment has been established for the other funds, and the annual scholarships are paid from the accrued interest. We gladly accept any donations you can make towards any of these funds, in which case please complete the form below and mail it to us. And, of course, if your personal finances allow, we would be happy to establish a scholarship fund under your own name!

Criteria for the scholarships mentioned in this article are as follows:

Lloyd L. Kempe and Barbara B. Scholarship Fund – *is awarded to an outstanding student in the biochemical area who has financial need.*

Brymer Williams Scholarship Fund - *recipients are selected based on their scholarship and financial need.*

James O. Wilkes Scholarship Fund - *applicants are interviewed, and considerable weight is given to those students who are working to help pay their own way through college.*

Faculty/Alumni Fund - *awarded to students who have financial need and who have excellent academic records.*

Scholarship Funds for the Undergraduate Program

Name(s) as you would like them to appear in donor listings

City State Zip

Home Phone Business Phone E-Mail

☐ Please check if you would like your gift to remain anonymous

☐ Lloyd L. Kempe ☐ G. Brymer Williams ☐ James O. Wilkes ☐ Faculty/Alumni

☐ Enclosed is my gift of $ _____ made payable to : The University of Michigan

☐ Enclosed is my employer (or my spouse's) matching gift form

☐ Charge my gift of $ _____ to my

☐ Visa ☐ MasterCard ☐ Discover ☐ AMEX

Account Number

☐☐☐☐ ☐☐☐☐ ☐☐☐☐ ☐☐☐☐

Expiration

☐☐ ☐☐

Signature

Credit card gifts are deductible only in the year the bank processes the transaction. To be processed by the year end, these gifts must reach us by 12/15/03.

Send to: Claire O'Connor, Department of Chemical Engineering, The University of Michigan, 3074 H.H. Dow Bldg., Ann Arbor, MI 48109-2136

UNDERGRADUATE SCHOLARSHIPS

THEODORE C. ARGUE
Meghann Stricker

BASF
Rebecca Domzal, Priscilla Ho, Jessica Mattis, and Melissa McGinnis

HELEN B. GIBSON
Landon Greene and Adam Cole

CLIFTON S. GODDIN
Shauna Puhl and Dan Schmidt

LLOYD L. AND BARBARA B. KEMPE
Adam Cole

LUBRIZOL
Suchita Shah and Bryan Styles

MERCK
Sean Vance

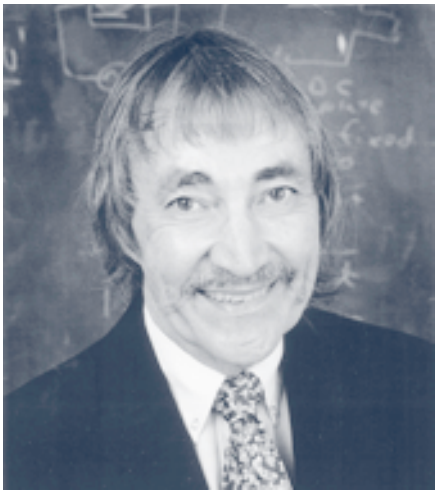
IAN & FRANCIS PATTERSON
Jennifer Bowker

JANE & HOWARD TEN BROECK
Chitra Laxmanan

JAMES O. WILKES
Laura Darjatmoko and Derek Bagozzi

G. BRYMER WILLIAMS
Nicole Arnold, Adam Redstone, Marc Schneidkraut, Jekaterina Severova, Matt Smith, and Santy Sulaiman

2003 Alumni Society Merit Award



From the College of Engineering Media and Marketing

Dr. Stuart W. Churchill was the 2003 recipient of the ChE Alumni Society Merit Award. He was honored at department and college events during Michigan Engineering Alumni Weekend in October. Dr. Churchill received bachelor's degrees in both chemical engineering and mathematics from the University of Michigan in 1942. He returned to the university for graduate work in 1947. He became a member of the faculty even before completing his Ph.D. in 1952, and served as chairman of the Department of Chemical and Metallurgical Engineering at Michigan from 1962 to 1967. In 1967, Dr. Churchill left Michigan to accept the Carl V.S. Patterson Chair of Chemical Engineering at the University of Pennsylvania.

Best known for his work encompassing fluid mechanics, heat transfer, reaction kinetics and combustion, he has published six books and nearly 300 papers. He formally retired in 1990, but has remained active in teaching, research, and scholarly work. Dr. Churchill is a member of the National Academy of Engineering and was recently honored with its Founders Award. Dr. Churchill served as a director of the American Institute of Chemical Engineers (AIChE) from 1961 to 1967 and as its president in 1966. He has received many awards in his career, including AIChE's William H. Walker and W.K. Lewis awards. In 1983, AIChE named Dr. Churchill one of 30 "Eminent Chemical Engineers of the Quarter Century" during its 75th anniversary.

Dr. Churchill is a member of the department's External Advisory Committee. His granddaughter, Lara G. Zajic, is following in her grandfather's footsteps and has just completed her freshman year at Michigan, although she is studying biology rather than chemical engineering!

Alumni Notes

Don Kory (BSE '50) still keeps in touch with a couple of people from the U-M and occasionally joins the alumni group in south Florida for a football afternoon. Don and his wife have two very young grandchildren, a girl 6 and a boy almost 3. He is still a sailor but has not done much sailing as of late–even though he lives in a great place to do it.

Tom Vanden Bosch (BSE '59) retired in 1997 after 36 years in process development, process engineering and plant management. He is currently doing a little consulting in batch chemical manufacturing. Mostly he's enjoying family, hobbies and travel.

Jude Sommerfeld (MSE '60, PhD '63) retired from the faculty of the School of Chemical Engineering at Georgia Tech in August 2002. He served for 32 years on the school's faculty, including 8 years as associate director of the school.

Thomas Cleveland (BSE '61, MSE '63, MBA '63) published his thesis at Stanford University, June 22, 2002 entitled "Comparison of Resampling Methods for Improving Confidence Intervals in Group Sequential Trials on Rare Event Target Populations."

Steve Pondell (BSE '79) has taken a new position as VP-Operations for Cambrex Corporation in Charles City, Iowa. It's a big change in leaving, first Detroit, and then, Chicago but he and his family are looking forward to life in Small Town, USA in the Heartland! He says he'll miss his engineering recruiting for Abbott but hopes to be able to assist the college in some way from Iowa. He would like a great, big Meechigan victory over those pesty Hawkeyes this fall. His usual obnoxious behavior in support of Blue has had to be tempered somewhat after last season!

James Medalie (BSE '81) has been promoted to president of Kleerdex Company. Kleerdex Company, a subsidiary of Sekisui Chemical Ltd. (Japan) is the manufacturer of Kydex® thermoplastic sheet which is a specialty sheet used to make three-dimensional components for a multitude of applications. He lives with his wife Lynn and his children Susan and Philip in the small town of Bloomsburg in north-central PA.

Bruce K. Vaughen (BSE '84) (PhD Vanderbilt 1989) transferred to the DuPontTeijinFilms joint-venture polyester film plant in Hopewell, VA, in 2000. His primary work concentrates on applying the Process Safety Management (PSM) principles per the OSHA and corporate PSM Standards across the site's polymer and film production areas. He is the Americas' regional coordinator for PSM efforts between six polymer and film production sites and leads corporate PSM audits at other DuPont business sites.

Alex Packard (BSE '91) has been with Abbott Laboratories (Chicagoland area) since graduation and is currently in pharmaceutical manufacturing. He is married and has two children–the oldest will be starting kindergarten in the fall.

Scott Adams (BSE '94) has worked for Eaton Corporation since graduation. He was married to Julie Weiss in June of 2000 and they live in Rochester Hills, MI. He completed a master's in engineering at Case Western Reserve University in Cleveland, OH in 1998 and will begin the University of Michigan's Executive MBA program in August 2003.

Kari (Andrews) Walworth (BSE '94) and her husband, Kyle, welcomed a new member to their family this past spring, a lovely daughter, Kelsey Grace, who was born on May 29, 2003 at U-M Hospital. Kelsey is their first! Kari and her family are living in Ann Arbor and she is currently on maternity leave from her job as an environmental engineering specialist at Ford Motor Company. She says hello and best wishes to all ChE alumni and especially to the class of 1994! Go Blue!

Jeremy Bjork (BSE '94) just graduated from the Wharton School of Business this May. He and his wife, Adriana, moved to Frisco, Texas (a suburb of Dallas) this summer so he could start his job in marketing at Frito Lay.

Kristin Gross (BSE '94) is working as a sales manager in the human nutrition division of Chr. Hansen, which supplies probiotics, excipients, coatings, colors and flavors to the nutritional supplement and pharmaceutical industries.

Michelle Zimmerman (BSE '94) works as a strategic marketing manager at Novellus Systems in Silicon Valley. She is also launching a career development seminar called "Women: Make Your Mark" and working on her first book, a collection of poetry.

Kim Wicklund (BSE '95) graduated with her Ph.D. from UC-Berkeley's Chemical Engineering Department in May 2001. She spent a year working as a research scientist, then moved to a sales/applications scientist position at a digital imaging/systems engineering company that specializes in fluorescence microscopy applications. Kim's based in San Francisco, so if anyone is in the area, drop her a line!

Venu Ghanta (BSE '96) is currently serving as a Peace Corps volunteer in Janakpur, Nepal. He is a secondary school science teacher and hopes to have a water and sanitation engineering focus for his secondary project. You can contact him at venug22@yahoo.com.

Dieter Schweiss (MSE '96) married Leila Ann Grubby on March 22, 2002 and on November 18, 2002, their son, Devin Peter Schweiss, was born. He is currently between jobs, but hopes to find employment in the New Jersey area.

Visit the ChE Alumni News page at www.engin.umich.edu/dept/cheme/alumni.html

Amanda Uhrick (BSE '97) has been very busy in the five years since graduation. She started out in Chicago, doing catalyst research for Amoco Oil Co. Within a year and a half, the company was bought out by BP and she ended up in Houston, TX working in a refinery. Three and a half years later Amanda made it full circle and is now back in Chicago. She is still with BP, but is now working in their supply and trading organization. As for her personal life, she is happy to announce that she got married this summer in Northern Michigan.

Ellyne Buckingham (BSE '97) is still at Procter & Gamble in Cincinnati, OH, and is senior process development engineer in the paper division. She married another P&G'er, Mike Prodoehl, in Michigan on Saturday, June 28, 2003.

Jeffrey Sanchez (BSE '97) is still working in Ann Arbor for USFilter as a project engineer in engineering consulting where he is primarily doing industrial wastewater engineering work.

Andrea Brown (BSE '98) is a project management associate at Eli Lilly and Company and campus recruiter for Lilly engineering recruiting. She plans to marry Michael Ferguson (UIUC engineering grad) on September 6, 2003 in Indianapolis, IN.

Andrea (Bologna) Barringer (BSE '99) has settled down, gotten married, and has been at Lear Corporation for three years. She was recently promoted to a sales account manager.

Carmita Burnette (BSE '99) has just completed her first year at Kellogg School of Management at Northwestern University and this summer interned at Quaker Foods and Beverages. She has recently traveled to South Africa and Botswana to study the role of foreign direct investment in each country's current economic development efforts. Carmita will also be a part of an exchange program next winter, during which she will study at the London Business School.

Tom Kaminski (BSE '99) is still working with Accenture (based out of Detroit). He recently became engaged and will be getting married in May 2004.

Charley Lloyd (BSE '99) will be pursuing a master's degree in college student personnel from the University of Maryland in fall 2003. Upon receiving her degree, she plans to begin her new career as a student development educator supporting the academic and professional development of engineering and science students.

Jenny Ma (BSE '99) is working as a process engineer at 3M in Cottage Grove, MN. She married Chris Harvey on June 28, 2003 in Michigan. Chris and Jenny met at 3M in 1998. They plan on staying in the Saint Paul area . . . for now.

Andrea Messmer (BSE '99) is still working at Applied Materials in Santa Clara, CA, where she's been for the past four years, as a global product manager. On top of her duties at Applied Materials, she keeps busy in her free time by volunteering at several Silicon Valley organizations and even finds time for training and competing in triathlons. Andrea will be leaving Applied soon and her short-term plans include seven months of extensive travel through Asia, starting this summer.

Cynthia (Postema) Frayman (BSE '99) married her high school sweetheart, Chuck Frayman, in 1999 and now resides in Mundelein, IL (a suburb of Chicago). She works at Abbott Laboratories in North Chicago as a senior controls engineer.

Kristen (Walkush) Yeh (BSE '99) and her husband Elbert (MA Education '99) are expecting their first child in November 2003. They are very excited to become parents! Kristen is working for GE Silicones in Waterford, NY and recently accepted a new position: Center of Excellence Leader for Supply Chain. She is working with her colleagues in Europe and Asia to leverage the global capabilities of SAP within silicones.

Mark Dettling (BSE '01) is currently a graduate student at Cornell University in the Department of Natural Resources. His research focuses on the interactions between microorganisms and certain trace metals in peatland (a type of wetland) ecosystems.

Jeff Dowell (BSE '01, MSE '01) worked in BASF's PDP rotation program after graduating in 2001. He now is working in Toyota's Materials Engineering Department at their Ann Arbor location.

Nathan Hoffman (BSE '01) is still with GE Plastics, but now is working at the Evansville, IN site.

Irene Kokkinos (BSE '01) has been living in Green Bay, WI since graduation. She is a process engineer for Procter and Gamble at a paper products manufacturing site. She says to tell everyone to buy Puffs tissues!

Rachel Latvala (BSE '01) is repairing restaurant equipment while pursuing a massage certificate at the Ann Arbor Institute for Massage Therapy. Next year she plans to apply for a teaching position in Japan where, in addition to learning Japanese, she hopes to learn acupuncture.

Michelle Wu (BSE '01) received her master's in chemical engineering practice from MIT in August 2002. She's now working for Bristol-Myers Squibb in Syracuse, NY as an engineer in the biotechnology purification development group.

Tracy L. Matson (BSE '02) has been living in Green Bay, WI since graduation. She is working as a process engineer for Procter and Gamble at a paper manufacturing site, specifically in Charmin.

Take a minute to send a note or e-mail (cheme@umich.edu) us and let us know what you're up to!

Update your contact information with the university at www.engin.umich.edu/alumni/updateform.html

Graduate student Anshuman Roy moves another box into the crowded hallway in the Dow Building on Clean-Up Day

CLEANING DAY AT THE COLLEGE

The First Annual College of Engineering Clean-Up Day was a tremendous success! On May 31, the college recycled a total of 110,000 pounds of material and sent another 78,000 pounds to the landfill. These totals included 66,000 pounds of paper, 16,000 pounds of scrap metal, 62,000 pounds of concrete and 16,000 pounds of trash. This was the largest clean-up project ever undertaken at the university. We had so many volunteers who pitched in to tidy up the department that day that we managed to win a college prize, a $50 gift certificate, awarded to the department with the most participants.

MichiganEngineering
Chemical Engineering

Chemical Engineering
University of Michigan
3074 H.H. Dow Building
2300 Hayward Street
Ann Arbor, MI 48109-2136

Address Service Requested

Non-Profit Org.
U.S. Postage
PAID
Ann Arbor, MI
Permit #144