Massachusetts Institute of Technology

Chemical Engineering Alumni/ae News

Fall 2002 • Course X

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From the Head of the Department....

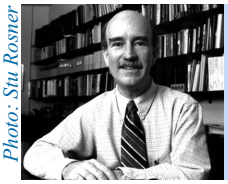

Photo: Stu Rosner

Professor Robert C. Armstrong

Head, MIT Chemical Engineering

Greetings from Department Headquarters! Life in the department continues at an exhilarating pace, with new developments occurring on many fronts. I am grateful to have this opportunity to touch on a few of the developments in the department, and I invite you to learn more from the rest of the newsletter.

First a few highlights: the Department's graduate and undergraduate programs were both ranked number one among chemical engineering departments in the most recent **U.S. News & World Report** academic survey; our faculty achieved a record $22 million research volume; we attracted the largest and most outstanding incoming graduate class in recent memory for this academic year; we completed the renovation of the entire sub-basement of Building 66 for a state-of-the-art undergraduate teaching laboratory *(See article page 20)*; we renovated the graduate student offices and Walker Lounge on the second floor of Building 66; and in the midst of all of this we completely overhauled the undergraduate curriculum in the Department. It is a wonderful and exciting time in chemical engineering at MIT! Two dominant intellectual themes are impacting our programs: weaving biology throughout our curriculum as an underlying fundamental science and exploiting the broad and rich set of opportunities at the interfaces with many other disciplines on some of the most exciting technologies of our times. MIT provides a truly exceptional environment for both of these, because of the uniform excellence of departments in other, related areas of science and engineering on campus. MIT's strong commitment to life sciences, the outstanding biology department at MIT, and the innovative **Biological Engineering Division** (co-directed by Professor ***Douglas A. Lauffenburger*** from our department) combine to make the appropriate and meaningful inclusion of biology possible in ways that would otherwise not be possible. In responding to these two opportunities the department has in the past two years revamped both its graduate and undergraduate curricula.

The department has also been a significant part of MIT's international educational initiatives. As part of the **Cambridge MIT Institute (CMI)**, the department has engaged in faculty and student exchanges with the University of Cambridge, and has launched a joint Practice School Program (led by Professor ***T. Alan Hatton***) that promises to add significant value to both universities through interchange of ideas, people, and the collaborative development of new subjects. Under the direction of Professor ***Jackie Y. Ying***, we have also launched one of the five core programs that constitute the **Singapore-MIT Alliance (SMA)**, **Molecular Engineering of Biological and Chemical Systems (MEBCS)**. This program combines faculty from the Departments of Chemical Engineering and Biology at MIT with colleagues at the National University of Singapore to create an entirely new, multi-pronged graduate program featuring three different degrees. The department is also breaking new educational ground with its **Doctor of Philosophy in Chemical Engineering (PhDCEP)**

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PBS Program Highlights Griffith, Langer, pg. 6

Cain Foundation, Roos '44, Evans Help Fund New Undergrad Lab Facility, pg. 20

New Alliance Shares Biotech Strengths and Benefits, pg. 22

ALSO IN THIS ISSUE:

Practice School News

By Prof. Alan Hatton, *Practice School Director*

The **David H. Koch School of Chemical Engineering Practice** continues to be an attractive option for many of our graduate students, and continues to be recognized as a unique educational opportunity within the Department, attracting top students from around the country and around the world. A total of 35 students attended the stations, during the Fall '01 through Summer '02 sessions. With the strong support of our hosting companies, we are able to continue to provide the diversity of experiences for our students that has traditionally characterized our program.

Photo: PS File

Dinner with Summer 2002 General Mills Station Members (L side of table from F to B): Andrew Kim (Asst. Station Director) , Joanna Yu, Stephany Lin, and Michael Rappel. (R side of table from F to B): Matthew Sokol, Yuhua Hu, Ramin Haghooie, and Uttam Kumbhat. Not pictured: Thomas Lada, and William Dalzell (Station Director).

The Practice School operated stations at a number of companies over this past year. In Fall '01, ***Paul Bryan*** directed the station at **Cabot Corporation** in Billerica MA, and ***John Friedly*** ran the **General Mills** station, primarily in the Minneapolis area, but with one project in Lodi, California. The Spring '02 sessions were conducted at **M&M Mars Inc.** in Elizabethtown, PA (***John Friedly*** as director) and the Minneapolis station at **Cargill Inc.** was supervised by ***Paul Bryan*** with some assistance from ***Anish Goel***, who was in training for his Directorship role at the **Mitsubishi Chemical** station in Mizushima, Japan in the summer of '02. In Japan, Anish was aided by Associate Director ***Carlos Rinaldi*** – both Anish and Carlos had recently graduated with their PhDs from MIT, and both were outstanding students during their stints in the Practice School some years earlier. Other stations over the summer were at **KalKan** in Vernon, CA (***John Friedly***, Director), **General Mills** in Cincinnati OH, Minneapolis MN and Lodi CA (with ***Bill Dalzell*** running the show, assisted by ***Andrew Kim***, a recent MSCEP graduate) and **Alkermes** in Cambridge MA (***John Friedly*** again). Last fall we initiated a joint program with Cambridge University under the **Cambridge-MIT Institute (CMI)** in which four Cambridge students participated in our core courses here at MIT. This fall, we completed a joint Practice School session under the CMI program, at **BP Chemicals** in Hull, UK, in which the four Cambridge students were joined by four MIT students under the supervision of Director ***Barry Johnston*** and Assistant Director ***Andrew Kim***. By all accounts this has been a very successful collaboration and we look forward to continuing it in coming years. The remainder of the fall will see us running stations at **General Mills** facilities in Lodi CA and Cedar Rapids IA, supervised by ***Brian Baynes***. At these stations, five MIT students will be joined by three students from Singapore under the auspices of the **Singapore-MIT Alliance** program.

The breadth of technical problems and environments provided by this large number of diverse companies afforded an excellent educational opportunity for our students. We are grateful to these companies for their hosting of our Practice School Stations.

The Department's **Annual Information Conference**, to have been held in October 2001, was cancelled because of the travel restrictions imposed on many of our industrial friends as a result of the terrible tragedy in New York in September of that year.

However, we did hold the annual Practice School Awards Banquet, where the **Tester**, **Vivian**, **Wojtowicz** and **Rousseau Awards for Outstanding Performance** in the Practice School projects were presented. Recipients were ***Jacob Johnson*** and ***Stephen Fox***, sharing the **Vivian** award; ***Lino Gonzalez***, whose enthusiasm for the program earned him the **Tester** award; ***Megan LeMott***, whose personal generosity, integrity and commitment to the program won her the **Wojtowicz** award; and ***Anand Sivaraman*** who received the **Rousseau Award** for Leadership and Ethics in Chemical Engineering Practice

Beth Tuths who celebrated her anniversary with the Practice School as Administrative Assistant to the Director in June, 2002, must be congratulated on her fine organization of the Award Dinner, and on so very ably dealing with all those little (and big!) problems with which the

PS see facing page

2001 Chemical Engineering Fellowships •••

Class of 1936 Fellows
Dhananjay Dendukuri
Hiroyo Kawai
Jin Zhou

Edwin R. Gilliland Fellow
Sharon Yu-Wen Soong

John Henry Grover Fellow
Mohit Rawat

Haas Family Fellow
Sheng Li

Robert T. Haslam Fellow
Yunpeng Yi

Frederick Holloway Fellow
Zubair Anwar

George M. Keller Fellows
Brandon Shaw Blackwell
Phuong Nguyen
Joseph Francis Shuga

George M. Keller Chevron Fellow
Peter Alan Colvin

David H. Koch Fellow
Konrad Krupinski

Ralph Landau Fellows
Minggang She
Christopher Patrick Tommaso
Benjamin Ragan Waters
Sheryl Yu Villa

Jerry & Geraldine McAfee Fellows
Neil Kumar
Cindy Ren
Sanjoy Sircar

Reid & Williams Fellow
Aruna Mohan

Charles & Hilda Roddey Fellow
Yu Pu

William & Margaret Hutchinson Rousseau Fellow
Huan Zhang

Keith & Helen Rumbel Fellow
Benjamin N. Wang

Adel F. Sarofim Fellow
Joel Forrest Moxley

Arch Scurlock Fellow
Manoj Viswanathan

John C. Sluder Fellows
Beth P. Dubeck
Corey James Moore

Howard Stern Fellow
Chester K. Bai

Frank Hall Thorp/Class of 1936 Fellow
Jacob W. Albrecht

Rosemary Wojtowicz Fellow
Andrew John Allen

Robert T. Billings Fellow
Jason Fincher

Tae Sup Lee/Whitaker Fellow
Daeyeon Lee

George M. Morrow III Fellow
Bernat Olle

Alfred Wechsler Fellow
Amy Lewis

Alkermes Fellows
Ryan Bennett
Smeet Prakash Deshmukh
Ajay Selot

ATOFINA/Class of 1936 Fellow
Kerry A. Bentley

Bayer Fellow
Andy Wijaya

Shell Doctoral Fellow
Tyler Philip Martin

Chemical Engineering Practice School Fellows
Alisa Mei-Jin Ching
Hiroki Kaido

Exxon Mobil Fellow
Chun-Yue Lee

Procter & Gamble Fellow
Jared K. Johnson

Rohm & Haas Fellow
Malancha Gupta

Dumbros Fellow
Joseph L. Lowery

Dupont/MIT Alliance Fellows
Erik Christian Allen
William Shannan O'Shaughnessy
Kris C. Wood

Haslam/Presidential Fellows
Hal S. Alper
Gregg Beckham
Theis Forman Clarke
Jane Yevgeniya Rempel
Jodie L. Lutkenhaus
Wilson Mok
Brian Curtis Stephenson

Norman B. Leventhal Fellow
Ana M. Acosta

NDSEG Fellow
Ginger Chao

Presidential Fellows
Micah J. Green
Margaret Ruth Horton
Mark Philip-Walter Styczynski

PS from facing page

Practice School Directors and students challenge her, and for making it look so easy.

This has been a stimulating year for the Practice School, and we look forward to continuing our development and testing of innovative approaches to station operations over the next year to ensure that our students get the best education they can!•••

2001-2002 Practice School Awards for Outstanding Performance

William C. Rousseau Award
Anand Sivaraman

Jeffereson W. Tester Award
Lino Gonzalez

J. Edward Vivian Award
Jacob Johnson & Stephen Fox

Rosemary J. Wojtowicz Award
Megan LeMott

Congratulations to all for their dedication and fine contributions!

Awards Day

By Anne Fowler, ChemE Student Office

The annual Awards Ceremony for the Department of Chemical Engineering was held on Monday, May 13, 2002 in Gilliland Auditorium. Professor and Department Head, ***Robert C. Armstrong***, presided and the following awards were presented:

Juniors ***Bukola Aina*** from Philadelphia, PA, and ***David Yin*** from Tyler, TX received **Merck Fellowships** for the upcoming academic year.

The **Goldwater Scholarship** is given out annually to one Chemical Engineering undergraduate in the United States. This year MIT junior, ***Bradley Olsen*** from Brooklyn Park, MN was the winner of this prestigious award.

The recipient of the **Dow Chemical Company Outstanding Junior Award** was also ***Bradley Olsen*** for his balanced record of achievement in academics and campus professional and social organizations, as well as work experience.

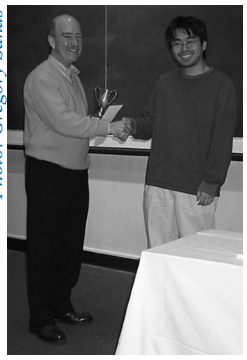


Photo: Gregory Sands

The **Robert T. Haslam Cup** was awarded by Prof. Armstrong *(Above L)* to ***Hiroki Kaido*** *(Above R)*. He is a senior from Greensburg, PA and was recognized for outstanding professional promise in Chemical Engineering.

The **Roger de Friez Hunneman Prize** is the oldest in the department and is given to an undergraduate for outstanding scholarship and research. This year the award went to ***K. Jaisel Vadgama*** from Calgary, Alberta.

The **Edward W. Merrill Outstanding Teaching Assistant Award** was presented to ***Kimberly Bryan-Kosto***, a 3rd year graduate student from North East, PA for her work with 10.302 in the fall. Also recognized was ***Matthew Lazzara***, a 5th year graduate student from Temple Terrace, FL for his exceptional work as a Graduate Instructor for 10.302.

Every Monday two 3rd-year graduate students present the progress of their research for peer evaluation. Two graduate students were recognized for giving outstanding seminars. This year recognition went to ***Geoffrey Moeser*** *(Above L)* from Burlington, Ontario for his seminar during the fall term, and ***Kevin Dorfman*** *(Above R)* from Bensalam, PA for his seminar during the spring term.

Photo: Gregory Sands

The **Chemical Engineering Special Service Awards** were given to GSC president ***Jason Kralj*** from Houston, TX, and current AICHE president, ***Princess Imoukhuede*** from Matteson, IL. ***Reuben Domike*** from Brookline, MA and ***Roger Aronow*** from San Francisco, CA were also recognized for their hard work organizing the ChemE Intramural athletic teams.

The **Chemical Engineering "Rock" Award** for outstanding athletics, as voted by ChemE graduate students went to ***Reuben Domike*** *(R)* for active participation in Intramural sports. *Jason Kralj (L)*, presented the award.

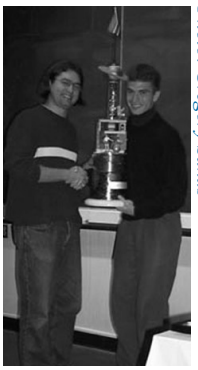


Photo: Gregory Sands

The ***Outstanding Employee Award*** was presented to ***Susan Lanza***, *(R)* an administrative assistant for Professors *William Green, George Stephanopoulos* and *Daniel Wang*. She was acknowledged for her exceptional dedication to these professors, their students and the department as a whole.

Photo: Gregory Sands

The **Outstanding Faculty Award** from the graduate students was presented by *Jason Kralj*, and went to Professor ***Daniel Blankschtein***. *Bradley Olsen* presented the undergraduate Outstanding Faculty Award to Professor ***C. Michael Mohr***.

Nominations for the **Individual Accomplishment Citation** were requested in the month of April and the recipient of the citation was ***Annie Fowler***. She was praised for her dedication to the department and hard work in the Graduate Student Office.

Phi Cup is a charity ice hockey event hosted by Alpha Epsilon Phi sorority. The ***Chemical Engineering Graduate Students*** were the Phi Cup champions this year and were recognized with a plaque from the department.

We would also like to congratulate seniors, ***Princess Imoukhuede*** for receiving the **Betsy Schumacker Award**, ***Yolanda Fan*** for receiving the **Frederick Gardinar Fassett, Jr. Award** and ***Huanne T. Thomas*** for winning a **Ronald E. McNair Scholarship**. They were acknowledged for these awards at the 2002 MIT Awards Convocation, held on Monday, May 13th.•••

Faculty Appointments & Promotions

IN THE DEPARTMENT OF CHEMICAL ENGINEERING •••

Alice P. Gast Welcomed to Faculty

Photo: Stu Rosner

Professor Alice P. Gast

In September 2001, the Department welcomed new **Robert T. Haslam Professor**, and **MIT Vice President for Research and Associate Provost**, ***Alice P. Gast***.

"Alice is a renowned researcher, scholar and educator and a tremendous advocate for research," said Provost ***Robert A. Brown*** in announcing the appointment, "She adds a wonderful perspective to the leadership of MIT."

Gast coordinates policy regarding research and graduate education and oversees the Institute's large interschool laboratories. She works with Brown in coordinating these areas through the budgeting process and through the planning, assignment and utilization of space at the Institute, also reporting to Chancellor ***Phillip L. Clay***, on matters of graduate education policy.

"Alice Gast has the ideal background, interests and skills to foster interdisciplinary research at MIT," said President ***Charles M. Vest***. "Her own work has been at the interface of science and engineering, and she has thought deeply about how to create supportive environments and facilities for faculty who want to pursue research and education that cross traditional boundaries. I very much look forward to working with her."

Gast joined us from Stanford in Fall 2001, where she had been on the faculty since 1985 after earning the PhD from Princeton. Her research explores the frontiers of the chemical physics of colloidal and polymer solutions, polymer adsorption and most recently proteins.

Gast was a notably effective teacher at Stanford and is the co-author of a classic textbook on colloid and surface phenomena. Her numerous honors include a **Camille and Henry Dreyfus Teacher Scholar Award** and the **Allan P. Colburn Award**. She was elected to the **National Academy of Engineering** in the Spring of 2001.

"We are extremely delighted to have Alice join the department. She is one of the world's leading experts in complex fluids and colloids, and one of the world's leading and most exciting chemical engineers."

Prof. Robert C. Armstrong
Head, MIT Chemical Engineering

"It wasn't easy for me to leave Stanford and all my wonderful colleagues and students," she said. "I had the best of times there and hope I've left a positive imprint on those I have taught and worked with. My career benefited greatly from the tremendous support of my department and school. I look forward to building the same collegial relationships at MIT."

Gast was the valedictorian of the Class of 1980 at the University of Southern California when she received the BS in chemical engineering. She went on to earn an MA (1981) and PhD (1984) from Princeton. She is a member of the American Association for the Advancement of Science, the American Chemical Society, the American Institute of Chemical Engineers and the American Physical Society.•••

Promotions in the Department

Photo: Stu Rosner

Professor Linda G. Griffith

Linda G. Griffith, promoted to **Full Professor,** joined MIT as a postdoc in 1988, following her graduate work at U.C. Berkeley. In 1990, she was appointed Asst. Prof., and in 1996 was promoted to Assoc. Prof. She is a tissue engineering pioneer and has developed a range of new biomaterials and approaches to constructing functional 3-D tissues for therapeutic and clinical diagnostic use. Her accomplishments have resulted in numerous awards, editorial appointments, and speaking invitations. *(Also see article, page 6)*•••

Photo: Stu Rosner

Professor Paula T. Hammond

Paula T. Hammond, promoted to **Associate Prof. with Tenure**, has been on the Chemical Engineering Faculty since 1994. Prof. Hammond's PhD ('93) and SB ('84) are both from MIT. She received her MS from Georgia Tech, and in 1994 completed Postdoctoral work at Harvard University.

Hammond's research centers on the newest frontier in polymer science, self-assembly: the inherent tendency of some materials to self-arrange due to thermodynamic driving forces and non-covalent secondary interactions. She has received a number of commendations for her work including the 2000 **Junior Bose Faculty Award**, 1997 **NSF Early Career Award**, 1996 **EPA Early Career Award** the 1996 **duPont Young Faculty Award**.*(Also see article, page 16)*•••

Cooney Named Faculty Director for New Innovation Center

The marriage of technical creativity to business acumen has become a growing feature of MIT's reputation as a hot bed for budding technology entrepreneurs. Despite this vitality, a need exists to more successfully join potential entrepreneurs --particularly for research in the incipent stages--with capital. As recently appointed Faculty Director of MIT's new **Deshpande Center for Technological Innovation**, MIT ChemE Prof. ***Charles L. Cooney*** may now be in a position to help smooth the road to funding for budding MIT innovators.

"The establishment of the Deshpande Center for Technological Innovation is an exciting opportunity for MIT, as it will allow us to fund cutting-edge research at an early stage and accelerate emerging technology development towards real-world impact."

Professor Charles L. Cooney, Faculty Director
Deshpande Center for Technological Innovation

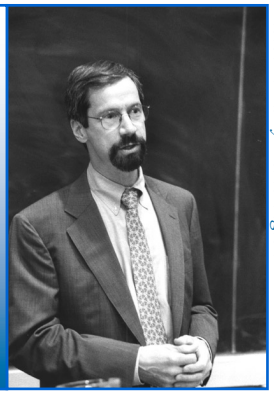


Photo: L. Barry Hetherington

With a generous $20M gift from ***Jaishree and Desh Deshpande***, co-founder and Chairman of **Sycamore Networks, Inc**., the new Center was established in January 2001 to serve as a catalyst for innovation and entrepreneurship by supporting research and collaboration among entrepreneurs, young companies, and MIT students, alumni and faculty. Initial opportunities for support will include three MIT faculty grants for "ground breaking" research at $250K each, and five $50K grants to support research into exciting, but still-incipient technologies. The Center also helps fund the new **Undergraduate Practice Opportunities Program (UPOP)**, which places MIT undergrads in industry and government internships.

Dr. Deshpande remarked, "MIT has always provided a fertile ground where its students and faculty can break down through technology barriers, fuel new areas of research and development, and fundamentally transform whole industries. We can think of no better place to begin this work."

Since 1991, Prof. ***Charles L. Cooney*** has been co-director of the **Program on the Pharmaceutical Industry**, which cuts across the Schools of Science, Engineering, and Management. He was MIT ChemE's Executive Officer (1996-2001), and currently is on sabbatical leave at the University of Cambridge. He received the BS in Chemical Engineering from the U. Penn.in 1966, and the SM ('67) and PhD ('70) in Biochemical Engineering from MIT. He joined the MIT Faculty as Asst. Professor in 1970, was promoted to Assoc. Professor in 1975, and to Full Professor in 1982.•••

Klavs Jensen Elected to NAE

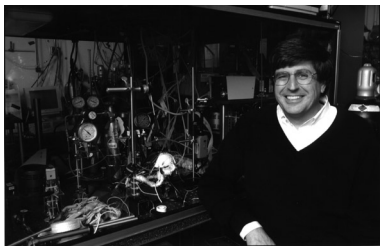


Photo: Stu Rosner

Prof. Klavs F. Jensen

Congratulations to ***Klavs F. Jensen***, Lammot du Pont Professor of Chemical Engineering, who was recently elected to the **National Academy of Engineering**. Jensen was elected in recognition of his "fundamental contributions to multi-scale chemical reaction engineering with important applications in microelectronic materials processing and microreactor technology." This is an outstanding honor for Prof. Jensen and richly deserved.

Election to the National Academy of Engineering is one of the highest professional distinctions that can be accorded an engineer. Academy membership honors those who have made "important contributions to engineering theory and practice" and those who have demonstrated "unusual accomplishment in the pioneering of new and developing fields of technology."

Also recently elected were Professor ***Douglas A. Lauffenburger*** *(See article, page 21)* and two MIT ChemE alumni ***Rakesh Agrawal*** (ScD '80) and ***Frank Bates*** (ScD '82).•••

For more information about Prof. Klavs F. Jensen...
http://web.mit.edu/cheme/people/faculty/jensen.html

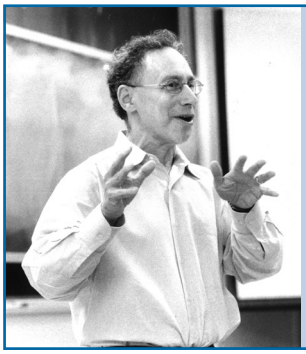
Griffith, Langer Focus of PBS Program

Prof. ***Linda G. Griffith*** *(L) explains her "Liver Chip" (BELOW) to* ***Alan Alda*** *(R), host of "Scientific American Frontiers." The Chip allows living human liver cells to serve as test subjects. Alda featured both Griffith's and* ***Prof. Robert Langer's*** *work in his program "***Body Building***" which aired in May 2002. Videos and more at the web sites below:*

http://www.pbs.org/saf/1209/segments/1209-2.htm (GRIFFITH)
http://www.pbs.org/saf/1209/segments/1209-1.htm (LANGER)

Langer Wins "Triple Crown" for Biomedical Innovations

Photo: L. Barry Hetherington



Langer's Inspiration for Innovation

*In 1974, with a new MIT PhD in chemical engineering, Robert Langer declined the lucrative industrial job offers pouring in. Instead, he went to work in the lab of famous cancer researcher **Judah Folkman** at Children's Hospital in Boston. "This job had a profound impact on what I ended up doing with my life," says Langer. "One of the great things about Dr. Folkman was that he believed almost anything was possible, and seeing his example was terrific for me."*

Special recognition goes to ***Robert S. Langer***, Kenneth J. Germeshausen Professor of Chemical and Biomedical Engineering. For 2002, Langer garnered three of the most distinguished honors in the field: the Charles Stark Draper Prize, given by the **National Academy of Engineering,** the **Chemical Heritage Foundation's** Donald Othmer Gold Medal, and the **American Institute of Chemical Engineers (AIChE)** Institute Lecturership.

Charles Stark Draper Prize

Langer was honored with the Charles Stark Draper Prize for his invention of medical technologies that help prolong lives and ease suffering. He is a pioneer in applying engineering principles to medical problems, and his groundbreaking discoveries are a cornerstone of the controlled drug-delivery industry, which is a $20 billion enterprise in the US alone. The Draper Prize, often called engineering's Nobel, is awarded annually and consists of $500,000 and a gold medallion.

"Bob Langer was chosen both for the substance of his contributions and because he is a role model," says NAE President Wm. A. Wulf. "The large number of companies his students have created is notable, effectively transferring the technology he has created into the private sector where it becomes available to all of us."

It had been thought that large molecules, including some promising anti-cancer agents, could not pass through plastic delivery systems in a controlled manner. Langer nevertheless discovered engineering principles that would allow a desired release of these molecules from plastic devices.

Langer's creative engineering of polymer plastics is now allowing delivery of medicine in unique ways to difficult locations in the body. One of his biodegradable polymer inventions broke a 20-year drought in FDA-approved brain cancer treatments-- the first such chemotherapy that could be delivered directly to a tumor site.

That success is just one of many for Langer, who is among only a handful of active members of all three U.S. National Academies--**National Academy of Sciences**, **National Academy of Engineering**, and **Institute of Medicine**. He has written about 700 papers and holds some 400 patents licensed or sub-licensed to around 80 companies, some launched using his ideas. He has a reputation for helping students take their theses to the marketplace. Langer is proud of the students he has shepherded into professorships,more than 80 at universities worldwide, and the subsequent impact on advancing chemical engineeering and bioengineering education.

The **NAE** established the Draper Prize, with an $8-M endowment from the **Charles Stark Draper Laboratory**, to honor the "father of inertial navigation." It is awarded for innovative engineering achievement or a body of work extending over a period of years. The work must demonstrate a proven innovation that contributes to human welfare and freedom.

For more about the Draper Prize..
http://www.nae.edu/nae/naehome.nsf/weblinks/NAEW-4NHML8?Opendocument

Othmer Gold Medal

The 2002 Othmer Gold Medal was awarded to Langer in a gala event at the **Chemical Heritage Foundation (CHF)**'s June Othmer Award Luncheon held in CHF's new Philadelphia headquarters. Langer's address to the prestigious gathering, explored biomaterials, and how they will change people's lives. He highlighted the critical emerging roles that chemists and chemical engineers will play in the advancement of life sciences, particularly with the spread of pathbreaking technologies such as tissue engineering and drug delivery.

Established in 1997, the annually-awarded Othmer Gold Medal honors outstanding individuals who have, like ***Donald Othmer*** (1904-95), made multifaceted contributions to our chemical and scientific heritage through outstanding innovation, entrepreneurship, research, education, legislation or philanthropy.

For more about the CHF Othmer Gold Medal..
http://www.chemheritage.org

AIChE Institute Lectureship

The Institute Lecturer Award is given annually in recognition of "the quality and relevance of the accomplishments of the lecturer,...the communication skills of the lecturer, and the value of the lecture to the meeting attendees and the members of the Institute."

Langer's lecture, **"Biomaterials in Drug Delivery and Tissue Engineering"** was presented on November 6th at the 2002 AIChE Annual Meeting in Indianapolis, Indiana.•••

For more about Prof. Langer...
http://web.mit.edu/cheme/people/faculty/langer.html

Faculty Distinctions

IN THE DEPARTMENT OF CHEMICAL ENGINEERING •••

Professor Robert C. Armstrong continued as Head of the Department of Chemical Engineering during the academic year 2001-2002. In November 2001 he received the **Distinguished Service Citation Award**, from the College of Engineering at the University of Wisconsin-Madison. He was elected as Second Vice Chair of the Governing Board of the Council for Chemical Research (CCR); he will Chair this organization in 2005. He currently serves on the External Advisory Boards and/or Visiting Committees of the respective Departments of Chemical Engineering at the Georgia Institute of Technology, Northwestern and Texas A&M Universities, the Universities of Michigan at Ann Arbor and of Wisconsin at Madison, and the Virginia Polytechnic Institute.•••

Professor Paul I. Barton gave invited papers at the Fifth Society for Industrial and Applied Mathematics (SIAM) Conference on Control and its Applications in San Diego, California; the International Conference on Scientific Computation and Differential Equations in Vancouver, British Columbia, Canada; the Sensitivity Analysis Workshop 2001 at the Lawrence Livermore National Laboratory in California; and the Seventh SIAM Conference on Optimization in Toronto, Ontario, Canada. He gave an invited lecture at Lehigh University in Bethlehem, Pennsylvania. He was elected a Director of the American Institute of Chemical Engineers (AIChE) Computing and Systems Technology (CAST) Division, continued to serve on the editorial board of Chemical Engineering and Processing, and organized a mini symposium at the International Conference on Scientific Computation and Differential Equations in Vancouver, British Columbia, Canada.•••

Professor E. Daniel Blankschtein was a Keynote Speaker at the 76th American Chemical Society Colloid and Surface Science Symposium in Ann Arbor, Michigan and also Chaired a session on "Nanoscale Organization via Self-Assembly in Non-Aqueous Media" at the Symposium. He was also guest editor of the section on "Thermodynamics and Theoretical Aspects of Colloid Science" for the journal, Current Opinion in Colloid and Interface Science. He continues to serve in the editorial boards of Current Opinion in Colloid and Interface Science and Marcel Dekker's Surfactant Science Series. Professor Blankschtein received the **2002 Outstanding Faculty Award** from the graduate students in the Department of Chemical Engineering, and continues to serve as Graduate Officer in the Department.•••

Professor Howard Brenner received the **2001 Fluid Dynamics Prize** of the Division of Fluid Dynamics of the American Physical Society (APS). He served as a member of the Chemical Engineering Peer Review Committee of the National Academy of Engineering (NAE), and was chosen to serve for the period 2002-2005 as a member of the Membership Committee of that organization. During the year, he presented or co-presented invited seminars and lectures at the State University of New York at Buffalo (SUNY-Buffalo), the Annual Meeting of the Division of Fluid Dynamic of the American Physical Society (APS), including delivering the Fluid Dynamics Prize lecture, the Annual American Institute of Chemical Engineers (AIChE) Meeting, the Society of Rheology, the University of Florida Engineering Research Center for Particle Science and Technology, the Division of Engineering and Applied Science (DEAS) at Harvard University, and the International Workshop on Particles and Polymers Near Interfaces in the Netherlands.•••

Professor Robert A. Brown continued serving as Provost at MIT, a position he has held since 1998. He also continued as executive editor of the Journal of Chemical Engineering Science and as a member of the National Research Council (NRC) decadal study on the "Frontiers in Chemistry and Chemical Engineering." Among other forms of service, Professor Brown continued to serve on the International Academic Advisory Panel (IAAP) to the Government of Singapore and as Director of the **DuPont-MIT Alliance (DMA)** at MIT. He was a plenary speaker at the World Congress on Chemical Engineering in Melbourne, Australia in October 2001 and at the American Institute of Architects' (AIA) Conference on Architecture and Education in Boston, Massachusetts in April 2002. Professor Brown also delivered the Lavoisier Lecture at E.I. DuPont de Nemours and Company in 2001.•••

Professor Robert E. Cohen continued as Chair of the Steering Committee of the **PhD in Chemical Engineering Practice (PhDCEP)** doctoral program, now in its third year of operation. Eleven students are currently enrolled in various stages of the Program. He also continues to co-direct, with Professor ***Douglas Lauffenburger***, the operations of the **DuPont-MIT Alliance (DMA)**, a $35 million/5-year education and research initiative in the area of bio-based materials. *(See article, page 22)* Professor Cohen is a member of the External Advisory Committee of the Department of Chemical Engineering at Columbia University. He continues to serve as a member of the Board of Directors of the William and Mary Greve Foundation in New York. He is also a Director of Mattek Corporation, a surface science/tissue engineering company he co-founded in 1985 with former colleague, Professor Emeritus ***Raymond F. Baddour***. Professor Cohen's 12-student research group generates new knowledge, publications and patents in the area of polymer science and technology. In the past year papers were presented at the meetings of the American Institute of Chemical Engineers (AIChE), American Chemical Society (ACS), and the Materials Research Society (MRS), and invited lectures were delivered at the University of Minnesota, the University of Massa-

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chusetts, and Columbia University. Professor Cohen's teaching responsibilities include 10.568, Polymer Physical Chemistry, a popular graduate elective in chemical engineering and required core subject in the curriculum of the interdepartmental Program in Polymer Science and Technology (PPST). He developed and delivered a new module for the undergraduate subject, **10.491, Integrated Chemical Engineering (ICE)**. The new ICE module introduced students to concepts of product design and structure/property relationships in the context of polymeric gas separation membranes.•••

Professor Charles L. Cooney stepped down from the position of Executive Officer of the Department on June 30, 2001 and after finishing coordination of the American Board of Engineering and Technology (ABET) review for the Department in September 2001 left for a yearlong sabbatical at the University of Cambridge in the United Kingdom in the Chemical Engineering Department. He continues on the Board of the MIT Community Services Fund. He is the Co-Director of the Consortium for Advanced Manufacturing of Pharmaceuticals (CAMP), an industry consortium jointly run with Purdue University to support research on pharmaceutical manufacturing and continues as Co-Director of the Program on the Pharmaceutical Industry (POPI), a joint program between the Schools of Engineering, Science, Humanities and Management at MIT. On March 1, 2002, Professor Cooney was appointed as Faculty Director of the new **Deshpande Center for Technological Innovation** in the School of Engineering. *(See article, page 6)* He has continued his participation on the external review committee for the Department of Chemical Engineering of the University of Cambridge and was named as a Cambridge-MIT Institute (CMI) Fellow in March 2002.•••

Professor William M. Deen and the members of his laboratory continued their investigations in the areas of hindered transport in fibrous media, water and macromolecule filtration in kidney capillaries, and physico-chemical aspects of nitric oxide toxicity and carcinogenicity.•••

Professor Patrick S. Doyle was an invited lecturer at the University of Massachusetts at Amherst, Brandeis University, General Electric, and the Massachusetts General Hospital. Professor Doyle's group continues to investigate single molecule DNA dynamics and to develop mesoscopic simulations for studying polymer rheology. On the MIT campus, he developed a new Independent Activities Program (IAP) course for freshmen entitled **"Hands-on ChE"** with Professor ***Kenneth Beers.***•••

Professor Alice P. Gast, Vice President for Research and Associate Provost, joined the MIT faculty and administration in November 2001. *(See article, page 5)* She has remained the Co-Chair of the National Research Council (NRC) Board on Chemical Science and Technology and on the visiting committee for the Cornell University School of Chemical Engineering. Last fall she gave the Holtz Lectures at the Johns Hopkins University and was inducted into the National Academy of Engineering (NAE). She gave the Henske Lecture at Yale University and the plenary lecture at the 76th American Chemical Society (ACS) Colloid and Surface Science Symposium in Ann Arbor, Michigan. She was awarded the **University of Southern California (USC) School of Engineering Award for Academic Excellence**. She has moved her laboratory and one student to MIT, graduated two students and has four remaining at Stanford University. Her National Aeronautics and Space Administration (NASA)-sponsored research on magnetic fluids will be moved to the International Space Station; her first experiment will be performed there this fall.•••

Professor Karen K. Gleason completed her first year as the Department's Executive Officer. In this role, she won Institute approval for required changes to the undergraduate curriculum that enhanced the introductory and capstone experiences for undergraduate chemical engineering majors. Professor Gleason also led a Department-wide curriculum review process this spring aimed at promoting more rapid introduction of examples from biology and advanced materials into the core undergraduate subjects. In addition, she gave invited presentations at Semicon Japan, the Eidgenössische Technische Hochschule (ETH) in Zürich, Switzerland, Stanford University, the Pennsylvania State University, the University of Arizona, the Georgia Institute of Technology, Intel Corporation, and the DuPont Corporation. Together with two of her former PhD students, Professor Gleason co-founded GVD Corporation, the aim of which is to translate her laboratory's inventions for the vapor deposition of polymeric coatings to commercial applications in the membrane, medical device, and biopharmaceutical sectors.•••

Professor William H. Green, Jr. joined the Editorial Advisory Board of the International Journal of Chemical Kinetics in January 2002. Professor Green continues to Co-Chair the sessions on "Combustion Reaction Engineering" for the American Institute of Chemical Engineers' (AIChE) annual meeting. He presented invited lectures on his research to the Chemical Engineering Departments at Stanford University and the University of California at Santa Barbara, and at the American Chemical Society's (ACS) Spring National Meeting. Professor Green wrote an overview of his work on computing rate constants from first principles for Theoretical Chemistry Accounts. On a more practical side, he invented a method for establishing the fundamental limits on achievable yields in complex catalytic processes, and a method for predicting the range of operability of novel homogeneous charge compression ignition (HCCI) internal combustion engines. Professor Green and Professor ***Herbert H. Sawin*** developed and co-taught the new subject, **10.10, Introduction to Chemical Engineering**, for freshmen in the spring 2002 term. It is anticipated that this will become the first required subject for chemical engineering majors.•••

Professor Linda G. Griffith was promoted to Full Professor of chemical and biological engineering effective July 1, 2002. She is continuing to develop the **LiverChip™** for study of liver physiology and detection of biowarfare agents and environmental toxins. Her work was profiled in May on the PBS series "Scientific American Frontiers" hosted by Alan Alda. *(See article, page 6)* She is participating in the Cambridge-MIT Institute

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(CMI) program and was chosen as a CMI fellow.•••

Professor Paula T. Hammond was promoted this year to Associate Professor with tenure in the Department of Chemical Engineering effective July 1, 2002. Professor Hammond's research work on directed assembly of colloidal particles on patterned surfaces was featured on the cover of Advanced Materials; the image, which was captured by Felice Frankel, was also featured in a photography text by Dr. Frankel just released by the MIT press. Professor Hammond was a key faculty member responsible for the identification, planning and writing of a proposal for the **Institute for Soldier Nanotechnologies (ISN)** at MIT. This major multidisciplinary research center, involving over 35 MIT faculty members, was funded for $50 million by the United States Army, is directed towards new technologies for the protection of the soldier. *(See article, page 16)* Professor Hammond is a member of the ISN Executive Committee, is the Facilities Coordinator and is a Research Team Leader in the ISN. She has given invited talks at the Gordon Conference on Polymers in Ventura, California and the Polyelectrolytes 2002 Conference in Lund, Sweden. She was also an invited speaker at several companies and universities, including the University of Minnesota, the Georgia Institute of Technology, and Schlumberger.•••

Professor Jack B. Howard continues to serve as Director of the Center on Airborne Organics involving MIT, the California Institute of Technology, and the New Jersey Institute of Technology. He was the Paul Chung Distinguished Lecturer in the College of Engineering at the University of Illinois at Chicago and he received the honorary doctor of engineering from the Colorado School of Mines.•••

Professor Klavs F. Jensen was elected to the **National Academy of Engineering (NAE)**. *(See article, page 6)* In collaboration with colleagues at MIT, he continued research on microfabricated chemical systems for chemical and biological synthesis and analysis, microsystems for fuel processing, on multiscale modeling of reactive processes for thin film deposition, and quantum dot composite materials for optical devices. The **MicroChemical Systems Technology Center** was started in his laboratory with support of eight international chemical and pharmaceutical companies. Jensen was also principal investigator for the new **MIT Multidisciplinary University Research Initiative (MURI)** program on microchemical systems for conversion of fuel to electrical power. This program involves researchers from a number of departments across the School of Engineering. He participated with colleagues from the Departments of Biology, Chemical Engineering, and Electrical Engineering and Computer Science in a **DuPont-MIT Alliance (DMA)** research project on microfabricated bioprocessors. He co-chaired the National Research Council (NRC) Workshop on Materials and Processes as a part of the NRC's survey of chemical sciences. As the 2002 L.K. Doraiswamy Lecturer he presented lectures at the Iowa State University and the Indian National Chemical Laboratory in Pune, India. He also gave the 2002 Donald L. Katz Lectures at the University of Michigan at Ann Arbor and several invited presentations on microchemical systems at national and international conferences and at universities.•••

Professor Robert S. Langer was honored by the National Academy of Engineers (NAE) with the **2002 Charles Stark Draper Prize**, the world's most prestigious engineering prize, which carries an award of $500,000.00. *(See article, page 7)* Also, he received an honorary doctorate from the Hebrew University of Jerusalem in Israel in 2002. He was awarded the **Othmer Gold Medal** from the Chemical Heritage Foundation and the **2002 Nagai Innovation Award** from the Controlled Release Society. He was the 2002 Distinguished Lecturer at the University of Louisville, the 2002 Institute Lecturer of the American Institute of Chemical Engineers (AIChE), the 2001 Ullyot Lecturer of the Chemical Heritage Foundation, the 2001 Clapp Lecturer at Brown University, the 2001 Julian Smith Lecturer at Cornell University, the 2001 Mason Lecturer at Stanford University, and the 2001 Distinguished Lecturer at Carnegie Mellon University. **Time Magazine** named him one of the **"100 Most Important People in America"** ("America's Best") and one of the 18 Most Important Individuals in Science and Medicine in the United States. Discover Magazine also named him one of "20 Biotech Geniuses to Watch."•••

Professor Paul E. Laibinis delivered invited seminars at Rice University, Rensselaer Polytechnic Institute (RPI), the Johns Hopkins University, the Massachusetts General Hospital, Notre Dame, Texas A&M, and North Carolina State Universities, the Universities of Houston and of Maine, Tufts and Columbia Universities, the City College of New York, and various industrial laboratories. He gave invited presentations at the 2nd Chemical Engineering Conference for Collaborative Research in the Eastern Mediterranean in Turkey, an international conference on **"Self-Assembly: The Future"** in Italy, and various domestic meetings on his group's development of a new class of chemical sensors and gene chips. For his efforts in surface engineering, he was selected by the **Information Sciences Institute (ISI) in 2002** as being among the top-cited authors in the area of molecular self-assembly during 1981-1999. He serves on the editorial boards of the journals Langmuir and Sensors and the Victor K. LaMer Award Committee of the Colloid and Surface Chemistry Division of the American Chemical Society (ACS). Professor Laibinis is also a faculty fellow in the **Singapore-MIT Alliance (SMA) Program on the Molecular Engineering of Biological and Chemical Systems**. In January 2003, Prof. Laibinis will join the Chemical Engineering Department at Rice University.•••

Professor Douglas A. Lauffenburger was elected this past year to membership in the **National Academy of Engineering (NAE)** and the **American Academy of Arts & Sciences (AAA&S)**. *(See article, page 21)* At MIT, he continues as Co-Director of the Biological Engineering Division (BE), formerly the Division of Bioengineering and Environmental Health (BEH), Director of the Biotechnology Process Engineering Center (BPEC), and Associate Director of the DuPont-MIT Alliance (DMA) in bio-based materials. Nationally he serves on the Advisory Council for the National Institute of General Medical Sciences,

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and this year is the Chair of the College of Fellows of the American Institute of Medical and Biological Engineering (AIMBE).•••

Professor Gregory C. Rutledge is currently serving as Director of the **Program in Polymer Science and Technology (PPST)** at MIT, an interdisciplinary educational program that draws a small but élite group of graduate students to MIT for polymer studies. He has continued his research to develop improved tools for the atomistic modeling of polymeric materials and on electrospinning of polymer nanofibers. He is a team leader for Processing and Characterization in the new **Institute for Soldier Nanotechnologies (ISN)** at MIT, as well as a continuing investigator in the **Center for Materials Science and Engineering (CMSE)**, the **Center for Advanced Engineering Fibers and Films (CAEFF)**, the **National Textile Center**, and the **Air Force Program on Nanocomposites at MIT**. Over the past year he has delivered a number of invited talks, including those at the European Polymer Society, the Centre Européen de Calcul Atomique et Moléculaire (CECAM) – the European Center for Atomic and Molecular Computations – at the École Normale Supérieure in Lyon, France, the American Society of Mechanical Engineers (ASME), Gordon Research Conference on Composites, the Flory Award Symposium of the American Chemical Society (ACS), the International Symposium on Polymer Crystallization in Mishima, Japan, and several academic institutions. He continues to serve on the editorial boards of Polymer and Computational and Theoretical Polymer Science, and co-teaches the ACS short course on Molecular Modeling of Polymers.•••

Professor Herbert H. Sawin developed, in collaboration with Professor ***William H. Green, Jr***., a new introductory course for the chemical engineering curriculum, **10.10, Introduction to Chemical Engineering**. This course combines instruction in mass and energy balances, engineering problem solving, and MATLAB programming. Professor Sawin was made a fellow of the American Vacuum Society. He gave an invited talk at the Electrochemical Society Plasma Symposium on the use of multivariate statistics for the analysis of optical emission in the identification of endpoint in plasma etching processes. He gave a chemical engineering departmental seminar at the University of California/Los Angeles.•••

Professor Kenneth A. Smith has continued his research on the roles of fluid mechanics and transport phenomena in a number of contexts. These include use of the supercritical water oxidation process for destruction of organic wastes, jointly with Professor ***Jefferson W. Tester,*** and the dynamics of micellar self-assembly, jointly with Professor ***T. Alan Hatton***. He is also engaged in the development of an instrument that can determine the size-segregated chemical composition of an aerosol in real time. He is participating in the **Molecular Engineering of Biological and Chemical Systems (MEBCS)** program within the **Singapore-MIT Alliance (SMA)**. In addition, he delivered invited lectures at Tsinghua University in Beijing, China and at the Eidgenössische Technische Hochschule (ETH) in Zürich, Switzerland.•••

The central goal of **Professor Gregory Stephanopoulos's** educational and research activity is to extend the chemical engineering paradigm to the analysis and design of biological systems, thus developing a foundation for chemical and biological engineering at MIT and nationally. This requires increasing biological content in the chemical engineering curriculum and tighter integration between biology and engineering. As Bayer Professor of the Department, his efforts were recognized in the fall of 2001 by the **AIChE Wilhelm Award** in chemical reaction engineering, the **2002 Merck Award** in metabolic engineering and the **2002 CIO Magazine 20/20 Vision Award** honoring 20 academic (and 20 industrial), visionary leaders in information technology for pioneering work in biological data mining and bioinformatics.

Professor Stephanopoulos continued as co-editor of the journal, Metabolic Engineering, published by Elsevier Academic Press and serves on the editorial boards of 7 other scientific journals. In 2001 he delivered plenary lectures at the 10th European Conference in Biotechnology in Madrid, Spain, the Bioinformatics Gordon Research Conference in, and the Princeton Symposium on Metabolic Engineering. In 2002 he presented at the Conference on New Biology at the University of Illinois at Urbana-Champaign, the European Symposium on Biocatalysis in Italy, and the Annual DECHEMA (the German Association of Industrial Chemists) Meeting in Wiesbaden, Germany. He was also the 2002 Merck Lecturer at the University of Virginia and at the Rutgers University Distinguished Lecture series. Professor Stephanopoulos also participates in the **DuPont-MIT Alliance (DMA)**, is a Fellow of the **Singapore-MIT Alliance (SMA)** and a member of the International Faculty of the Technical University of Denmark.•••

Professor Jefferson W. Tester, after serving as the Director of the Energy Laboratory for the past 12 years, decided to step down and resume his responsibilities as a faculty member in the Department. He continues to be active in the energy area where he remains as Chair of the National Advisory Council of the Department of Energy's (DoE) National Renewable Energy Laboratory (NREL) and Co-Chair of the Governor's Advisory Board for the Massachusetts Renewable Energy Trust. Professor Tester also continued as a member of the advisory groups for the Paul Scherrer Institute, which is part of the Eidgenössische Technische Hochschule (ETH/Swiss Federal Institute of Technology) in Zürich, Switzerland and the Nuclear and Energy Systems Division of the Idaho National Engineering and Environmental Laboratory (INEEL). Last year, while he was on sabbatical he gave invited lectures at Rensselaer Polytechnic Institute (RPI), the National Renewable Energy Laboratory (NREL), Los Alamos National Laboratory, the Conference on World Affairs at the University of Colorado, and provided invited testimony at several U.S. government hearings and forums on distributed energy and renewable energy and on sustainable waste treatment. He was a recipient of the Department's **2001 Outstanding Faculty Award**.•••

Professor Bernhardt L. Trout was named the **Henry C. and Grace Doherty Professor of Ocean Uti-**

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lization for his work on clathrate-hydrates. He was awarded an **NSF CAREER** grant for his work with solid-acid zeolyte catalysis. In addition, he has been granted a **Ford Motor Company Young Investigator Award**. He has given invited talks at the National University of Singapore, the National Research Council of Canada, and the California Institute of Technology, in addition to the American Institute of Chemical Engineers (AIChE) and the American Chemical Society (ACS). Funding for his projects on chemical and process design via molecular understanding is provided by the National Science Foundation (NSF), the Department of Energy (DoE), the National Aeronautics and Space Administration (NASA), Amgen, Inc., and the Ford Motor Company.•••

Professor Daniel I.C. Wang was the keynote lecturer at the Society of Industrial Microbiology/American Chemical Society (ACS) in November 2001 at their annual meeting held in Long Beach, California. Professor Wang Chaired the National Science Foundation's (NSF) Workshop on the "Future of Biochemical Engineering." He was awarded the Taiwan Semiconductor Corporation Professor Lectureship and delivered two lectures at Tsing Hua University, Hsinchu, Taiwan in June 2002. He delivered the keynote lecture at the 7th Asian Biochemical Engineering Conference at Taipei, Taiwan in July 2002. He was invited by the Institute of Chemical and Engineering Sciences in Singapore to be a member of the Scientific Advisory Board for a three-year appointment. In addition, he was invited to deliver an address at the 2nd Meeting of the MIT Club of Germany in Munich in November 2002. Lastly, he was also invited to deliver the keynote address on "Trends in Biotechnology" to be held in Vienna, Austria in November 2002.•••

Professor Jackie Y. Ying delivered fourteen invited lectures at international conferences and national meetings during 2002, including plenary lectures at the Third Int'l Symposium on Mesostructured Materials in Korea and the Fourth World Congress on Particle Technology in Australia. She served on the scientific/programming committee of the Sixth International Conference on Nanostructured Materials, and on the organizing committee of the Second Japan-America Frontiers of Engineering Symposium. Ying was the inaugural **G.-J. Su Distinguished Lecturer** at the University of Rochester and an invited seminar speaker at the University of California/Los Angeles (UCLA). She serves on the editorial boards of seven journals/book series, and on the advisory boards of the Leibniz-Institut für Festkörper- und Werkstoffforschung Dresden in Germany, the University of Queensland Nanomaterials Centre in Australia, and the National Research Council Steacie Institute for Molecular Sciences in Canada. Ying is an honorary professor of chemistry of China's Jilin University, a Director of the American Institute of Chemical Engineers' (AIChE) Materials Engineering and Sciences Division, and an Executive Committee Member of the American Chemical Society's (ACS) Colloid and Surface Chemistry Division. She Chairs the **Singapore-MIT Alliance (SMA) Program on Molecular Engineering of Biological and Chemical Systems (MEBCS)**.•••

Other members of the faculty in the Department include Professors ***Kenneth J. Beers***, ***Clark K. Colton***, ***T. Alan Hatton***, ***Gregory J. McRae***, ***George Stephanopoulos***, ***Preetinder S. Virk*** and ***K. Dane Wittrup***, as well as senior lecturers, Dr. ***Barry S. Johnston*** and Dr. ***C. Michael Mohr***.•••

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program, led by Professor ***Robert E. Cohen***), which is offered jointly between the Department of Chemical Engineering and MIT's Sloan School of Management. This program is targeted at producing leaders for the molecularly based technology sectors by combining in-depth education in manufacturing, research, and management. We are entering our third year of this program, and we look to its first graduates emerging in a little less than two years from now.

With the academic year that ended in June of this year, we again produced a large number of graduates at both the undergraduate and graduate degree levels. We awarded 82 SB degrees in Chemical Engineering, 54 to women and 28 to men. Our undergraduate enrollment has decreased to around 168, but we are encouraged by a roughly 25% increase in size of this year's sophomore class relative to last year's. Similarly, during the academic year just ended, we granted 40 master's degrees in Chemical Engineering (with 29 of those in the Practice School) and 32 doctorates.

This fall (2002) we admitted over 70 new graduate students to study in one or both of the Practice School and Doctoral Programs. The quality of the students is excellent, as measured by the large number of applicants to our program, the high degree of selectivity exercised in our admissions process, and our unusually high yield (percentage of admitted students who accept our offer). We are grateful to Professor ***K. Dane Wittrup*** and the Graduate Admissions Committee for their hard work in bringing in these outstanding students.

An essential asset in our effort to attract the very best students to our Department is the generous external support to the Practice School and our doctoral program by our alumni, through endowed and continuing support of graduate fellowships. We are truly indebted to you for your ongoing commitment and support. Beyond its value as a recruiting tool, funds for graduate fellowships are an essential element of our graduate educational philosophy.

By targeting fellowship support on Practice School students and beginning doctoral students, we can have these students begin their graduate program focused on the core subjects of chemical engineering. This not only provides all students with in-depth study of fundamentals that underlie whatever specialty they pursue in chemical engineering, but also provides doctoral students the important opportunity to learn more about the breadth of research opportunities in the Department before choosing a thesis topic. This model for educating graduate-level chemical engineers goes hand-in-hand with the picture of modern chemical engineering as the central engineering discipline embraced by our Department.

In the past year, there have also been several significant changes in the faculty to bring to your attention,

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ChemE Connection

The Year in Review at a Glance •••

The past year has seen some exciting growth in our department. Two of our faculty received promotions this year. ***Paula T. Hammond***, was promoted to Associate Professor with Tenure. ***Linda G. Griffith***, was promoted to Full Professor.

The Department welcomed one new faculty member- Robert T. Haslam Professor ***Alice P. Gast***, who also serves as MIT's new Vice President for Research and Associate Provost. Gast comes to us from Stanford. *(See article, page 5)*

Faculty News

We are proud to report the continued honors bestowed upon our outstanding faculty. ***Robert S. Langer***, Germeshausen Professor of Chemical and Biomedical Engineering, received three major awards this year--the **Draper Prize**, the **Othmer Gold Medal**, and the **AIChE Institute Lecturer Awards**. This trio of awards represents hard won recognition for Langer's prominent contributions to the fields of tissue engineering and drug delivery. *(See article page 7)*

The Department honors Professors ***Klavs F. Jensen***, and ***Douglas A. Lauffenburger***, who this year were both elected to membership in the **National Academy of Engineering (NAE).** Election to the **NAE** is one of the highest professional distinctions that be accorded an engineer!

Jensen was elected in recognition of his "fundamental contributions to multi-scale chemical reaction engineering with important applications in microelectronic materials processing and microreactor technology." *(See article page 6)*

Lauffenburger was elected in recognition of his pioneering contributions to the application of engineering in molecular and cell biology, a quantitative understanding of molecular and cellular processes, and for his leadership in the bioengineering community. *(See article, page 21)*

Photo: Gregory Sands

Prof. C. Michael Mohr (C) with 1997 Graduates (L to R): Brad Ricketson, Frank Greer, Bethany Rogers, Julia Greer, and Caroline Keller.

And if that wasn't enough, ***Lauffenburger*** who wears several hats as Professor of Bioengineering and Chemical Engineering, Co-Director, Division of Bioengineering & Environmental Health and Director of the Biotechnology Process Engineering Center, also won this year's AIChE **William H. Walker Award for Excellence in Contributions to Engineering Literature.** Congratulations to all of our award winning faculty members!

Student Awards

We're proud to announce that five ChemE Seniors, ***Allison M. Johnson, Sheng Li, Luke D. Tomyez, Kaitya J. Vadgama, and Sheryl H. Yu Villa*** were elected to the honorary **Phi Beta Kappa** society. Membership is conferred in recognition of excellent academic performance and a demonstrated commitment to the objectives of a liberal education.

Department News

This was a year of major renovations in building 66. This included the refurbishment of the second floor offices, to accommodate our large entering class for Fall 2002, and first floor lab space - both scheduled for completion in August 2002, and of course the jewel in the crown, our new **Undergraduate Laboratory,** which was finished last Spring! *(See article and photos, pages 20-21)*

Changing Faces

This year has seen a number personnel changes among our staff.

In July, we welcomed ***Alina Haverty***, our new ChemE Headquarters Receptionist and Assistant to Executive Officer *Karen K. Gleason.* Alina comes to us from **Nuvera Fuel Cells** where she was working as the Executive Assistant to the Vice President of Technology. Prior to that she worked at **Arthur D. Little**, as an Administrative Assistant to the Managing Director. The Department is grateful to ***Patricia A. Sampson***, for her excellence and dedication in that position, and we wish her well in her new position in MIT's Electrical Engineering and Computer Science (EECS) Department.

Melissa Lowthers recently joined the Administrative Services Organization (ASO), filling the post vacated by ***Stephen J. Malley.*** We're sad to note Steve's departure from the ASO, but sources indicate that he's in a new position right around the corner in the DMSE Student Services Office!•••

Named Lectures

IN THE DEPARTMENT OF CHEMICAL ENGINEERING •••

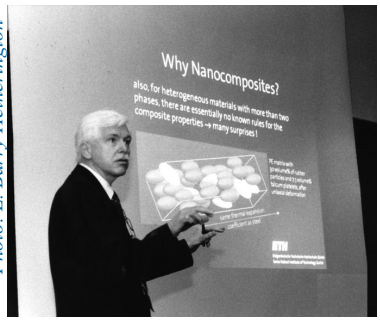


Photo: L. Barry Hetherington

Prof. Ulrich W. Suter, ETH Zurich

Warren K. Lewis Lecture

The 2002 Warren K. Lewis Lecture was presented on Friday May 10, 2002, by ***Ulrich W. Suter***, **Professor of Materials, ETH Zurich**, in 66-110. Suter spoke about, **"Polymeric Nanocomposites."**

Prof. Ulrich (Ueli) W. Suter received his Dr. Sc. Techn. in Chemistry at ETH-Zürich, Switzerland in 1973. He joined MIT Chemical Engineering from 1982 to 1989, achieving the rank of Full Professor. He returned to Switzerland to a position of Professor of Macromolecular Chemistry at ETH-Zürich. He has held various Visiting Professor positions at University of Arizona; Seoul National University; National University of Singapore, and Imperial College, and has been Professor Associé at both E.S.P.C.I. in Paris and Université Louis Pasteur, Strasbourg France. His group produces approximately 5 diplomas and 4 doctorates per year. Cumulatively, 87 doctoral students and young post-docs have come from his group. He has published approximately 280 papers.

Professor Suter's research interests are in Macromolecular chemistry and physical chemistry of polymers, particularly structure-property relationships; polymeric materials, particularly the predictability of properties; atomistic, molecular, and materials modeling and the application of computers in education and research. Polymeric materials and polymer-based materials systems have gained a large share of the structural and functional materials market. Trends point to growing complexity and miniaturization based on multi-functional materials. With the aid of computer-assisted modeling and simulations, his group develops polymers that fulfill these needs collaborating with partners in the Institute of Polymers, in the Department of Materials, ETHZ, and in Swiss and International technical colleges, universities, and industrial research and development laboratories.

This lecture series is a tribute to ***Warren "Doc" Lewis***, who is well known as one of the Chemical Engineering Department's most revered members. Also established in his honor by the AIChE is the **Warren K. Lewis Award**, which recognizes outstanding educators in chemical engineering.•••

Frontiers of Biotechology Lecture

This year's Frontiers of Biotechnology Lecture was presented by ***George M. Whitesides***, **Mallinckrodt Professor of Chemistry at Harvard University**, on Friday September 28, 2001 in Wong Auditorium. The topic of his lecture was "**Microfabricated Tools for Biotechnology**."

Whitesides received his A.B. from Harvard and PhD from CalTech. He was a member of the MIT faculty before joining the Department of Chemistry at Harvard. He has received numerous awards including the **ACS Award in Pure Chemistry**, the **Arthur C. Cope Scholar Award** and the **Arthur C. Cope Award**, the **National Medal of Science**, the **Von Hippel Award** and many others. He is a member of the American Academy of Arts and Sciences, the National Academy of Sciences, and the American Philosophical Society. He is a Fellow of the American Association for the Advancement of Science and the New York Academy of Science, a foreign fellow of the Indian National Science Academy, and an Honorary Fellow of the Chemical Research Society of India. His present interests include materials science, biophysics, complexity, surface science, microfluidics, self-assembly, micro- and nanotechnology, and cell-surface biochemistry.

Frontiers in Biotechnology was established in 1999, to acknowledge the enabling technologies which have sustained the growth of biotechnology and life sciences, and to honor the achievements of distinguished scientists and engineers in the field. The Department warmly thanks ***Dr. Noubar Afeyan '87*** whose generous donation made this visionary new series possible!•••

Photo: David Tucker

Prof. George M. Whitesides
Harvard University

Photo: L. Barry Hetherington

Henri Termeer, Chair
Genzyme Corp

Alan S. Michaels Lecture

On Friday, April 26, 2002, ***Henri Termeer***, **President and CEO of Genzyme Corporation** presented this year's Alan S. Michaels Lecture in 4-370 on the subject of **"Biotechnology and Industry."**

Termeer was appointed President of Genzyme Corporation in 1983, Chief Executive Officer in 1985, and Chairman in 1988. Under his leadership, Genzyme has grown into a world biotechnology leader.
Mr. Termeer is renowned for his contributions to biotechnology and his expertise in financing new initiatives. His innovations have earned the **Laguna Niguel 1991** and ***1994 Best of Biotech*** awards, **Hall of Fame** Award in 1997, the **Special Recognition for an Individual Award**, and in 1993, the **SWAT Team Award**.

Mr. Termeer has been acknowledged by "Wall Street Transcript" for four consecutive years and during 1990-92, received the Transcript's Gold Award. Termeer was named **1992 Entrepreneur of the Year** by Merrill Lynch and Ernst & Young, Inc. and in 1995, Success Magazine named him "**Renegade of the Year."**

Mr. Termeer serves as a board member for biotechnology corporations, including Genzyme Transgenics Corporation; Abiomed Inc.; AutoImmune, Inc. and Diacrin, Inc. and serves on the Board of Associates of the Whitehead Institute and as Chairman of the Genetics Advisory Council of the Harvard Medical School.

Mr. Termeer actively serves as a trustee for Darden Graduate School of Business Administration, trustee and vice-chairman of the Boston Museum of Science, a member of the Massachusetts Governor's Economic Development Council. He was honored by the Anti-Defamation League's New England Region with the 1995 ***Torch of Liberty Award*** for his leadership in human rights and for promoting understanding among people of diverse backgrounds. In 1997, Mr. Termeer received ***The Governor's New American Appreciation Award*** for his success as a foreign-born entrepreneur in America and in 1999, he was inducted as a **Fellow** into the **American Academy of Arts and Sciences**.

Prior to joining Genzyme, Mr. Termeer held various management positions during 10 years at Baxter Travenol (now Baxter International). In 1973, Mr. Termeer earned an MBA from the Darden School at the University of Virginia.

This Lectureship has been established as part of an endowment fund donated in honor of ***Alan S. Michaels,*** a distinguished leader in bioengineering. The series provides a forum for annual lectures dedicated to bringing distinguished engineers from academia and industry to share their views on research and development in medical and biological engineering.•••

Hoyt C. Hottel Lecture

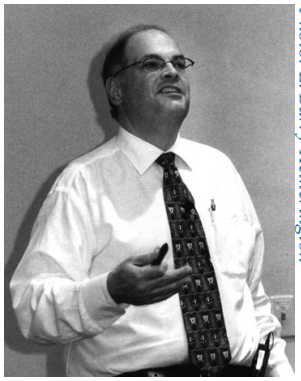
On November 30, 2001 in 66-110, the annual Hoyt C. Hottel Lecture was presented by ***Kevin O. Meyers*****, Executive Vice President, Alaska Production and Operations, Phillips Petroleum Company,** on **"Oil and Gas Development in Alaska: An Evolving Story."**

K.O. (Kevin) Meyers was elevated to his current position in 2001 after serving as Senior Vice President of Alaska production and operations and President and Chief Executive Officer (CEO) of Phillips Alaska, Inc. in 2000. Dr. Meyers joined ARCO Exploration and Production (E & P) Technology in Plano, Texas in 1980. He has held a number of positions in ARCO's E & P Operations in both Texas and Alaska, including Senior Vice President of the Prudhoe Bay business unit in 1996, and in 1998, President of ARCO Alaska, Inc. Later that year, his responsibilities were expanded to include the duties of CEO of ARCO Alaska, Inc., and Senior Vice President of Atlantic Richfield Company. He accepted the above-mentioned positions with Phillips in the Spring of 2000 when ARCO Alaska, Inc. was acquired by Phillips.

Dr. Meyers earned undergraduate degrees in chemistry and mathematics from Capital University in 1975 and holds a doctorate in chemical engineering from MIT. Dr. Meyers serves on the University of Alaska Board of Regents and on the boards of directors of the **Alaska Oil and Gas Association**, the **Anchorage Symphony Orchestra**, the **Nature Conservancy of Alaska**, the Anchorage Museum Fondation and Commonwealth North.

The ***Hoyt C. Hottel*** Lectureship was established in early 1985 to recognize Professor Hottel's contributions to the intellectual climate of the Chemical Engineering Department, to the encouragement of students over six decades, and to the foundation and direction of the Fuels Research Laboratory. The Lectureship is intended to draw eminent scholars, preferably in field of combustion and energy technology, to MIT for short periods of residency, in order to stimulate future generations of students. The inaugural Hottel Lecture was presented in April 1985 by Prof. Hottel, himself.•••

Photo: L. Barry Hetherington



Dr. Kevin O. Meyers, Exec. V.P.
Phillips Petroleum Company

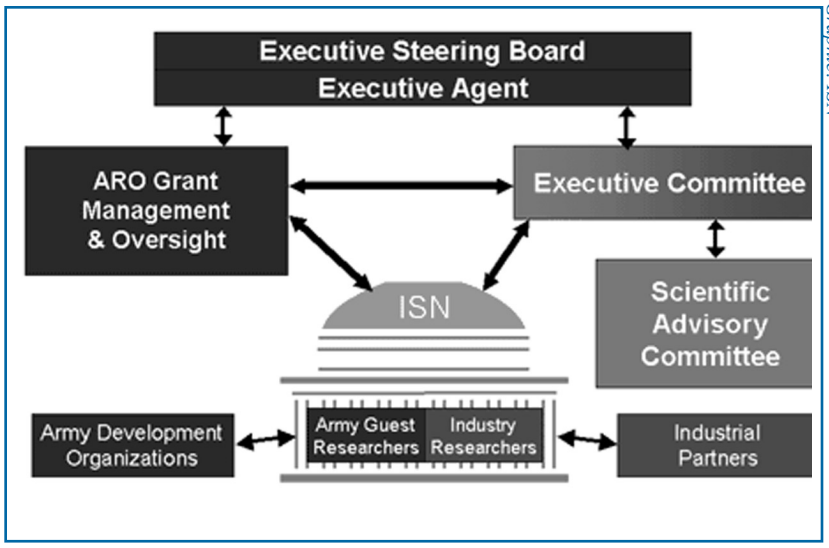
New Nanotech Institute Places ChE Faculty in Forefront

MIT's New Army Sponsored Institute for Nanotechnology Soldier Stresses Basic Science and Project Integration

Researchers from our Department are poised to play a leading role in MIT's new $50M partnership with the US Army, known as the **Institute for Soldier Nanotechnologies (ISN)**.

The mission of the new ISN, announced in March 2002, is to create lightweight molecular materials to equip foot soldiers of the future with uniforms and gear that can heal them, shield them and protect them against chemical and biological warfare.

MIT won an Army competition for the five-year, $50M proposal to which industry will contribute an additional $40M in funds and equipment.



Graphic: ISN

Newly appointed Robert T. Haslam Professor, and MIT V.P. for Research and Associate Provost ***Alice P. Gast***, and ChemE Professor ***Paula T. Hammond*** played leading roles in planning the new Institute, with DMSE Prof. ***Edwin L. Thomas*** as ISN Director.

"I applaud my colleagues who have worked long and hard to win this competition," said Provost ***Robert A. Brown***. "This is an important [milestone] in MIT's history." He noted MIT's history of responding to the needs of our nation's military by rapidly developing technologies that save soldiers' lives.

The ISN involves 9 faculty from ChemE working in 6 different teams. In addition to MIT faculty, graduate students, and postdoctoral associates, from several departments, the ISN will also include specialists from the Army, E.I. duPont de Nemours and Co., Wilmington, Del.; Raytheon Co., Lexington, Mass.; and physicians from Massachusetts General Hospital and Brigham and Women's Hospital.

These researchers will develop ideas such as a uniform that is nearly invisible, soft clothing that can become a rigid cast when a soldier breaks his or her leg, and paper-weight chainmail made of molecular materials.

"Our goal is to help greatly enhance the protection and survival of the infantry soldier using nanoscience and nanotechnology," said Thomas, the Morris Cohen Professor of Materials Science and Engineering.

"This will be achieved by creating, then scaling up to a commercial level, revolutionary materials and devices composed of particles or components [often] so tiny that hundreds could fit on the period at the end of this sentence. The idea is to incorporate these nanomaterials and nanodevices into the future soldier's uniform, and associated equipage like helmets and gloves," Thomas said.

In addition to protecting the individual soldier, "imagine the psychological impact upon a foe when encountering squads of seemingly invincible warriors protected by armor and endowed with superhuman capabilities, such as the ability to leap over 20-foot walls," said Thomas. The leaping ability, he explained at the news conference, would be enabled by "building up energy storage in shoes." Thomas went on to note that MIT researchers have recently created "world-record actuator materials" that are "better than human muscles."

What is the time frame for the revolutionary products ISN researchers foresee? Although "we hope to deliver some goodies early," within the next five years, Thomas said, some are indeed futuristic and many years from reality. Provost Brown noted that "if you don't have a vision that pushes the science and engineering for a giant leap, you can't do anything."

The ISN will focus on six key soldier capabilities: threat detection, threat neutralization (such as bullet-proof clothing), concealment, enhanced human performance, real-time automated medical treatment, and reduced logistical footprint (i.e., lightening the weight load of the fully equipped soldier). At the news conference announcing ISN Thomas noted that one ISN goal is to reduce the weight of a soldier's equipment from today's 125-145 pounds to the 45 pounds carried by Roman warriors. These themes in turn are addressed by seven research teams: energy absorbing materials, mechanically active materials for devices and exoskeletons, detection and signature management, biomaterials and nanodevices for soldier medical technology, process systems for manufacture and processing of materials, modeling and simulation, and systems integration. In addition, Raytheon, DuPont and Massachusetts

ISN see facing page

ISN from facing page

General/Brigham and Women's Hospital are Founding Industrial Partners, who will work closely with the ISN and with the Army Natick Soldier Center and the Army Research Laboratory, Aberdeen, MD, to advance the science in field-ready products.

The researchers are confident that these teams will build off each other to create products with a variety of applications. For example, an "exoskeleton" for the soldier composed of such things as novel nanoparticles, electroreological fluids, and polymer actuators could not only provide ballistic protection, but also be transformed into a medical cast (on demand) or it could be activated to create an offensive "forearm karate glove."

"Now yet again the U.S. faces threats that challenge our country to capitalize on the enabling power of novel technologies. The ISN really embodies a great opportunity to create these new technologies to protect our soldiers," said Thomas.

Lieutenant Colonel ***Brian L. Baker***, commander of MIT's Army ROTC program, noted that in the past, technology has been used "to take the man out of the loop." He continued: "Here you're applying [MIT's] greatest strengths to helping the man or woman him- or herself.•••

For more about the ISN...
http://web.mit.edu/ISN

HEAD from page 12

especially in the areas of tenure and promotion. Beginning this academic year Professor ***Paula T. Hammond*** is now a tenured Associate Professor of chemical engineering. Professor Hammond is a pioneer in that she is the first woman of African-American descent to achieve tenure in the entire School of Engineering. Professor ***Linda G. Griffith*** is now Full Professor of chemical and biological engineering in the Department. We are very proud of the accomplishments of these two important members of our Department, and you can find more details on each of them later in this newsletter.
(See articles page 5)

Also this year, we have as Visiting Professor of Chemical Engineering, ***Richard D. Braatz***, Professor and University Scholar at the University of Illinois at Urbana-Champaign. Professor Braatz will be teaching a course in systems engineering during the Spring 2003 term. We are also pleased to welcome back from leave of absence and sabbatical, respectively, Professors ***George Stephanopoulos*** and ***Charles L. Cooney***. Professor Stephanopoulos was Executive Managing Officer and Chief Technology Officer at Mitsubishi Chemical in Tokyo, Japan. Professor Cooney spent his sabbatical year at the University of Cambridge. Upon returning to campus, he has resumed his teaching and research responsibilities; in addition, he is director of the new **Deshpande Center for Technological Innovation**.*(See article page 6)*

The Deshpande Center is just one of several new programs and initiatives that have been instituted at the beginning of the academic year 2002-2003. Thanks to a generous gift of $20 million from ***Jaishree Deshpande*** and ***Desh Deshpande***, the Center has been created with the mission of focusing on the support of leading edge research on new and emerging technologies, and fostering the interactions between MIT and entrepreneurs from outside the Institute. Also, thanks to the leadership of several of our faculty members, namely Professor ***Alice P. Gast***, Vice President for Research and Associate Provost of the Institute, Professor ***Paula T. Hammond***, and Professor and Institute Provost ***Robert A. Brown***, MIT has been awarded a $50 million, 5-year contract with the United States Army to set up the **Institute for Soldier Nanotechnologies**, whose main project is to develop lightweight molecular materials which can be used to create self-healing and protective gear that will protect soldiers from chemical or biological weapons.
(See article page 16)

Also in the newsletter you can read about MIT exciting alliance with Dupont, DMA, which is led by co-director Professor ***Robert A. Brown*** and by co-chairs of the MIT Steering Committee Professors ***Robert E. Cohen*** and ***Douglas A. Lauffenburger***. *(See article page 22)*

Finally, our faculty continue to distinguish themselves, and the past year has produced another extensive list of faculty honors and awards. To name just a *few* notable achievements, Professor ***Robert S. Langer*** was awarded the 2002 Charles Stark Draper Prize, the highest honor conferred by the National Academy of Engineering--viewed by many as the engineering equivalent of the Nobel Prize. This is intended to increase public understanding of the contributions of engineers, especially in technology, to the welfare and freedom of humanity. Langer was also awarded by the Chemical Heritage Foundation, the 2002 Othmer Gold Medal for his contributions to science and medicine. *(See article page 7)* You may recall that the very first recipient of the same medal was one of our own distinguished alumni – ***Ralph Landau***.

This year Professor ***Klavs F. Jensen*** also was elected into the National Academy of Engineering for his contributions to multi-scale chemical reaction engineering.
(See article page 6)

Professor ***Douglas A. Lauffenburger*** was selected as recipient of the 2002 AIChE William Walker Award for excellence in research publications.
(See article page 21)

Professor ***Gregory Stephanopoulos***, who was recently named the Bayer Professor of Chemical Engineering, was awarded the **2002 Merck Award in Metabolic Engineering**; he was also elected to the Board of Directors of the American Institute of Chemical Engineers (AIChE). As you can tell, our faculty, in addition to their dedication to research and teaching, are also highly regarded and respected by their peers in the discipline.

I hope that you enjoy this issue of the newsletter, and I encourage you to write us to let us know how you are doing. Thank you all for your support and best wishes for the coming year!•••

News From Alumni/ae

OF THE DEPARTMENT OF CHEMICAL ENGINEERING •••

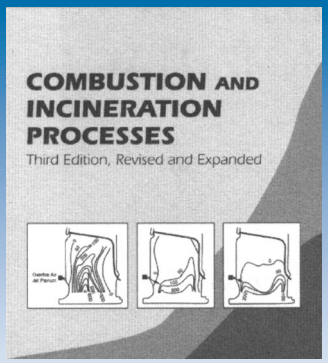
Photo: Brian Ashton

Brian Ashton '52, and his wife ***Margaret*** *(See photo above)* are happy to be home in their native Cape Town, South Africa. After graduating from MIT, Ashton worked for **Hydrocarbon Research, Inc.** in New York, then after a brief return home, he began a new position in the Research Division of **Distiller's Company** in London, England. After four years he returned to Cape Town, where he worked for **AA Distilleries and Wines, Ltd.** until about 1968 when the company was taken over by a competitor. Ashton then worked for **Amalgamated Launderies** for two years, and in 1974 bought **Vitria Glassware**. He remains active with Vitria, which wholesales, decorates and cuts glassware and lead crystal, although his son ***François*** now runs the company. Despite some health complications, Ashton still enjoys yachting, tennis, and skiing.•••

Akbar F. Brinsmade MS '42, is congratulated for his selection for the ***2002*** edition of ***Who's Who in America***.•••

Gabriel "Gabe" de Roetth '44 is staying active, working as a part-time substitute teacher in three high schools near his home in Kihei, on the Hawaiian island of Maui. He and his wife ***Maricruz***, also enjoy summer sojourns in the lakes region near Coeur d'Alene, Idaho.•••

Charles Homsy (X-B) '53/ScD '59, is pleased to share the news that **The Cato Institute,** a Washington DC libertarian think tank, on August 28, 2001 published his policy analysis, "***How FDA Regulation and Injury Litigation Cripple the Medical Device Industry***." It can be read or downloaded from **http://www.cato.org** or requested via email (***chomsy@houston.rr.com***). Homsy reports that his 6 months at the Practice School were some of the most helpful and enjoyable months of his life. After completing his ScD under Hoyt Hottel, and along the way serving as Practice School Asst. Director (1955-56), he was appointed as a Fulbright Scholar in the UK (1957-58). Since then, much of his professional life has been spent experiencing the subject matter of the Policy Analysis. Now retired, he is doing a little consulting, but mainly enjoying his 6 yr. old grandson and 23 month-old grand-daughter, and his children, both of whom are post-graduate medical students.•••



Published by: ***Marcel Dekker***
Web: ***http://www.dekker.com***
Tel: ***(800) 228-1160***

David Karohl '85/PS '86 reports that after 13 years working for **Solvay** in the hydrogen peroxide and HDPE businesses--the first 7 years in production and R&D and the final 6 years in marketing and business development--he departed to attend business school full time. Shortly after completing his MBA at **Rice University** in May 2001, he joined the Business Development team at **Carbon Nanotechnologies, Inc. (CNI)**.•••

Michael Lysaght '64 recently received the **Elizabeth LeDuc Award for Outstanding Teaching in the Life Sciences** from **Brown University**. After a career in the Biotechnology and Medical Device Industries, he joined the faculty at Brown where he is currently Professor of Medical Sciences and Engineering, and Director of **Brown's Center for Biomedical Engineering**.•••

James McCauley '51 wrote in report that he's had a fulfilling career. First he served as V.P. for Research, Development and Engineering at **Crucible Steel Corporation**, and then as V.P. for Development and Engineering at **Sharon Steel Corporation** until 1979 when he became the owner of **Emeco, Inc.**•••

Hans Morgenstern '58 recently retired from the **U.S. Air Force**, in which he pursued a rich and interesting career first as a Training Officer, then as a Course Development Instructor. He now works as a consultant through **HGM Associates** in the fields of Chemical, Environmental, Materials and Safety Engineering.•••

Walter R. Niessen '60 is pleased to share his good news! The third edition of Niessen's latest book, Environmental Science and Pollution Control Series: **Combustion and Incineration Processes** (Pub: Marcel Dekker) was released in Spring 2002, offering one of the most comprehensive and authoritative books available for this complex field. *Environmental Engineering* reviewers commented, "*a must...contains a wealth of information"* See ordering information *(L)*. •••

Natesh Parashurama '94 wrote in to report that after two years of working in General Surgery at **Boston Medical Center**, he entered the PhD program at **Rutgers University** in Chemical Engineering. Parashurama, already an MD, is excited about the opportunity to use ChemE methods for studying surgical problems.•••

2002 ChE Alumni/ae Reception Class of 1952 • June 7, 2002

Photo: Gregory Sands

FRONT ROW (L to R): Peter Melnik, Bill Dunn, and Steve Learnard. MIDDLE ROW (L to R): Sam Mitchell, Dirk Plummer, Cliff Sayer, Dick Heitman, and Allan Chin. BACK ROW (L to R): Bob Damon, Joe Moore, Amos Dixon, Bob Bacastow, Manuel Liberman, Bob Lurie and Nick Haritatos.

Lurie Lures Lockhart Into Slide Rule Conducting Debut!

The department and MIT Alumni Association convey special thanks to ***Robert M. Lurie '52*** *(R) who was instrumental in encouraging alumni/ae to visit our Alumni/ae Reception this year, held in the Lewis Room on MIT Commencement Day, June 7th. Lurie also provided* ***Boston Pops Conductor Keith Lockhart*** *(R,bottom) with a special MIT baton -- an engraved slide rule, with which he conducted chorus and orchestra in the "Star Spangled Banner" at this year's MIT Night at the Pops.*

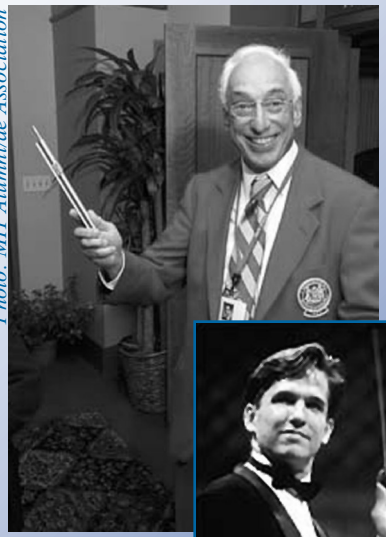
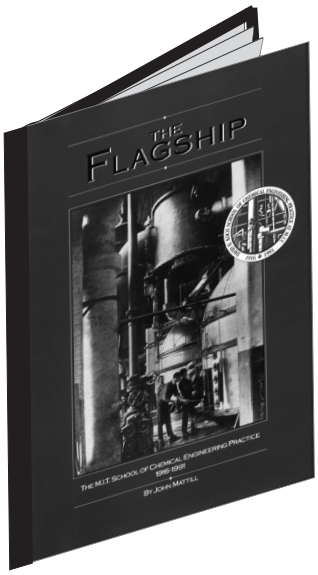


Photo: MIT Alumni/ae Association

Photo: Boston Symphony Orchestra

THE FLAGSHIP



The School of Chemical Engineering Practice, 1916-1991

By John I. Mattill, *Editor Emeritus, Technology Review*

190 pages, 120 photographs, scores of anecdotes, and three reminiscences by alumni/ae capture the special passion of this audacious - and still unique - concept that has become a world standard for engineering education

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There's No Substitute for Hands-On Experience

Cain, Roos'44, Evans Investment Helps Boost Value and Power of ChemE's Undergraduate Lab Curriculum

Light spills through the parting elevator doors after a long plunge through the heart of building 66. Did you press the right button? The floor indicator says "SB"-sub-basement, yet instead of a dreary dark cave, there's a bright, modern, spacious, and well-equipped new research facility. "Maybe," you think, "the elevator is lying." If you did--you'd be wrong!

Welcome to ChemE's new subterranean undergraduate teaching laboratory, generously funded with the help of lead gifts from the **Gordon A. and Mary Cain Foundation** and from ***Edwin G. Roos*** '44 and his wife, ***Mary Ann Evans***, and contributions from a large number of alumni and friends of the Department. At last, our undergraduate process and project lab courses have a unified home! We are very grateful to all those who made this possible.

This new facility, finished in Spring 2002, was constructed in response to a dramatic increase in numbers of ChemE majors, the emergence of Bioengineering as a prominent focal point, the need to more effectively maximize student/faculty contact time by consolidating lab space, and the need for reliable, state-of-the-art equipment.

Each of our two undergraduate lab courses to be housed in the new space, **10.26 Project Lab** and **10.27 Processes Lab** offers unique opportunities for ChemE Jr's and Sr's to apply theoretical knowledge, exercise teamwork and collaboration skills, and gain familiarity with laboratory equipment, procedures and practices.

Previously, these courses shared space distributed over several floors or even several buildings, adding logistical complications for students and teachers alike. Specialized equipment, particularly for bio-related projects was in short supply and sometimes fixing or improvising substitutes consumed critical planning and implementation time. A new undergraduate lab subject, **10.28 Biological Engineering Laboratory**, will share this space beginning next year.

Photo: Gregory Sands

Low-rise exhaust hood (L) permits easier access for wheelchair and other handicapped students.

Photo: Gregory Sands

L to R: ChE Industrial Development Officer Dr. Barry Johnston, Dept. Head Robert C. Armstrong, Donors Edwin G. Roos '44 and Mary Ann Evans, and ChE Executive Officer Karen K. Gleason (Background L to R: Arthur D. Little '85, William H. McAdams '17, and William P. Ryan '17).

What's Inside

To address the need for better space management and flexibility, reliable and up-to-date equipment, proper bioengineering facilities, the reinforcement of team-work and collaborative learning, and compliance with ADA (Americans with Disabilities Act) regulations, the new lab design has a number of important features. Space management will be made easier, with rolling benches and cabinets --for easy configuration of multiple apparatuses where needed, and a spiral duct exhaust-system which offers exhaust port capabilities throughout the lab. Varying electrical requirements of lab appliances such as ovens will be filled by the use of overhead "buss bars" which safely provide the variable voltage and wattage for multiple appliances having different requirements.

Photo: Gregory Sands

Chris Bettinger '04 (R) explains his project to visiting lab donors Edwin G. Roos '44 (C) and Mary Ann Evans(L).

One-third of the new lab is devoted to Bioengineering facilities, including BL1 and BL2 areas separated by window-walls for projects involving cell growth and cell cultures as well as separations.

To maximize exhaust-handling capabilities, new dedicated exhaust blowers were installed. Unlike exhaust hoods in other parts of the building, which are vented by a central blower via a complex duct network, those in the subbasement are served by a system which vents subbasement exhaust directly to the roof.

Within an empty duct-way which was included as part of the Landau building's original construction but never used, Facilities Manager Steve Wetzel and lab designers installed a dedicated exhaust duct which will ensure that the new lab's exhaust

NEW LAB see facing page

NEW LAB from facing page

needs are met at least as well as those above ground level. To further maximize system efficiency and reliability, suction is driven by an alternating pair of roof blowers, rather than a single unit. Other centralized facilities include dedicated compressed gases, de-ionized and chilled water.

Another important improvement is handicapped accessibility, which has been enhanced by such features as low rise exhaust hoods which allow seated wheelchair students to work comfortably on projects requiring the use of an exhaust hood.

Teamwork and collaboration are a critical part of the ChemE undergrad lab experience. The new Edwin G. Roos '44 and Mary Ann Evans Room supports these important activities with a generously appointed conference room immediately adjoining the lab space complete with spacious white boards, student lockers, and conference table. Smaller meeting areas, all brightly lit with spacious whiteboards are also available. Having these facilities nearby, all with windows overlooking the labspace, helps maximize the value of time spent in the lab area. Students may easily shift back and forth between meetings, and lab work, wasting minimal time on meetings-logistics.

Photo: Gregory Sands

Edwin G. Roos '44 and Mary Ann Evans Project Room.

Photo: Gregory Sands

ChE Facilities Manager Steve Wetzel with new roof mounted dual-exhaust blowers.

Keeping Pace with Technology

In the future we hope to establish a companion endowment, which will help maintain and update experiments, supplies, and equipment for the future. This investment will enable the labs to keep up with advances in the field, permitting cutting-edge experiments to be added and existing experiments to be revised as technology evolves.

With warm gratitude we thank the **Gordon A. and Mary Cain Foundation** and ***Edwin G. Roos*** '44 and ***Mary Ann Evans*** for their visionary investment in helping prepare tomorrow's innovative engineering graduates!•••

***10.26** is rare, if not unique in the nation. Sponsored by industry and supervised by Chemical Engineering faculty, the experiments selected for this one-semester course pose real-world problems in need of real-world answers. Working in groups on a single experiment, which lasts the duration of the course, students often must design, specify, and assemble equipment prior to conducting experiments. They are introduced to novel topics and manage the projects from proposal and planning to execution and reporting. The five-person teams include three students, a faculty member, and a company representative, with whom students maintain ongoing involvement.*

***10.27** is a one-semester course giving students experience in unit operations. Students work in teams of three on three open-ended experiments that cover various chemical engineering subjects. What sets Processes Lab apart is that the experiments on a single topic are progressive within the semester, allowing students not only to compare results, but also to build on the results of previous teams. The experiments are selected to illustrate traditional subjects, such as distillation, fermentation, and reaction kinetics, and newer topics, including chemical vapor depostion and pressure swing adsorption.*

Lauffenburger Wins Election to NAE and AAAS

Photo: Stu Rosner

Professor Douglas A. Lauffenburger

The Department of Chemical Engineering is proud to recognize Professor ***Douglas A. Lauffenburger***, **J.R. Mares Professor of Chemical Engineering**, **Co-Director** of the new **Biological Engineering Division**, and **Director of Biotechnology Process Engineering Center** who was elected both as a Fellow of the **American Academy of Arts and Sciences**, and as a Member of the **National Academy of Engineering** since our last Newsletter.

Lauffenburger was cited for pioneering contributions in the application of engineering in molecular and cell biology and to a quantitative understanding of molecular and cellular processes and for his leadership in the bioengineering community.

Congratulations to ***Professor Lauffenburger*** on this impressive dual honor!•••

For more about Lauffenburger...
http://web.mit.edu/cbe/dallab/doug.htm

For more about the National Academy of Engineering...
http://www.nae.gov

For more about the American Academy of Sciences...
http://www.amacad.org/index.htm

New Alliance Shares Biotech Strengths, Benefits

What happens when a bio-tech savvy research university teams up with a chemical industry-giant to maximize their collective biotechnology "smarts"?

ChemE faculty members ***Robert A. Brown*** (MIT Provost), ***Robert E. Cohen*** and ***Douglas A. Lauffenburger*** recently initiated just such an exciting partnership. Officially begun on January 1, 2000, the **Dupont-MIT Alliance** is now a thriving addition to existing campus-industry collaborations, and bears strong ties to ChemE with Cohen and Lauffenburger co-directing the Alliance's MIT activities, and Brown serving with ***Thomas M. Connelly*** of Dupont as Co-Chair of the DMA Steering Committee.

The MIT/ DuPont partnership is emblematic of DuPont's increased emphasis on life sciences in the past several years. "DuPont has traditionally been very strong in chemicals, and polymer and inorganic materials," according to ***Bruce E. Smart***, research manager in the biochemcial sciences and engineering section of DuPont Central Research and Development and the company's Program Director for the Alliance. "But we feel the future of DuPont is at the interface of chemistry, materials science, and biology. The resulting technologies will represent the new growth opportunities for the company."

The Alliance supports research projects that draw upon the science, engineering and business expertise at MIT and that extend and better leverage the reach of DuPont's scientific expertise in the areas of biology, genetics, bioinformatics, and catalysis. This joins DuPont's and MIT's strengths in materials, chemical and biological sciences to develop new processes for new materials directed at bioelectronics, biosensors, biomimetic materials, alternative energy sources, and new high-value materials.

Brown said, "We are extremely excited about the opportunity to work together with DuPont to help shape the application of modern biology to a new range of materials and products for the benefit of society."

Research Funding

For its initial set of research programs, the DMA Steering Committee in August 2000, selected 10 proposals from a field of 37 submissions from MIT faculty. Varying in cost, size, and complexity, the funding for the selected projects ranged from $100K per year to large, multi-investigator projects at $1M per year.

DMA has since then executed four more rounds of proposal solicitation and review. Overall, 75 applications for research funding were received by DMA and an open solicitation process is now accepting white papers throughout the year for review.

DUPONT MIT ALLIANCE

"It's essential to maintain an academic environment in which first-year graduate students can freely explore options for their thesis research project, unencumbered by considerations of need for immediate financial support of their educational program. This is particularly important for those who may be attracted to projects with multiple research advisors working in areas outside the range of the student's undergraduate experience."

Robert E. Cohen,Alliance Co-Director
Professor of Chemical Engineering

At present, there are 17 funded programs involving 46 faculty from 13 different departments, centers and divisions at MIT. Each of the 17 programs has one or more closely-connected liaisons at the DuPont Experimental Station.

Educational Programs

DMA's educational activities include fellowships for entering graduate students, tutorials by individual MIT faculty presented at the Experimental Station in Wilmington as well as multi-day short courses presented at MIT and DuPont.

In 2000-2001 there were 14 DuPont Fellows in 8 departments. In 2001-2002, the fellowship program was expanded to 20 DuPont Fellows in 10 departments and centers, reflecting the broader participation in DMA research activities at the Institute.

In each of the first two years of the Fellowship program, the DuPont Fellows were invited as a group to visit the Experimental Station and other DuPont facilities in Wilmington. This unusual opportunity was received with great enthusiasm by the students.

"The seminar was really enriching as it showed us a glimpse of the industrial world. Also, having the opportunity to talk with several DuPont scientists was really great, as I learned a lot from these conversations, especially about biomaterials," remarked one DMA Fellow. Another commented, "The visit gave me a good insight on DuPont's efforts to adapt pro-actively to the new business environment. Definitely valuable."

MIT faculty presentations in Wilmington have included six one-day tutorials, covering topics of a "character-changing" nature for the professional staff at the Experimental Station. In Summer 2001, there were two short course presentations. Professors ***Daniel I.C. Wang*** and ***Charles C. Cooney*** presented *Fermentation Technology*, and a *Metabolic Engineering and Bioinformatics* course was given by Professors ***Gregory Stephanopoulos*** and ***Anthony Sinskey***. In June 2002, Professors ***Harvey Lodish***, ***Paul Matsudaira***, ***Bruce Tidor***, and ***Alexander Klibanov*** presented an executive tutorial in *Biotechnology*, and eight DuPont professionals attended the *Promoting Innovation: The Dynamics of Technology and Organizations* course at the Sloan School.

With this dynamic blend of educational programs, research sponsorship, and resource-sharing, we look forward to a bright future for the new DuPont-MIT Alliance and the increased vitality it promises for both distinguished partners, and the Chemical Engineering community in general.•••

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For the period July 1, 2001 through June 30, 2002

Thank you for all of your generous support throughout the year!

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Amrita Guha ’00
John E. Gulick ’49
Frank A. Gulla ’74
Heinz H. Gunther ’52
John R. Gunther ’43
Frank E. Guptill ’48
Robert N. Gurnitz ’60
David E. Gushee ’50
Samuel Gusman ’46
John A. Gutai Jr. ’50
Edgar B. Gutoff ’52
Vincent Ha ’96
Young Soo P. Ha ’85
John C. Haas ’42
Robert A. Haass ’50
Austin G. Habib ’57
Nicholas Habibe ’56
David S. Hacker ’50
P. F. Hagerty ’46
Wilburt E. Haggerty ’50
Aaron F. Hahn ’45
Chris K. Hahn ’58
Edwin R. Hahn ’40
Eddy R. Hair ’54
Mohammadreza Hajaligol ’81
Daniel J. Halbert ’81
David J. Haley ’91
Mitchell J. Halle ’49
Benjamin D. Halpern ’43
Michael E. Halpern ’55
Bruce K. Hamilton ’69
Philip G. Hampton ’77
Julie J. Han ’94
Robert H. Handler ’43
Jason Handwerker ’97
Robert T. Hanlon ’85
John N. Hanson ’64
Jon C. Hanson ’65
Robert A. Hard ’57
Michelle T. Hardiman ’00
Nicholas J. Haritatos ’52
John B. Harkness ’71
Kenneth G. Harms ’51
George S. Harrington ’41
George M. Harriott ’83
Peter Harriott ’52
Grady W. Harris ’61
Leonard Harris ’44
Marvin S. Harris ’55
Ray W. Harris ’50
Brian M. Harrison ’97
William J. Hart ’48
Samantha L. Hartemink ’98
Gary L. Harting ’60
John S. Hartman ’65
Christine M. Hartmann ’98
Mark A. Hartney ’82
Heidi E. Harvey ’81
William H. Haslett Jr. ’61
James A. Hasse ’79
William Y. Hata ’81
Robert L. Hatch ’47
Gary R. Hattery ’78
Robert D. Hawthorn ’54

Althea T. Haylett ’85
Hal P. Headley ’37
Frank J. Hearl ’80
Craig L. Heath ’56
Ralph L. Hegner ’39
Adel E. Heiba ’79
Harry J. Heineman Jr. ’42
Edward W. Heinle ’82
Nina M. Heinrich ’02
Robert W. Heinze ’68
Richard E. Heitman ’52
Joseph J. Helble Jr. ’87
Mark G. Helder ’84
John D. Helferich ’79
Steven Heller ’43
Richard K. Helling ’86
Kelly L. Hellmuth ’00
Charles B. Henderson ’52
James H. Henderson Jr. ’42
Donald L. Hendrickson ’50
D. B. Henschel ’67
David C. Herak ’89
Mark J. Herbst ’73
Gilbert R. Hernandez ’95
Linda R. Hernandez ’93
Jorge C. Herrera ’81
Eduardo F. Herrerias ’43
Howard J. Herzog ’74
Sidney W. Hess ’53
Ann M. Hession Botelho ’90
Bedrich V. Hettich ’43
Jon M. Heuss ’62
Robert C. Hewitt ’67
Eve J. Higginbotham-Williams ’75
Harold B. Higgins ’44
Arthur E. Higinbotham ’60
Arthur S. Hill ’63
Charles G. Hill Jr. ’59
Robert J. Hinds ’53
Thomas J. Hirasuna ’76
Peter M. Hirsch ’79
Henry E. Hirschland ’49
Sidney Hirshon ’37
Anthony W. Ho ’96
Henry Ho ’52
Nancy M. Ho ’95
William Hoagland ’73
Robert M. Hodges ’60
Allan S. Hoffman ’53
Thomas R. Hoffman ’87
Thomas S. Hoffman ’56
Wilburn H. Hoffman ’46
John E. Hofmann ’56
Henry G. Hohorst ’52
Stanley E. Holbrook ’44
Stacy M. Holden ’00
Henry R. Holgate ’89
William D. Holland ’58
Edward H. Hollister III ’50
Charles R. Holman ’36
Geoffrey W. Holman ’80
Pamela L. Holmes ’92
Benjamin M. Holt ’37
Robert P. Holton ’57
Charles A. Homsy ’53
Caroline C. Hon ’01
Robert W. Hone ’79
Glenn T. Hong ’81
Joonkee Hong ’84
Kristy H. Hong ’99
Wan-Jen Hong ’01
Thomas Hooker ’40
John W. Hoopes Jr. ’44
Kenneth R. Hootnick ’61
Lloyd N. Hoover ’56
Harold B. Hopfenberg ’60
Harvey C. Hopkins Jr. ’51
Bernd P. Hopp ’63
Allen F. Horn ’84
William B. Horner ’52
Robert V. Horrigan ’44
Jane F. Hortelano ’94
William E. Horton ’56
Joseph I. Horwitz ’93
Anne K. Hou ’83
Patrick B. Houghton ’82
James J. Hourihan Jr. ’48
John H. Howell ’35
Matthew P. Howell ’94
Edward L. Hoyt ’57
Sherry H. Hsiung ’95
Shih-Liang Hsu ’60
Benjamin V. Hu ’79
Evelyn Y. Huang ’99
Mengchien C. Huang ’54
Nganfong Huang ’02
Dennis J. Huber ’74
Robert T. Hucks Jr. ’51
Timothy G. Hueston ’84
John E. Hueter ’71
George A. Huff Jr. ’82
Robert L. Huffman Sr.. ’42
Donald P. Hug ’47
Mark D. Hughes ’79
Thomas P. Hui ’75
Lewis W. Hull ’38
Robert D. Hulse ’68
Ralph A. Hulseman ’80
Edward C. Hume ’83
Albert S. Humphrey ’49
Dean E. Humphrey ’49
Edwin P. Hunger ’54
Catherine M. Hunter ’81
Jean B. Hunter ’76
Julia A. Hunter ’84
Gilbert L. Huppert ’89
Robert H. Hurt ’87
Albert G. Hutchins III ’53
Daniel Hyman ’52
Brian Hynes ’95
Tomoko Iida ’02
Kristin M. Imsande ’95
Robert R. Imsande ’42
Paul P. Ip ’82
Thomas B. Irwin ’80
Larry Z. Isaacson ’53
James J. Isenberg ’75
Allan B. Isham ’56
Wesley J. Ishida ’84
Shingo Ishikawa ’79
Frank J. Iskra ’48
John M. Iwasyk ’60
Kingsbury T. Jackson ’40
Norman A. Jacobs ’59
Ralph L. Jacobson ’35
Thomas A. Jadwin ’69
Frederick L. Jaggi ’57
Hugh R. James ’74
Peter A. James ’67
Vincent W. James ’78
James M. Jamieson ’70
Alice Jang ’00
Christine J. Jang ’93
Frederick J. Jao ’98
Lawrence A. Jarnagin ’58
Mottlene Jarvis ’74
George R. Jasny ’52
Donald M. Jassowski ’57
Sarah E. Jatko ’98
Alwyne C. Jealous ’42
Dara T. Jeffries ’02
David M. Jenkins ’59
Robert D. Jenkins ’48
Rodman Jenkins ’46
James T. Jensen ’50
Peter L. Jensen ’73
Lewis T. Jester ’72
Vinod K. Jhunjhunwala ’65
Neil Jochelson ’68
Adrain E. Johnson Jr. ’49
Charles T. Johnson Jr. ’73
Dana E. Johnson ’88
Douglas L. Johnson ’53
Harry E. Johnson ’83
Ivette M. Johnson ’97
John R. Johnson Jr. ’60
Robert A. Johnson ’62
Robert H. Johnston ’45
David H. Jones ’65
Robert D. Jones ’86
Russell L. Jones ’72
Stephen F. Jones ’76
Arnold S. Judson ’47
Burton F. Judson ’48
Nikola M. Juhasz ’92
Lisa B. Jungherr ’81
Beth H. Junker ’89
Nicholas C. Kafes ’55
Naomi J. Kagetsu ’82
Burton H. Kahn ’47
Morley D. Kahn ’51
Muhammad R. Kaimuddin ’01
Robert J. Kallal ’49
Mauritz J. Kallerud ’62
Elsa Kam-Lum ’74
Harold W. Kamins ’78
Angelo W. Kandas ’93
Edward D. Kane ’47
Eugene W. Kane ’47
Rahra Kang ’01
Shin G. Kang ’91
Amy B. Karger ’98
David A. Karohl ’85
Daphne Karydas ’94
Brian R. Kashiwagi ’64
Stanley Kasper ’48
I. M. Kasser ’60
Stacy D. Katchman ’87
David A. Katz ’80
Gerald Katz ’59
William E. Katz ’48
James R. Katzer ’70
Lara I. Kauchak ’96
Arnold F. Kaulakis ’38
John D. Kavazanjian ’72
Herbert Kay ’47
Nancy D. Kayvanfar ’85
Marwan M. Kazimi ’96
Mitchell F. Keamy ’47
Andrew H. Kean Jr. ’43
John R. Kearney ’48
Tamara J. Kearney ’99
James B. Keeler ’81
James J. Keenan ’48
George T. Keene ’52
Caroline L. Keller ’97
George M. Keller ’48
Michelle B. Keller ’84
John S. Kellett ’47
Ralph L. Kelly Jr. ’42
Thomas K. Kelly ’44
Kenneth Kelton ’49
Robert M. Kemper II ’65
Delbert W. Kendall ’24
C. T. Kennedy ’42

Colin J. Kerwin ’82
David S. Keselica ’83
Donna L. Kessel ’89
Yehia F. Khalil ’86
Fadilah A. Khan ’02
Samer S. Khanachet ’72
Bhupendra N. Khetani ’60
Donna M. Kilian ’80
Byung C. Kim ’58
Hose Kim ’81
In Ho H. Kim ’56
Jeenok T. Kim ’84
Joo C. Kim ’61
Juyong B. Kim ’00
Miral E. Kim-E ’85
Robert M. Kimmel ’64
William O. Kincannon Jr. ’50
Cary J. King III ’58
Charles H. King Jr. ’41
Robert C. King Jr. ’88
Terry S. King ’79
George S. Kingsley ’83
Erdogan Kiran ’69
Kenneth A. Kirk ’81
Wylie C. Kirkpatrick ’40
Thomas P. Kisala ’85
Linda D. Kiss ’87
Robert D. Kiss ’87
Yves J. Kissenpfennig ’95
William R. Kittredge ’43
Kazuo Kiyonaga ’50
Katherine M. Klar ’97
Mitchell Klausner ’84
Howard W. Klee Jr. ’72
Gary G. Klein ’74
Max M. Klein ’81
Wm. S. Kleinman ’79
David E. Kleinschmidt ’76
Hans A. Klemm ’75
Allen L. Klibanoff ’56
Douglas F. Kline ’93
David H. Klipstein ’56
Norman R. Klivans ’40
Stuart R. Knapp ’31
Chester E. Knight Jr. ’64
Joseph K. Knight ’40
Heather L. Knoedler ’94
John A. Knowlton Jr. ’49
David H. Koch ’62
Robert W. Koch ’50
Wendy S. Koegler ’00
Kenneth C. Koehlert ’83
Han-Jong Koh ’86
Henry H. Kohl ’48
Alison D. Kohler ’78
Edward Kohler ’95
Jo-Anne M. Kokoski ’96
Frederick J. Kolb Jr. ’38
James D. Kolb ’53
Paul C. Kolosick ’86
Sheila J. Konecke ’80
Amy K. Koo ’95
Harry L. Kopp ’48
Paul M. Koppel ’54
Kenneth D. Kopple ’51
Ernest I. Korchak ’61
Theodore H. Korelitz ’56
Michael A. Kornitzky ’62
Richard G. Kotosky ’81
Robert W. Koucky ’56
Alexandros Koulouris ’91
Kenneth L. Kovach ’83
Eugene J. Kovary ’54
Robert F. Kratz ’44
Lawrence R. Kravitz ’60
Louis F. Kreek ’48
David W. Kress ’67
Michael J. Kreuze ’93
John N. Krikelis ’97
Hannes B. Kristinsson ’51
Elizabeth J. Kroeker ’91
Adam D. Kroft ’00
Robin A. Krolikowski ’93
Charles L. Kroll ’49
Thomas P. Kronenberger ’88
Dean E. Kross ’73
John A. Krueger ’70
Richard T. Krueger ’48
Richard M. Kruger ’76
Gilbert K. Krulee ’44
George C. Krusen ’50
Larry J. Krussel ’73
Yuji Kubo ’01
Joseph D. Kuhach Jr. ’83
Alexander M. Kulinowski ’83
Dennis Y. Kuo ’84
Hirofumi Kurihara ’66
Ronald T. Kurnik ’81
Stuart J. Kurtz ’63
Charles L. Kusik ’56
Chi S. Kwan ’52
Gerald K. Kwentus ’67
Lily F. Kwok ’80
Agathagelos Kyrlidis ’89
William J. LaPoint Jr. ’84
Aaron J. Labrocca ’98
Arthur J. Lacroix ’45
Arthur P. Lagace ’60
James Lago ’47
Chiu-Kin S. Lai ’86
Chung J. Lai ’73
Robert I. Lait ’54
David S. Laity ’50
Frederick W. Lam ’89
Harry W. Lambe ’49
Paul E. Lambert ’63
Gerard C. Lammers ’48
Steven P. Lamontagne ’01
Ralph Landau ’41
Robert E. Lander ’52
Mary E. Landrum ’87
J. H. Laning ’40
Teresa S. Lantz ’82
Berton M. Lapidus ’59
Ana I. Laplaza ’94
Cheryl A. Larrivee-Elkins ’87
Howland A. Larsen ’50
Jason K. Larsen ’99
Paul R. Larson ’54
Albert K. Lau ’72
Edmund K. Lau ’75
Amy B. Laverdiere ’99
Hugh P. Lavery ’73
Stephen D. Laveson ’60
James S. Law ’72
John V. Lawler ’86
Michelle Lawlor ’97
Evan K. Lawrence ’50
Leroy E. Layton ’50
Melanie L. Lazaro Flores ’92
Francis N. Le Baron ’44
Jeffrey B. LeBlanc ’98
Shirley C. LeMay ’89
Steven R. LeMott ’72
Donald C. Lea ’50
Kathleen J. Leach ’92
James W. Leader ’43
Andrew W. Lee ’76
Barbara A. Lee ’87
Chun-Hyuk Lee ’94
Chung M. Lee ’87
David S. S. Lee ’98
Dek S. Lee ’80
George Lee ’52
Heather M. Lee ’95
Helen H. Lee ’02
Ivan H. Lee ’98
Jenny C. Lee ’96
Jeong S. Lee ’80
Julian P. Lee ’97
Kathy J. Lee ’99
Lester A. Lee ’55
Max N. Lee ’58
Richard Y. Lee ’97
Robert Lee ’82
Wanchieh Lee ’02
Yam Y. Lee ’82
Yung B. Lee ’81
Ronald P. Leemhuis ’72
Steven J. Lefkowitz ’00
Haiyun M. Lei ’00
Jean P. Leinroth Jr. ’48
Joseph E. Leitgeb ’57
Frank B. Leitz Jr. ’55
Robert B. Lennox ’83
Stephen T. Lentz ’86
Katie M. Leo ’95
Edward F. Leonard ’53
Donato R. Leone ’59
Sai B. Leong ’80
Sing Leong ’45
Richard N. Leslie ’66
Gerald A. Lessells ’50
James C. Leung ’75
James A. Levitan ’45
Roy N. Levitch ’66
Karl B. Levy ’83
Peter F. Levy ’79
Philip C. Lewellen ’75
Natalie D. Lewis ’86
Peter J. Lewis ’65
Robert W. Lewis ’61
George T. Li ’89
Marlene M. Li ’89
Yulan Liao ’96
James W. Libby Jr. ’35
Frank H. Libman ’40
William R. Licht ’87
William E. Lifson ’41
Bruce D. Lilly ’93
Larry J. Lilly ’65
Fredric J. Lim ’83
Kenneth J. Lim ’70
Kirk W. Limbach ’89
Danielle J. Lin ’98
David Y. Lin ’98
George F. Lin ’98
Nelson P. Lin ’91
Selina Lin ’84
Wendy W. Lin ’84
John W. Lincoln ’55
Carl A. Lindstrom ’49
William Lintner Jr. ’53
John R. Linton ’84
W. H. Linton Jr. ’47
Malcolm J. Lipson ’50
Theresa M. Liu ’97
Fred P. Lobban ’40
Paul A. Lobo ’50
Raymond S. Locatelli ’65
George O. Lof ’40
Jordan Loftus ’50
Robert C. Lonadier ’84
William C. Long ’59
Joseph V. Longcor ’38

John M. Longoria ’86
John P. Longwell ’43
Emilio M. Lopez ’87
Juan M. Lopez ’79
Daniel F. Lord ’44
Rebecca E. Lords ’89
Richard A. Loring ’62
Jeremiah A. Lott ’48
Otway Louie ’93
Quintin B. Louie ’01
Bertrand C. Louvet ’62
Richard N. Lovett ’43
Robert F. Lovezzola ’48
John M. Luger ’51
Robert M. Lurie ’52
Martiel A. Luther ’82
Christine M. Lyons ’86
Michael J. Lysaght ’64
Yi H. Ma ’67
Alan L. MacLean ’44
Marc Machbitz ’78
Anthony C. Mack ’62
Arnold Mackintosh ’44
Temina C. Madon ’98
Robert P. Madrulli ’51
Robert D. Maher ’44
Louis E. Mahoney III ’54
William F. Mahoney ’89
Thomas O. Maier ’67
Donald A. Mains ’47
Alex S. Malaspina ’52
Jeffrey K. Malcolm ’98
Gregory S. Malkin ’76
Francis M. Mallee ’74
James A. Malloch ’43
John B. Malloy ’50
Robert L. Malster ’56
David A. Manalan ’65
Gerald Mandel ’77
James L. Manganaro ’61
Ivan Mankowich ’33
Albert R. Manner ’79
Brian A. Mannion ’84
Rodney C. Marable ’01
Frank A. March ’67
James K. Marchetti ’96
Jan W. Mares ’60
Stanley V. Margolin ’49
Geoffrey Margolis ’69
Mark E. Marinan ’81
Charles P. Marion ’52
Amy L. Markel ’85
Alan B. Marks ’70
Jerold S. Marks ’79
Stanley Marple Jr. ’41
Andre V. Marrou ’62
Henry N. Marsh ’51
Courtenay D. Marshall ’33
Harry A. Marshall ’65
Mark E. Marshall ’80
John E. Marsland Jr. ’57
Geo H. Martin ’53
Jeffrey W. Martin ’97
Reynold W. Martin II ’68
Agustin Martinez ’95
Boni P. Martinez ’46
Wade S. Martinson ’00
Joseph B. Marx ’37
Ben Y. Mason ’44
Edward A. Mason ’50
Thomas A. Massaro ’63
John L. Mattana ’51
Christian J. Matthew ’43
John W. Matthews ’44
David J. Mawer ’62
John V. Maxham ’69
Jerome F. Mayer ’74
Siegfried T. Mayr ’70
George C. Mc Farland ’24
Guy T. McBride Jr. ’48
James K. McCauley ’51
Hugh E. McCollum ’65
Douglas D. McConnell Jr. ’42
Kenneth H. McCorkle Jr. ’51
Donald C. McCulloch ’63
Charles W. McCutchen ’49
Crawford McDonald ’48
Howard M. McDowell ’60
Lindsay J. McFadden ’96
Robert G. McGrath ’53
John D. McGrew ’51
Joseph R. McHugh ’42
Robert A. McIlroy ’58
Robert V. McIntyre ’98
David McKay ’43
Richard G. McKee ’54
John T. McKenna Jr. ’50
Richard C. McKern ’94
Julian T. McKinnon Jr. ’89
Mary A. McLaughlin ’58
Gerald S. McMahon ’36
Lee P. McMaster ’69
James D. McMillan ’90
Robert L. McMurtrie ’52
James B. McNeely ’57
James D. McNitt ’41
Bryant R. Mclaughlin ’00
John J. Mealy ’51
Max F. Means ’48
Hendrik J. Meerman ’84
Neville Z. Mehenti ’01
Jerome F. Meier ’89
Herbert J. Meiselman ’66
Edward O. Meisner ’47
Jerry H. Meldon ’73
Peter Melnik ’52
Marco A. Mena ’99
Robert B. Meny ’44
Akbar A. Merchant ’89
Peter B. Merkle ’84
Edward W. Merrill ’47
Noelle M. Merritt ’85
Richard T. Merritt ’42
Arthur B. Metzner ’51
Juan M. Meyer ’68
Robert E. Meyer ’46
Amy S. Meyers ’89
Stephen L. Michaels ’76
Laurent P. Michel ’47
Richard C. Michel ’75
Robert C. Michel ’50
Stephen S. Mickel ’80
Harold S. Mickley ’46
Richard G. Miekka ’58
Theodoros G. Mihopoulos ’94
Glen A. Miles ’59
Irwin W. Millen ’50
David R. Miller ’48
Deanna C. Miller ’83
James A. Miller ’50
James D. Miller ’62
Kimberley R. Miller ’83
Stephen J. Miller ’48
Wayne E. Miller ’44
William H. Millick III ’49
Clare L. Milton ’40
Sherrill L. Minch ’90
Carl S. Minden ’47
David R. Ming ’85
Mark A. Mintun ’77
Leon Mir ’61
Floro D. Miraldi ’53
Mary Beth E. Miranda ’88
Richard T. Miskinis ’53
Angela M. Mislowsky ’99
Lisa Misterka-Benati ’91
Robert L. Mitchell Jr. ’43
Samuel L. Mitchell ’52
William J. Mitchell ’53
Thomas W. Mix ’56
Wang-Tsee T. Mo ’88
Wm. D. Mohr ’50
Lingfung Mok ’80
Brian V. Mokler ’60
Alexandra N. Molnar ’02
Aaron J. Moment ’96
Charles W. Monroe ’55
Craig C. Monsell ’77
Jose H. Montero ’83
Timothy L. Montgomery ’74
Steven S. Moor ’77
Albert L. Moore ’58
Arthur W. Moore ’59
James W. Moore ’78
Joe F. Moore ’52
Allan C. Morgan ’60
Dale F. Morgan ’38
Dean T. Morgan ’57
Hans G. Morgenstern ’58
John H. Morgenthaler ’51
Edward G. Morin ’39
Brian R. Moroney ’82
Eric M. Morrel ’87
Stephen R. Morris ’82
William C. Morris ’60
Beverly A. Morrow ’73
George M. Morrow III ’41
David C. Morse ’56
Merton Morse ’51
Peter C. Moss ’59
Johnson Mossman ’50
John A. Moulson ’62
David T. Moyle ’94
Joan T. Muellerleile ’85
Debi P. Mukherjee ’69
Antonio Mulet ’80
James A. Mulholland ’58
Lorenz A. Muller ’87
Allan U. Munck ’48
Paul S. Munn ’46
Richard L. Murdock ’58
Charles F. Murphy ’51
Regina M. Murphy ’78
Stephen F. Murphy ’87
Thomas P. Murphy ’54
Gilman Y. Murray ’44
Robert M. Murray ’48
William M. Murray Jr. ’55
Stephen A. Murtha ’74
Kevin T. Musselwhite ’99
Michael Mutsakis ’72
David F. Myers ’81
Henry J. Myers ’53
Kenneth L. Myers ’98
Edward M. Myskowski ’62
Mark R. Naber ’80
Gerald J. Nacamuli ’67
Fred S. Nadel ’58
Divya J. Nagri ’98
Paul R. Nahass ’83
Gabriel H. Nahigian ’96
Stacey T. Nakamura ’80
Rita Nanda ’93
Michael J. Nash ’59
Walter C. Nason Jr. ’45

Angela R. Neale ’97
Adonis A. Neblett ’79
Lita L. Nelsen ’64
Eric D. Nelson ’98
Lisette L. Nenninger ’90
Noble M. Nerheim ’61
Michael A. Neschleba ’69
Paul H. Netherwood ’33
Christine M. Neumann ’00
George W. Neuner ’66
Joseph P. Neville ’56
Barry A. Newman ’79
Margo L. Newman ’75
Robert W. Newman ’36
Andrew S. Ng ’73
Christine S. Ng ’97
Hau Yee Ng-Lo ’84
Shih-Tung Ngiam ’91
Davidhuy N. Nguyen ’02
Tuan Nguyen-Duy ’78
Hong Bin Ni ’92
William B. Nichols ’50
Edward W. Nicholson ’36
William J. Nicholson ’60
Kenneth R. Nickerson ’58
David E. Nickles ’62
Christopher T. Nidel ’95
Matthew E. Nilsson ’01
Reynold B. Nippe Sr. ’56
Kemal M. Nisancioglu ’68
Tuknekah M. Noble ’99
Susan C. Noe ’87
James P. Nolan Jr. ’51
Anthony R. Nole ’96
Ronald A. Norelli ’67
Edward M. Norin ’68
Robert G. Norton ’51
Verrill M. Norwood Jr. ’53
Richard M. Novo ’82
James P. Noyes ’53
Amechi E. Nwachuku ’95
Catherine Nyarady ’93
David C. O’Brien ’53
John B. O’Brien ’64
Ellen M. O’Connell ’90
John P. O’Connell ’61
Robert J. O’Donnell ’46
Analeah O’Neill ’00
William O. O’Neill ’43
Jeffrey C. Oehler ’81
Mary C. Oehler ’82
Paul D. Ogagan ’98
Larry M. Ogden ’58
Edwin M. Oh ’84
David T. Okamoto ’85
Donald R. Olander ’58
Jessica R. Oleson ’96
James D. Oliver ’81
Robert C. Oliver ’53
James M. Olivo ’82
Sven A. Olund ’51
Lillian M. Oppenheimer ’83
Robert D. Orlandi ’74
William F. Orr ’41
Ronald G. Ort ’71
David E. Ortman ’79
Joseph F. Osha ’62
Martine M. Osias ’90
Mark I. Ostler ’69
Steven G. Oston ’59
Ravinder K. Oswal ’80
Jeffrey Ou ’94
Alfred J. Oxenham ’45
Rudolph J. Ozol ’36
Walter J. Paciorek Jr. ’65
Richard D. Packard Sr. ’51
George W. Page Jr. ’78
Philip F. Palmedo ’61
Louis C. Palmer ’50
Nicole A. Palmer ’02
Tuomas A. Paloposki ’88
Mark A. Panarusky ’85
Neil A. Panzier ’52
Theodore G. Papastavros ’55
Chandrasekar Papudesu ’98
Trueman D. Parish ’63
Chan D. Park ’75
Keum J. Park ’93
Reginald Parker ’92
Rienzi B. Parker Jr. ’59
Leonard J. Parsons ’64
John S. Paschkewitz ’95
Stephen H. Pasternak ’87
Chandra Patel ’94
Bernard J. Patnode ’56
Jennie R. Patrick ’79
Richard S. Paul ’52
Houston K. Payne ’56
Donald W. Peaceman ’51
William E. Peak ’74
Frank G. Pearce ’46
Jorge A. Pefaure ’76
Abigail H. Pelcyger ’01
Wardner G. Penberthy ’81
William B. Penn ’37
Miguel Perales ’93
Roger C. Perkins ’85
Samuel E. Perkins II ’50
George P. Perkinson ’65
Christopher R. Perley ’77
Charles W. Perry ’35
Christopher D. Perry ’98
Steven D. Perry ’87
Rolph A. Person ’52
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John G. Polk ’53
Michael J. Pomianek ’90
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Olapeju A. Popoola ’96
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Neil S. Portnoff ’73
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Kevin T. Powell ’89
Robert W. Powell ’70
Arthur J. Power ’42
Sutikshan Prakash ’65
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Mark R. Pratt ’60
Randall N. Pratt ’44
Stuart W. Pratt Jr. ’51
Anthony Praznik ’56
Paal Prestegaard ’61
John L. Preston Jr. ’68
Jason D. Pride ’97
John J. Prior ’97
David N. Prugh ’82
James M. Prusko ’86
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Elta C. Ratliff ’94
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Charles E. Reed ’37
Charles L. Reed ’61
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Murray W. Rosenthal ’53
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Justin A. Strittmatter ’95
Pieter Stroeve ’73
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Michael C. Sudol Jr. ’58
Tzeng J. Suen ’35
Sarosh P. Sukhia ’66
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Wei F. Sung ’77
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Akira Suzuki ’63
Jahnavi Swamy ’95
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James R. Swartz ’78
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Linda E. Sweeney ’83
Maxwell P. Sweeney ’50
Darius Sweet ’81
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Wendell G. Sykes ’50
Min-Nan Sze ’70
Morgan C. Sze ’39
Andrea M. Tabor ’82
William Taggart ’59
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Hsin-Chien Tai ’93
Luther Tai ’70
Robert W. Tait ’80
Kudzaishe G. Takavarasha ’99
Richard E. Talmadge ’54
Kiichiro Tanabe ’61
Jack C. Tang ’49
Frank A. Tapparo ’60
Oded Tavory ’51
Sew-Wah Tay ’86
Douglas J. Taylor ’39
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Joshua D. Taylor ’98
Thomas R. Taylor ’38
James H. TeStrake ’62
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Donato R. Telesca ’48
Leonard R. Tenner ’60
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Keith M. Thompson ’64
Louis S. Thompson ’63
R. R. Thompson ’61
Suzanne M. Thompson ’81
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Hsueh-Rong Tong ’81
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Juan E. Torres ’82
Luisa K. Torrielli ’98
Warren L. Towle ’34
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David R. Treadwell ’33
David P. Trempel ’85
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Sergio C. Trindade ’73
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Wing Tsang ’56
Mosum E. Tsui ’82
Tsu-Man P. Tu ’86
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W H. Tucker ’46
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Shao E. Tung ’54
Howard T. Tupper ’52
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Chaplin Tyler ’23
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Jaime A. Valencia-Chavez ’78
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Jon Van Winkle ’53
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Robert R. Walsh ’85
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Eva C. Wan ’81
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David A. Willis ’60
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Leonard Wimpfheimer ’54
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Paul Wing Jr. ’34
Timothy S. Winsky ’80
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W. K. Woods ’36
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Lei Zhang ’95
Yanping Zhang ’96
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Research Highlights

FROM THE DEPARTMENT OF CHEMICAL ENGINEERING •••

Electrospinning of Polymer Fibers

Professor Gregory C. Rutledge

Electrostatic fiber spinnning, or "electrospinning," is a technology that uses electric fields applied to charged fluid streams to produce polymeric fibers that are typically hundreds of nanometers in diameter, two to three orders of magnitude smaller than fibers produced by conventional extrusion methods, and three orders of magnitude smaller than the typical human hair. Materials manufactured from such fibers exhibit potentially unusual fiber morphologies, very high porosity (e.g., >90%) and surface area (hundreds of square meters per gram), and pore sizes that can be varied over a wide range, from 1 to 1,000 microns. These materials are attracting interest in applications as diverse as filtration and membranes, composites, biomimetic materials for tissue engineering, drug delivery, and electronics.

Professor Rutledge's group has been developing the fundamental understanding required to operate and scale up this process for practical use. The process itself involves charging a polymeric fluid, for example by raising it to a voltage of 10-30 kV, in an electric field. The charged fluid ejects a jet that is then accelerated downfield to a collection device maintained at a lower potential. En route to the collector, the charged fluid stream undergoes one or more fluid instabilities, resulting in a jet that whips around in space, thereby rapidly stretching the fluid filament to ever smaller diameters. As the filament dries, the solid fibers are conveyed to the collector, where a nonwoven material or yarn is obtained. Using high-speed photography, the Rutledge group was among the first to identify the nature of these instabilities and capture them on film. An illuminating example appeared in ***Felice Frankel's*** book, **Envisioning Science: The Design and Craft of the Science Image** (MIT Press, 2002).

Photo: Gregory Rutledge

A jet of polymer solution generated by electrostatic spinning-- "electrospinning."

In collaboration with Professor ***Michael Brenner*** of **Harvard University**, a simple analytical electrohydrodynamic model for a slender charged jet in an electric field has been developed and tested against carefully designed experiments on model fluids. Using a linear instability analysis, the origins of several varicose and whipping instabilities have been identified and quantified. This synergy between theory and experiment has resulted in new insight regarding what are the controlling parameters during electrospinning, and has directed development of the technology in new directions. The theory permits the elaboration of design principles, operating diagrams and scaling relations that help the engineer to apply the technology to new materials and obtain new products.

In MIT's new **Institute for Soldier Nanotechnologies (ISN)**, electrospinning represents one of the key technologies for fabricating integrated, multifunctional textiles with nanoscale structure. By confining polymer molecules to fibers with diameters less than 100 nm, new morphologies and properties are expected for these fibers. Such fibers may be used to create composites for ballistic and other impact protection. Fibers in this size range are also better mimics of naturally occurring fibrils in the extracellular matrix of tissues than are more conventional fibers. The feature, combined with other qualities of electrospun materials such as high porosity and controllable pore size, offers promise for these materials in biomedical applications. The envisioned textiles also have filtration and chemical remediation specifications for chemical and biological warfare protection; for these purposes, nanofiber-based nonwoven fabrics are uniquely suited.•••

Engineering Superior Cells

Professor Gregory Stephanopoulos

As lately hardly a day passes without yet another biological breakthrough, you may have asked your microbiologist friend whether she or he knows of a microbe capable of producing the molecule of your choice. In the unlikely event that one is not readily available, they may suggest some other microbe that makes a similar product that can be converted to the desired one, or, better yet, your microbiologist friend will formulate some screen to select microbes and their mutants that can produce a whole family of similar products with potentially better properties than the one initially sought. The problem with most such candidate organisms is that they only make traces of the desired molecule and under conditions that may be difficult to implement on an industrial scale. These microbes must be improved before their potential can be realized. If you are similarly concerned about a particular disease you may want to know how a newly discovered gene, or some other gene(s) buried in the sequenced genome, can help discover a drug for the disease or define a strategy for gene therapy. The answer to these questions depends critically

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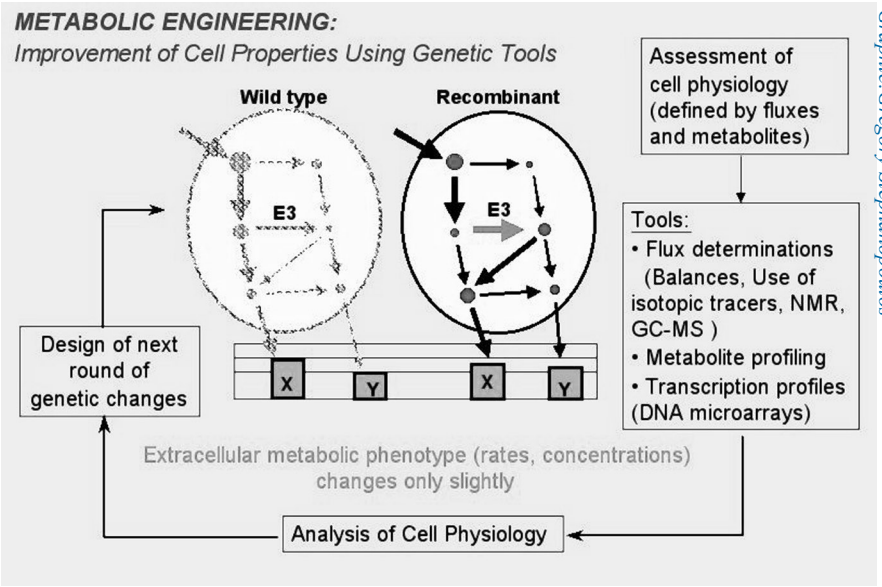
on how well we can characterize the physiological state of cells and tissues and use this information to prescribe the necessary genetic changes and/or environmental controls to improve such cells. This is also the goal and essence of **metabolic engineering**, the area of interest of Professor ***Gregory Stephanopoulos.***

To achieve the above goal, the Stephanopoulos Laboratory employs state-of-the-art tools such as: DNA microarrays for transcriptional profiling; stable isotopic tracers, in conjunction with software for metabolic pathway reconstruction, for the determination of metabolic fluxes in bioreaction networks; and advanced bioinformatics methods for data mining and determination of discriminatory genes and characteristic gene expression patterns. Besides research carried out on further developing the above methods, the latter are also profitably deployed for the study and improvement of various systems of medical and biotechnological interest. Thus, we have investigated amino acid production in fermentations of Corynebacterium glutamicum where we succeeded in increasing the specific productivity of lysine threefold through the simultaneous amplification of two important genes. In collaboration with scientists from Merck & Co. we increased the yield of a key precursor in the manufacturing of the AIDS drug Crixivan® from 25% to better than 95% through metabolic engineering of the bioconversion pathway of this organism. Our methods allow us now to determine pathway fluxes in vivo at high resolution using advanced gas chromatography-mass spectrometry (GC-MS) instrumentation, identify important genes and their characteristic expression pattern associated with highly productive strains or the onset of disease, and deploy these tools for the modification of cells for industrial and medical applications.

Presently we are investigating the mechanisms of carbon dioxide fixation by photosynthetic cyanobacteria and its conversion to useful products, such as biopolymers. In particular, we are engineering strains that have enhanced capability for biopolymer production under the hypothesis that increased product formation will also lead to increased fixation of CO_2. These improved cyanobacteria will thus be able to remove CO_2 from the flue gases of power plants in shallow ponds and convert this greenhouse effect gas to a useful product that is also biodegradable. Another system under investigation is the metabolic pathways associated with diabetes and obesity. The novelty of our approach is that we take an integrated view of all pathways of relevance to this disease inflicting more than 15 million Americans. Specifically, while critical enzymatic reactions and pathways of importance to diabetes have been adequately described at the biochemical and genetic levels, our understanding of the integrated behavior of these pathways and the factors impacting flux distribution among such pathways is quite limited. As a result, there are many reasons that can lead to the same diabetic phenotype of hyperglycemia (i.e., elevated blood sugar concentration) but it is not possible to identify the specific causes of diabetes in a particular individual. Detecting such mechanisms for each individual would provide the basis for prescribing the right medication and also developing new drugs with better efficacy and broader applicability in the treatment of this disease. To this end, our methods of flux determination and transcriptional profiling are deployed along with bioinformatics tools in the study of cell culture model systems and in and animal experiments.

One such study, presently underway in collaboration with scientists from the Beth Israel Deaconess Medical Center (BIDMC), investigates the transcriptional profiles, hormonal levels and diabetic phenotype in diabetic-prone and normal mice under a variety of dietary conditions. As the diabetic phenotype develops in the course of this experiment, gene activity profiles are measured by DNA microarrays to determine those genes whose expression is altered as hyperglycemia develops. This type of information will provide powerful clues about the molecular mechanisms of hyperglycemia and help the discovery of effective drugs for the treatment of diabetes.•••



Graphic: Gregory Stephanopoulos

To increase the low yield of product Y in wild type cells, enzyme E3 is over-expressed. However, due to bioreaction network interactions, this genetic change has minimal effect on the rates of product X and Y accumulation. Methods employing isotopic tracers, DNA microarrays, metabolomic and proteomic measurements and advanced computations are used to elucidate cellular physiology, and guide the next round of genetic changes. Purple circles indicate pool size of metabolites in the network. Arrow thickness depicts relative flux magnitude of the corresponding reactions.

GSC-X Activities

By Jason Kralj, *GSC President*

Chemical Engineering's GSC put together some great events for the 2001-2002 academic year. We kicked things off during the summer with a joint Materials Science/BEH/Chemical Engineering BBQ catered by campus favorite, **Blue Ribbon BBQ**, followed soon after by an August clambake to welcome our new students!

During the fall, the TG's featured both standard menu selections, like pizza and sandwiches, and new items, such as home-brewed beer. At the end of the semester, the GSC coordinated this year's annual holiday party-probably one of the best ever! From the first-years' homemade film about a day in the life of a first-year, to the overlapping Nth-years' and professors' skit theme of "Cabaret" – the fun was non-stop. Afterwards, everyone enjoyed a catered holiday dinner followed by carol singing.

During IAP, GSC-X helped organize practice oral qualifiers for the first-years, and with the start of the spring semester, we begin our monthly TG's. As usual, the festivities were dominated by our prospective-student weekends. Each featured lighter fare with the usual assortment of beverages --affording the incoming students an opportunity to mingle with the Nth-years and find out more about the department. Amid mild weather, the final TG of the year was held in the courtyard of Hayden Library, where many students undoubtedly enjoyed deep breaths of spring air, and exhaled sighs of relief knowing that they had survived another year!

With that, the torch was passed on to the next GSC-X committee. We wish them all the best and thank everyone who helped us along the way, including ***Annie Fowler, Jennifer Shedd***, ***Suzanne Easterly***, ***Arline Benford*** and everyone in the Department for helping make this such a successful year!

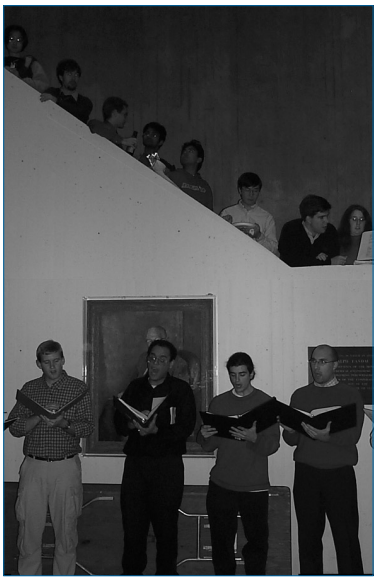


Photo: Gregory Sands

The ChE Holiday Chorale which included (BOTTOM, L to R) Brian Anderson, Ahmed Ismail Thomas Gervais and Cyril Delattre (among others) inspired partiers (TOP) to join the sing-along at the 2001 ChE Holiday Party!

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