MIT CHEMICAL ENGINEERING ALUMNI NEWS

XCurrents

Red coated alumni visit with the Department Head during June Commencement (Page 10)

Letter from *Department Head Klavs F. Jensen*

As the fall semester begins, I am happy once again for the opportunity to share with you some of the latest developments in the MIT Chemical Engineering Department. This past semester was especially busy, as the campus celebrated MIT's 150th birthday with a series of events and activities including interviews, demonstrations, and symposia in which our faculty discussed their research. Our students gave engaging displays of chemical engineering during a campus-wide Open House.

As an alumnus/a, you are part of the history of the department as well as its outlook, as your accomplishments, feedback and support help us to shape the future of the Course X. One of my favorite parts of the 150th celebration was the opportunity to hear updates from so many of our alumni. You may recall that we had sent an update request in February, and the response was overwhelming! With the spring 2011 newsletter, we were able to share a range of updates and news from Course X alumni around the world, be they class of 1939 or class of 2010.

HIGHLIGHTS

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find the latest news online:

web.mit.edu/cheme/

MITChemEng MITChemE

Massachusetts Institute of Technology

Letter from the Department Head continued

Please continue to send us your news! We hear every day from our former students, whose notes are in this newsletter and on the website at web.mit.edu/cheme/alumni/. The webpage is regularly updated as news comes in. In this issue we also highlight the current endeavors of a few former Course Xers.

Even as we celebrated the past during the spring, our faculty continued to shape the future through exciting research and educational development. In this issue, we have several research highlights, including Arup Chakraborty's advancements in HIV research, Michael Strano and Daniel Blankschtein's latest work with graphene and Paula Hammond '84 (PhD '93)'s drug delivery innovations. These and more start on page 14.

On the educational front, Paula Hammond and the undergraduate committee worked hard to design and implement a new flexible undergraduate degree: 10-ENG, the Bachelor of Science in Engineering as Recommended by the Department of Chemical Engineering. Created in response to requests by our undergraduates for more flexible options in the field of chemical engineering, this degree allows students to concentrate in an area addressing significant needs in today's field of chemical engineering: energy, biomedical engineering, materials design and processing and environmental studies. Most importantly, it retains the core of chemical engineering enabling our students to go to graduate school and seek industrial opportunities. The first 10-ENG students enroll this fall, and we look forward to working with them as we refine this new degree program.

One of my favorite parts of MIT's 150th celebration was the opportunity to hear updates from so many of our alumni.

The department hosted three major lectures during the past semester, where international leaders in tissue engineering (Michaels Lecturer Cato T. Laurencin '87, dean of the School of Medicine at the University of Connecticut), materials and industry (Lewis Lecturer Gary S. Calabrese, senior vice president and director, Photovoltaic Glass

Department members look on as Dominick Sama (SB '54 ScD '60) presents the inaugural Wing Fong award.

Technologies, at Corning, Inc.), and biotechnology (Frontiers of Biotechnology Lecturer Tillman Gerngross, inventor, entrepreneur and professor of engineering, Dartmouth College) shared with our faculty, students and colleagues insight into their research and outlook on the future of their areas. The webcasts for these lectures and other past events are on our events webpage: http://web.mit.edu/cheme/news/webcast.html.

Our faculty garnered several awards in the spring, which you can find on page 12. Unfortunately, along with the good news, I am sad to report a great loss to our faculty. Professor Emeritus Charles Satterfield passed away March 14th, 2011. Chuck was an internationally recognized pioneer in heterogeneous catalysis, as well as a thoughtful and gracious teacher and colleague. He is greatly missed. More information on Chuck's formidable legacy can be found on page 5.

This fall, we will host the 11th annual Frontiers of Biotechnology Lecture. The esteemed Professor Christopher Somerville, Director of the Energy Biosciences Institute at UC

Berkeley will speak about "The Development of Liquid Fuels from Lignocellulose" on Friday, October 14th. Chris has been recognized for his remarkable work on the biochemistry, cell biology, genomics and genetics of various aspects of plant and microbial growth and development. He was the first chairperson of the Arabidopsis Genome Initiative, an international collaboration that completed the sequence of the first plant genome. I hope you can join us – more information on the lecture is on page 13.

Next spring we will host the 2011 Hoyt C. Hottel Lecture, honoring Professor Hottel's work in energy technology. Professor Nate Lewis (CM PhD '81) of CalTech will be the lecturer. Professor Lewis is an international leader in artificial photosynthesis and electronic noses. We are currently scheduling his lecture; please got to the Hottel Lecture webpage for more information (web.mit.edu/cheme/news/hottel.html).

I'm glad to report that the department retained its number-one ranking in the US News and World Report listing of top undergraduate and graduate programs.

As always, our faculty and students have been working hard, and I'm glad to report that the department retained its number-one ranking in the US News and World Report listing of top undergraduate and graduate programs; we have now held the first place position in chemical engineering for the past 22 years. Although all rankings like this should be taken with a grain of salt, it is a record to be proud of, and we could not have held it without enthusiastic support of our alumni and friends throughout the years, of which our faculty and students are very grateful.

We hope you enjoy this fall 2011 issue of the newsletter and look forward to your feedback. Thank you for your support and best regards.

On the cover: During the April 30, 2011 Campus-wide Open House, Course X students showed attendees the gravity-defying qualities of a non-Newtonian fluid: water mixed with cornstarch. For more Open House images, go to page X.

Klavs F. Jensen
Department Head
MIT Chemical Engineering Department

Practice School News

I am pleased once again to be able to tell you the latest developments in the Practice School program and the stations we are running.

But first, I would like to mirror Klavs's sentiments in his preceding letter: hearing from so many of our alumni as we celebrated MIT's 150th birthday was a real treat. We received an abundance of stories from former Practice School attendees; they were entertaining and educational and reminded me of why the Practice School is so important. After 95 years, the Practice School is still the only academic program of its kind. What started in 1916 as five stations in the Northeast has burgeoned out to four continents and numerous new industries and technologies as the field of chemical engineering has evolved.

The centennial of the Practice School will be in 2016, and we're already working on plans to commemorate this milestone. I would love to hear thoughts and ideas from Practice School alumni; after all, you have been integral to making it the robust and unique program it is today.

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Spring 2011 Stations

Novartis Pharmaceutical Corp., Basel, Switzerland
Directed by Claude Lupis

Once more, our Novartis coordinator, Walter Bisson, and his team organized flawlessly all the details of our stay (work permits, accommodations, schedules, etc.). They also organizd the selection of the projects well in advance of our arrival and that contributed greatly to the smooth running of the station. In addition, the excellent collaboration from all the projects' sponsors was much appreciated.

Eight students attended the station. In the first four-week session, all the projects were conducted on the Novartis campus in San Johann, while in the second session, the projects were conducted at three different sites, Schweizerhalle and Stein in Switzerland, and Wehr in Germany, even as the presentations continued to be held in San Johann. Having two sites exposed the students to different facets of the company.

The subjects and scopes of the projects varied greatly. They ranged from an investigation of the innovative use of near infrared spectroscopy to monitor a specific aspect of product quality, to the study of potential productivity improvements in the production line of a drug and the proposal of techniques for reprocessing and preventing out-of-specification batches, to the execution of a 'lean maturity assessment' of a Novartis operation and the set-up of a database that could be shared by several company sites in different countries. The sponsors of these projects expressed many times their satisfaction at the results of the work of the students.

The Novartis Basel group takes some time off to sightsee in the old town.

A European station is an enriching experience for the students on many fronts. "Fasnacht", Basel's ancient three-day masked carnival that starts on a Monday at 4am, always provides a high point of entertainment, and the proximity of Alsace, France, offers many opportunities. As in previous years, we organized a guided tour of the old city of Colmar. However, this year, we added Mulhouse and its car museum. The latter is world-famous for its extraordinary collection of 437 vintage cars; it certainly did not disappoint.

SGC Energia, Güssing, Austria
Directed by Bob Hanlon

On page 6, Bob recounts his experience as director of the Practice School's first station in Austria.

I look forward to sharing more Practice School work and adventures with you in the next newsletter!

Best regards,

T. Alan Hatton
Director
David H. Koch School for
Chemical Engineering Practice

In Memoriam

Professor Emeritus Charles N. Satterfield '46

1921-2011

Professor Emeritus Charles N. Satterfield passed away on Monday, March 14, 2011, at the age of 89. Satterfield was a world leader in heterogeneous catalysis and, in 2008, was named by AIChE as one of its 100 Chemical Engineers of the Modern Era, recognized for his work in chemical reaction engineering, including trickle beds, slurry reactors, heterogeneous catalysis; Fischer-Tropsch synthesis and catalytic hydrotreating. He was a fellow of the American Academy of Arts and Sciences, recipient of the AIChE Wilhelm Award, and named in 1987 as one of the 20 "top scientists" in chemical engineering by the Science Studies Unit of the University of Leiden. He was author or co-author of five books and 150 technical papers.

Charles N. Satterfield in 1947.

Satterfield attended Harvard College as one of their first National Scholars. Graduating from there cum laude in chemistry in 1942, he moved down the river to MIT where he earned MSCEP in 1943 and ScD in 1946 in Chemical Engineering. His early research centered around the chemistry and manufacture of hydrogen peroxide, and his book on this chemical published in 1955, still remains the primary authoritative reference.

Satterfield joined the MIT faculty in 1946 and did early work on rocket propulsion, publishing a two-volume set of books entitled "Thermodynamic Charts on Rocket Propulsion" with Professors Williams and Hottel. There is no doubt that his greatest contributions were in the field of industrial catalysis where he was the leading academic authority for well over two decades. He authored several books on this topic including: "Mass Transfer in Heterogeneous Catalysis" in 1963 and "Heterogeneous Catalysis in Practice" in 1980. The second addition of the latter book, retitled as "Heterogeneous Catalysis in Industrial Practice", was published in 1991 and became the classic, authoritative reference for this important field. His research program educated a generation of leaders in reaction engineering and catalysis.

Satterfield's teaching was thoughtful with an emphasis on real and important problems in the world, which made his subject offerings among the most popular in the department while he was a faculty member.

March 1976: Professor Satterfield and a graduate student show a high pressure micro reactor. (courtesy of MIT Museum)

If it were easy, we wouldn't be asking you to do it.

MIT Practice School at SGC Energia at Güssing, Austria

Bob Hanlon
Station Director

When students first receive their project statements, they often experience the traditional Practice School sensation of overwhelm. Such was the case in Güssing. When one student team first heard about their project and asked, "But how can we do this in one month?", the response from SGC Energia's Chief Technology Officer, John Hemmings, was "If it were easy, we wouldn't be asking you to do it." As the students learned, as students always learn, the projects they receive are indeed overwhelming, but they're also very doable.

This station provided an ideal match between the needs of the host company and the objectives of the Practice School program. Founded about 5 years ago as a privately owned Portuguese company, SGC Energia has a mission to commercialize clean fuels technology throughout the world, starting with two Portuguese speaking countries, Brazil and Mozambique. They seek to gasify low-value carbon sources such as palm residue and waste coal to synthesis gas (H2, CO) and then convert this gas to diesel fuel using Fischer-Tropsch technology. SGC Energia's timeline for commercialization is extremely aggressive, and they already have a demonstration plant in Güssing, where the MIT projects were located. Their need to rapidly master the three key chemical engineering technologies involved, specifically gasification, syngas purification, and Fischer-Tropsch synthesis, provided the students all the motivation they needed to work hard and generate impactful results.

The modern town of Güssing, Austria, overlooked by Güssing Castle, built in 1157.

Modern Thinking in an Historic European City

Why Güssing? The answer was personally delivered to us during our first day by the mayor of Güssing, Peter Vadasz. Located in the southeastern Austria region known as Burgenland, Güssing sits right next to the Hungarian border. Some years after WWII ended, the Soviet Union dropped the "Iron Curtain" upon Eastern Europe, creating an impenetrable wall right along this Austrian-Hungarian border and effectively placing Burgenland at the end of a dead end street. Commerce subsequently dried up, turning this region into one of the poorest and least developed in Austria. Attempts to leverage the region's rich soil, sun and water into a viable agricultural economy weren't sufficient. Without hope, many fled. Vienna was one destination. Chicago another. (Chicago has since become the world's largest city of Burgenlanders!) Things were so bad that Güssing could barely afford to pay its own fuel bill, and this is what finally prompted the reform-minded citizens to ask the powerful question, "Why can't we use the resources we have in this area to fuel our city?" And thus was born Güssing's policy commitment in the early 1990s to completely shift its energy sourcing from fossil fuels to regionally available biomass, and in so doing, start it down the road of rebuilding its economy and retaining its youth.

This commitment became Peter Vadasz's guiding vision when he was elected mayor in 1992. One of his first acts was to appoint Reinhard Koch, an electrical engineer and native of Güssing, to lead the technical charge. In the face of "What do you think you're doing?" ridicule by many, this team pushed forward. In 1998 they saw a presentation by Professor Hermann Hofbauer of the Technical University of Vienna (TUV) about a biomass gasification technology he had developed. Duly inspired, they subsequently asked Professor Horbauer to scale-up his 100 kw pilot TUV gasifier to a 8 megawatt commercial gasifier in Güssing. The rest is history. Today, using wood chips as fuel, this gasifier has made Güssing the first community in the European Union to produce its whole energy demand out of renewable resources. Güssing has since become a worldwide research center and eco-tourist travel destination for exploring what's possible in renewable energy.

The World Comes Knocking

So now we return to SGC Energia. One can't easily go from concept to commercialization without appropriate research & development studies. SGC Energia clearly has the personnel to conduct such studies. In fact, as CTO, Hemmings has developed a best-in-class international technology team comprised of 23 nationalities among its 80 employees based in Houston, Texas. But in the end, such studies require time, time which SGC Energia didn't have. They needed to leverage their expertise with readily available R&D facilities and commercially proven technology. In particular for biomass-derived synthesis gas, after scouting around the globe, they found what they needed: Professor Hofbauer's pilot gasifier at TUV and Güssing's syngas stream from its commercial gasifier. The former provided them an opportunity to study gas-

"Initially, many of the students simply accepted... obstacles as a given and so lowered their goals. But they quickly learned how to transform the obstacles into conquerable challenges, thus allowing them to maintain high-level goals."

ification of Brazilian biomass material, while the latter provided them a real-world syngas feed, containing such impurities as sulfur compounds, tars and other hydrocarbons, that they could use to study purification and then Fischer-Tropsch synthesis. This enabled SGC Energia to demonstrate the performance of a sophisticated, compact Fischer-Tropsch technology using synthesis gas

At the farewell dinner, Practice School students experience an impromptu wine tasting in the cellar of Güssing Castle.

with a very challenging composition. (Of course, Fischer-Tropsch technology is well established, but in general from coal and natural gas feedstocks.) While SGC Energia has a very strong technical team, there were numerous potential improvements to the technology which the technology team do not have the resources to address and therefore our projects became imbedded within these studies. The students split their time between Vienna and Güssing, conducting both experiments and extensive Aspen and Comsol modeling.

Using Practice School Skills to Overcome Obstacles

As you can imagine, such an aggressive timeline left company resources tight at times, which set up obstacles for the students to either accept or overcome. This became a great 'teachable' moment for the students on how to shift thinking from the former to the latter. Initially, many of the students simply accepted such obstacles as a given and so lowered their goals. But they quickly learned how to transform the obstacles into conquerable challenges, thus allowing them to maintain high-level goals. In one case, for example, the analytical laboratory staff was going to be absent for two critical days during the students project. Rather than accepting this loss in time, the students engaged the lab staff to learn how to operate the equipment so that they could keep their experiments running while the staff was away.

This and other scenarios offered me an opportunity for growth as well. Typically during a two month session, the director conducts performance reviews with each student at the mid-way point and on the final day. As I realized during a good discussion with one of the students, my approach was inconsistent with the concept of 'learning through practice'. If the students were to truly learn and ingrain new competencies, they needed opportunities to practice them, which meant that they needed more immediate feedback, both positive and negative, as they moved forward through their projects. Taking a page from Ken Blanchard's The One Minute Manager, I started my own practice of this approach to feedback, bringing discussion of the recommended Practice School competencies into day-to-day operations. This is an area that I will continue to improve upon, my own "Practice School." One never stops learning!

Austrian and International Hospitality

Austria provided a tremendous location for our station. It's a country where everything has its place and everything is in its place. Litter is non-existent. Attractive buildings, churches and houses, painted in pastel yellows, greens, pinks and reds, are set against the rich earthen green and brown countryside. Beautiful, peaceful, calm. Cappuccinos and cakes, beer and schnitzels. What's not to like? Our central location in Eastern Europe provided us access to Prague, Budapest, Salzburg, Hungary, Slovenia and Graz, where we were able to visit the home of the famous Lipizzaner Stallions. Maps of Europe were scattered around our offices as we planned our weekend excursions.

The MIT students tour the Spanish Riding School in Vienna, home of the famous Lipizzaner Horses.

The people we met there were equally tremendous. Personnel from both Güssing and SGC Energia, most of whom were from Portugal and South Africa (making this a truly international station), were very friendly, generous and welcoming. This environment was best captured by SGC Energia's farewell dinner for us. After we enjoyed a very fine meal in Güssing's signature 12th century castle, a spontaneous decision was made by the restaurant's owner – with encouragement by none other than Reinhard Koch himself – to visit the castle's ancient cellar. The accompanying photograph captures the international moment quite well, as we gathered around another excellent form of renewable energy from the sun: wine! ◊

On May 9, 2011, The Department hosted its annual Award Ceremony and preceding dessert reception. Presided by Department Head Klavs F. Jensen, the ceremony recognized undergraduates, graduate students, staff and faculty for their achievements and contributions to the the Department during the school year.

A variety of organizations, as well as individuals, outside the Department and MIT donated prizes and scholarships to students in chemical engineering. The awards are below.

Course X Awards Day 2011

During the May 9 ceremony, the Department awarded its first Wing S. Fong (1954) Memorial Prize, established through the help of his wife Lourdes, daughter Genevieve, and family friend Dominick Sama (SB '54 SM '55 ScD '60). Dr. Sama and his wife were on hand for the ceremony, where Danielle Wang and Stephanie Wang (not related) received the award. Dr. Sama also shared stories of his time in the Department, much to the delight of the gathered faculty and students.

(at left, Professor Klavs Jensen, Dominick Sama, Danielle Wang, Stephanie Wang, and Jane Sama)

Merck Fellow
Yunxin Jiao '12

Robert T. Haslam Cup
Allen Lin '11

Roger de Friez Hunneman Prize
Ann Ouyang '11

Gates Cambridge Scholarship
Christopher Boyce '11

Barry M. Goldwater Scholarship
Joshua Cohen '12

Wing S. Fong Memorial Prize
Danielle Wang '11
Stephanie Wang '11

C. Michael Mohr Outstanding Faculty Award
William M. Deen,
Carbon P. Dubbs Professor of Chemical Engineering

Edward W. Merrill Outstanding Teaching Asst. Award
Ayse Asatekin Alexiou (G)

Outstanding Graduate Teaching Assistant Award
Jaisree Iyer (G)

Graduate Student Council Outstanding Faculty Award
Daniel Blankschtein, Professor

Fall 2010 Best Student Seminar
Jaisree Iyer (G)

Spring 2011 Best Student Seminar
Shawn Finney-Manchester (G)

Chemical Engineering Outstanding Employee Award
Fran Miles

Rock Award
Jon DeRocher (G)

Individual Accomplishment Award
Emily Chang (G)
Abhinav Akhoury (G)
Pedro Valencia (G)
Mark Kalinich ‘13

Outstanding UROP Mentor Award
Ying Diao (G)

Phi Beta Kappa Electees 2011
Christopher Boyce
Amrita Karambelkar
Ann Ouyang
Alina Rwei
Danielle Wang
Stephanie Wang
Kellie Young

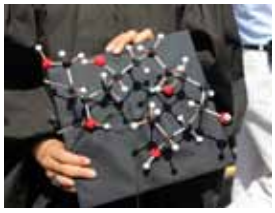
Departmental Special Service Awards

AIChE
Apiradee Sanglimsuwan ’11, President
Alexandra Piotrowski ’11
Molly Kozminsky ’12
Shannon Moran ’12
Michelle Lu ’12
Diana Wu ’11
Allison Hinckley ’12
Mary Boyd ’12
Saloni Jain ’12
Elizabeth Ohrt ’11
Daniel Paik ’11
Timothy Chang ’12
Mark Kalinich ’13

GSCX
David Borrelli (G)
Caleb Class (G)
Jonathan Gilbert (G)
Jonathon Harding (G)
Cary Opel (G)
Timothy Politano (G)
Katie Quinn (G)
Brandon Reizman (G)
Nisarg Shah (G)
Rathi Srinivas (G)
Carla Thomas (G)
Nicholas Wren (G)
Nicole Yang (G)

Commencement and Alumni Reception

This year's Commencement Reception was on Friday, June 3rd, 2011. Graduates, families, faculty, friends and alumni mingled at the Chemical Engineering Tent on the McDermott Circle, and the Red Coats were in full force!



Eric Suuberg SB ’74 SM ’76 ScD ’78 Alumnus Highlight

On August 8, 2011, Brown University Professor of Engineering Eric Suuberg (SB ’74 SM ’76 ScD ’78) became the first faculty member at Brown to become a fellow of the American Chemical Society (ACS). Suuberg, associate director of the Superfund Research Program and co-director of the Program in Innovation Management and Entrepreneurship (PRIME), said the recognition is an unexpected surprise and honor: “I am quite proud to join a distinguished group of individuals who have made significant contributions in the chemical sciences.”

Suuberg joined 212 scientists who have demonstrated outstanding accomplishments in chemistry and made important contributions to ACS, the world’s largest scientific society. The 2011 fellows were recognized Aug. 29 during the society’s national meeting in Denver. Fellow MIT Chemical Engineering alumnus Nicholas A. Peppas (ScD ’74) joins Suuberg in receiving this honor.

This is not Suuberg’s first honor from the ACS. The society awarded him the H.H. Storch Award for Fuels Chemistry Research in 1999.

Professor Suuberg has been at Brown since 1981, when he was one of the founding members of Brown’s Chemical Engineering program. He has served as Associate Dean of the Faculty (2002-2005), as Chair of the Psychology Department (2004-5) and as a member of the Executive Committee of the Division of Engineering. He is currently Co-Director of the Superfund Basic Research Program, and a co-founder of the Commerce, Organizations and Entrepreneurship concentration as well as a co-founder of the PRIME master’s program. He is a principal editor of the journal Fuel.

Professor Suuberg’s research interests center on energy and environmental areas, involving study of fuel chemistry (coal, oil shale, biomass), activated carbons (production and properties), materials reuse (automobile tires, coal fly ash), fire safety and, most recently, the characterization and cleanup of lands and sediments contaminated with mixed pollutants with a focus on thermodynamics of mixtures of high molecular weight organic compounds and the related problem of vapor intrusion.

He received his bachelor’s degree in chemical engineering from M.I.T., a master’s degree in management science from M.I.T., and an Sc.D. in chemical engineering from M.I.T.

Emeritus Professor Receives Award

Professor Emeritus Marcus Karel received the Life Achievement in Food Engineering from the International Association for Engineering and Food on May 22, 2011. The award was presented at the opening session of the 11th International Congress of the Engineering of Food (ICEF 11) in Athens, Greece.

The opening lecture of ICEF 11, given by former student Ted Labuza (SB ’62 PhD ’65) was named in his honor: “Professor Marcus Karel: Building Paradigms for Food Engineering and Material Science as Influenced by Water, An Historical Journey.”

Also honored were former Karel students Labuza, Jose Aguilera (SM ’73) and George Saravacos (ScD ’60) , as well as his former post-doc Jorge Chirife.

Faculty News

Robert Langer Wins Top Chemistry Award

David H. Koch Institute Professor Robert S. Langer has been selected by the American Chemical Society (ACS) to receive the 2012 Priestley Medal, the society's most prestigious prize, for his "distinguished services to chemistry."

Langer was honored for his "cutting-edge research that helped create the controlled-release drug industry and the field of tissue engineering," according to Chemical & Engineering News (C&EN), the journal of the ACS.

"I'm honored — and a bit shocked — to receive the Priestley Medal," Langer told C&EN. "It's a thrill to be included among the prestigious winners of this award, not just for me, but for my lab, my fields of research, and for the chemical engineering community."

The Priestley Medal is generally given to scientists with a traditional chemistry background; this is the first time in 65 years that a chemical engineer has won the medal. Langer's distinguished career as a pioneer in the fields of chemical, biomedical and tissue engineering, as well as his significant contributions to the development of biomedical devices, was referenced as a defining factor in his selection as recipient of this top award.

Greg Stephanopoulos Earns Two Top Honors

Professor Greg Stephanopoulos was recipient of the "Renewable and Non-Conventional Energy" Prize as part of the 2011 Eni Awards on June 8, 2011 at Rome's Palazzo del Quirinale in the presence of Italy's President of the Republic Giorgio Napolitano. Eni is an Italian multinational oil and gas company, Italy's largest industrial company, and a founding member of the MIT Energy Initiative.

The Eni Awards aim to encourage a better use of energy sources and develop new generations of researchers, reflecting Eni's commitment to scientific research and sustainability issues. Stephanopoulos was recognized "for his pioneering research in the rising field of metabolic engineering, aimed at modifying the gene structure of particular bacteria so as to make them more efficient in the conversion of renewable raw materials into hydrocarbons. This is a research topic of great interest as it is oriented toward the production of second generation biofuels, not in competition with the food sector."

In June 2011, Stephanopoulos was also chosen by the Academy of Athens as a corresponding member of Greek scientists abroad in the field of Metabolic Engineering, Sciences. Established in 1926, the Academy of Athens is the highest scientific institution in Greece.

Kristala Prather Wins Biochemical Award

The editors of the Biochemical Engineering Journal, in cooperation with the Engineering Conferences International (ECI) Biochemical Engineering Conferences Steering Committee, selected Professor Kristala L. Jones Prather '94 as the recipient of the second Biochemical Engineering Journal Young Investigator Award. This biennial award recognizes outstanding excellence in research and practice contributed to the field of biochemical engineering by a young community member.

In its citation, the award noted that "in addition to giving numerous invited lectures and serving on organizing committees for several international meetings, Professor Prather has also been called upon to present testimony on applications of synthetic biology before the Presidential Commission for the Study of Bioethical issues (July 2010, Washington, DC, with Professor George Church of Harvard and Dr. J. Craig Venter of the Venter Institute) and to speak at the National Academy of Science Kavli Frontiers of Science Symposium (2010).

Building on her experiences within academia and industry, Professor Prather's current research merges Metabolic Engineering with Synthetic Biology to establish "retro-biosynthesis," a new paradigm aimed at establishing principles and practices for biological pathway design in a manner analogous to the organic chemist's use of retrosynthesis principles."

Professor Prather discussed her current research findings in a presentation titled "A Platform Pathway for the Production of Value-Added Chiral Hydroxyacids" at the ECI Biochemical and Molecular Engineering XVII Conference on June 26th, 2011 in Seattle, Washington.

Three Professors Named Top Chemists and Material Scientist of the Decade

In early 2011, Thomson Reuters's Science Watch released reports on the "Top 100 Chemists" and "Top 100 Material Scientists" for 2000-2010.

Among the top chemists were Professor Michael Strano at #19 with a citation impact of 89.69 and Institute Professor Bob Langer, whose citation impact of 57.47 put him at 86th most

cited of the decade.

Professor Paula Hammond was also the 72nd most cited materials scientist during the decade, according to Thompson Reuters.

For more information, go to http://www.sciencewatch.com/dr/sci/misc/Top100MatSci2000-10/.

Three Professors Earn AIChE Awards



Professor Klavs Jensen was awarded AIChE's 2011 William H. Walker Award for Excellence in Contributions to Chemical Engineering Literature. This award is presented to a member of AIChE who has made an outstanding contribution to chemical engineering literature. The contribution may consist of a review, a history of the development of a process, a theoretical contribution, a research report, or other material of interest and importance to the chemical engineering profession. The recipient must be the author or co-author of an outstanding work in chemical engineering. Jensen will be presented the award at the 2011 AIChE annual meeting.

Professor Paul Barton won the 2011 Computing in Chemical Engineering Award from AIChE's Computing and Systems Technology (CAST) Division. This award recognizes outstanding contributions in the application of computing and systems technology to chemical engineering and is sponsored by the Dow Chemical Company. As awardee, Barton will deliver an address at the CAST Division dinner at the 2011 AIChE Annual Meeting in Minneapolis and write a feature article for the Division Newsletter. CAST is responsible for the wide range of activities within AIChE that involve the application of computers and mathematics to chemical engineering problems including process design, process control, operations, and applied mathematics.

The Executive Committee of AIChE's Computational Molecular Science and Engineering Forum (CoMSEF) also announced that Professor Bernhardt Trout has been selected as the recipient of the 2011 CoMSEF Impact Award. This annual award recognizes outstanding research in computational molecular science and engineering and will be presented during the CoMSEF General Meeting at the AIChE Annual Meeting in Minneapolis. He will also present a talk on his research at the CoMSEF Plenary Session at the AIChE Annual Meeting. Trout is receiving the CoMSEF Impact Award "for the development of generally applicable and widely used molecular computational algorithms and their use to obtain new mechanistic understanding of industrially relevant problems."◊

Upcoming Fall 2011 Lectureship

During the 2011 fall semester, the Chemical Engineering Department will host several academic and industry leaders during our seminar series (schedule on the back cover). A fall highlight will be the annual Frontiers of Biotechnology Lecture, noted below.

Webcasts for all Chemical Engineering major lectures can be accessed at *web.mit.edu/cheme/news/webcast.html.*

11th Frontiers of Biotechnology Lecture
Friday, October 14, 2011, 3pm in 32-123
"Development of Liquid Fuels from Lignocellulose"
Chris Somerville, Director, Energy Biosciences Institute, UCBerkeley

Chris Somerville is a biochemist who has been recognized for his work on the biochemistry, cell biology, genomics and genetics of various aspects of plant and microbial growth and development. He was one of the early advocates for the development of Arabidopsis as a model system to dissect plant growth and development and was the first chairperson of the Arabidopsis Genome Initiative, an international collaboration that completed the sequence of the first plant genome. The majority of his research contributions have concerned the synthesis and modification of membrane and storage lipids, and the synthesis of polysaccharides. Somerville and his collaborators characterized many of the genes and proteins involved in fatty acid desaturation and hydroxylation, and proposed the mechanism for desaturation and hydroxylation based on spectroscopy and protein engineering. His recent work on polysaccharides has been largely focused on the use of live-cell imaging of single cellulose synthase complexes and cytoskeletal components to dissect the basic mechanisms of cellulose synthesis.

Research Highlights

For more information, go to *web.mit.edu/cheme/news/*

Layer upon Layer

Method holds promise for making two- or three-tier graphene films that could be used for new electronic devices.

Article by David L. Chandler, courtesy of the MIT News Office.

Graphene, a form of pure carbon arranged in a lattice just one atom thick, has interested countless researchers with its unique strength and its electrical and thermal conductivity. But one key property it lacks — which would make it suitable for a plethora of new uses — is the ability to form a band gap, needed for devices such as transistors, computer chips and solar cells.

Now, a team of MIT scientists has found a way to produce graphene in significant quantities in a two- or three-layer form. When the layers are arranged just right, these structures give graphene the much-desired band gap — an energy range that falls between the bands, or energy levels, where electrons can exist in a given material.

"It's a breakthrough in graphene technology," says Michael Strano, the Charles and Hilda Roddey Associate Professor of Chemical Engineering at MIT. The new work is described in a paper published this week in the journal Nature Nanotechnology, co-authored by graduate student Chih-Jen Shih, Professor of Chemical Engineering Daniel Blankschtein, Strano and 10 other students and postdocs.

Graphene was first proven to exist in 2004 (a feat that led to the 2010 Nobel Prize in physics), but making it in quantities large enough for anything but small-scale laboratory research has been a challenge. The standard method remains using adhesive tape to pick up tiny flakes of graphene from a block of highly purified graphite (the material of pencil lead) — a technique that does not lend itself to commercial-scale production.

The new method, however, can be carried out at a scale that opens up the possibility of real, practical applications, Strano says, and makes it possible to produce the precise arrangement of the layers — called A-B stacked, with the atoms in one layer centered over the spaces between atoms in the next — that yields desirable electronic properties.

"If you want a whole lot of bilayers that are A-B stacked, this is the only way to do it," he says.

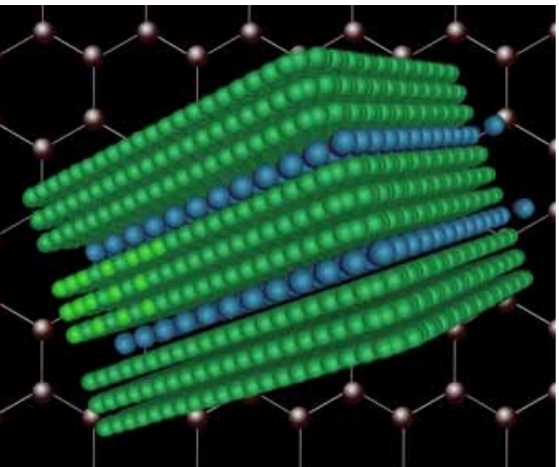
The trick takes advantage of a technique originally developed as far back as the 1950s and '60s by MIT Institute Professor Mildred Dresselhaus, among others: Compounds of bromine or chlorine introduced into a block of graphite naturally find their way into the structure of the material, inserting themselves regularly between every other layer, or in some cases every third layer, and pushing the layers slightly farther apart in the process. Strano and his team found that when the graphite is dissolved, it naturally comes apart where the added atoms lie, forming graphene flakes two or three layers thick.

"Because this dispersion process can be very gentle, we end up with much larger flakes" than anyone has made using other methods, Strano says. "Graphene is a very fragile material, so it requires gentle processing."

Such formations are "one of the most promising candidates for post-silicon nanoelectronics," the authors say in their paper. The flakes produced by this method, as large as 50 square micrometers in area, are large enough to be useful for electronic applications, they say. To prove the point, they were able to manufacture some simple transistors on the material.

The material can now be used to explore the development of new kinds of electronic and optoelectronic devices, Strano says. And unlike the "Scotch tape" approach to making graphene, "our approach is industrially relevant," Strano says.

While it's hard to predict how long it will take to develop this method to the point of commercial applications, Strano says, "it's coming about at a breakneck pace." A similar solvent-based method for making single-layer graphene is already being used to manufacture some flat-screen television sets, and "this is definitely a big step" toward making bilayer or trilayer devices, he says. ◊



(at left) When compounds of bromine or chlorine (represented in blue) are introduced into a block of graphite (shown in green), the atoms find their way into the structure in between every third sheet, thus increasing the spacing between those sheets and making it easier to split them apart.

Image: Chih-Jen Shih/Christine Daniloff

Removable 'Cloak' for Nanoparticles Helps Them Target Tumors

New MIT particles could deliver cancer drugs to any type of tumor.

Article by Anne Trafton, courtesy of the MIT News Office.

MIT chemical engineers have designed a new type of drug-delivery nanoparticle that exploits a trait shared by almost all tumors: They are more acidic than healthy tissues.

Such particles could target nearly any type of tumor, and can be designed to carry virtually any type of drug, says Paula Hammond, a member of the David H. Koch Institute for Integrative Cancer Research at MIT and senior author of a paper describing the particles in the journal ACS Nano.

Like most other drug-delivering nanoparticles, the new MIT particles are cloaked in a polymer layer that protects them from being degraded by the bloodstream. However, the MIT team, including lead author and postdoctoral associate Zhiyong Poon, designed this outer layer to fall off after entering the slightly more acidic environment near a tumor. That reveals another layer that is able to penetrate individual tumor cells.

In the ACS Nano paper, which went online April 23, the researchers reported that, in mice, their particles can survive in the bloodstream for up to 24 hours, accumulate at tumor sites and enter tumor cells.

A new target

The new MIT approach differs from that taken by most nanoparticle designers. Typically, researchers try to target their particles to a tumor by decorating them with molecules that bind specifically to proteins found on the surface of cancer cells. The problem with that strategy is that it's difficult to find the right target — a molecule found on all of the cancer cells in a particular tumor, but not on healthy cells. Also, a target that works for one type of cancer might not work for another.

Hammond and her colleagues decided to take advantage of tumor acidity, which is a byproduct of its revved-up metabolism. Tumor cells grow and divide much more rapidly than normal cells, and that metabolic activity uses up a lot of oxygen, which increases acidity. As the tumor grows, the tissue becomes more and more acidic.

To build their targeted particles, the researchers used a technique called "layer-by-layer assembly." This means each layer can be tailored to perform a specific function.

When the outer layer (made of polyethylene glycol, or PEG) breaks down in the tumor's acidic environment, a positively charged middle layer is revealed. That positive charge helps to overcome another obstacle to nanoparticle drug delivery: Once the particles reach a tumor, it's difficult to get them to enter the cells. Particles with a positive charge can penetrate the negatively charged cell membrane, but such particles can't be injected into the body without a "cloak" of some kind because they would also destroy healthy tissues.
The nanoparticles' innermost layer can be a polymer that carries a cancer drug, or a quantum dot used for imaging, or virtually anything else that the designer might want to deliver, says Hammond.

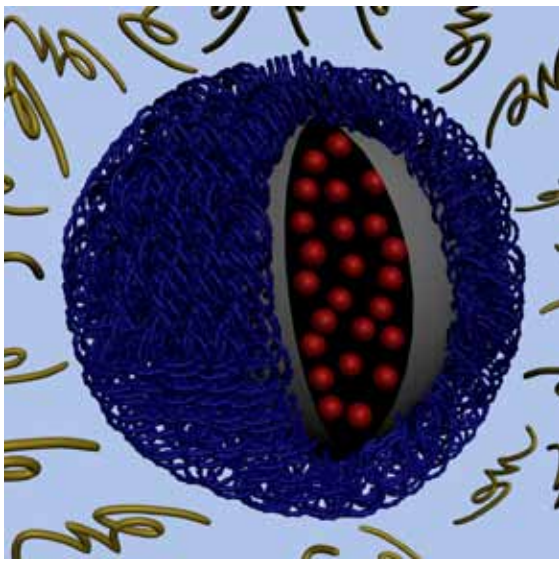
Layer by layer

Other researchers have tried to design nanoparticles that take advantage of tumors' acidity, but Hammond's particles are the first that have been successfully tested in living animals.

Jinming Gao, professor of oncology and pharmacology at the University of Texas Southwestern Medical Center, says it is "quite clever" to use layer-by-layer assembly to create particles with a protective layer that can be shed when the particles reach their targets. "It is a nice proof of concept," says Gao, who was not part of the research team. "This could serve as a general strategy to target acidic tumor microenvironment for improved drug delivery."

The researchers are planning to further develop these particles and test their ability to deliver drugs in animals. Hammond says she expects it could take five to 10 years of development before human clinical trials could begin.

Hammond's team is also working on nanoparticles that can carry multiple payloads. For example, the outer PEG layer might carry a drug or a gene that would "prime" the tumor cells to be susceptible to another drug carried in the particle's core. ◊



The outer layer of this nanoparticle (in yellow) falls off in an acidic environment.

Image: Stephen Morton

Research Highlights

For more information, go to *web.mit.edu/cheme/news/*

Scientists Reveal HIV Weakness

Vaccines that target newly identified viral protein sequences could be more effective than previous efforts.

Article by Anne Trafton, courtesy of the MIT News Office.

Ever since HIV was revealed as the infectious agent behind the AIDS epidemic, scientists have been striving to develop a vaccine against the disease. However, the task has proven difficult, because HIV mutates so rapidly.

In a new finding that may allow vaccine designers to sidestep part of that obstacle, researchers at the Ragon Institute of Massachusetts General Hospital, MIT and Harvard University have identified sections of an HIV protein where mutations would actually undermine the virus' fitness — its ability to survive and reproduce.

Vaccines that prime immune cells to specifically target those vulnerable regions could prove much more effective than previously tested vaccines, says Arup Chakraborty, the Robert T. Haslam (1911) Professor at MIT and senior author of a paper on the work appearing in the Proceedings of the National Academy of Sciences the week of June 20.

Though global HIV infection rates have dropped since 2000, there are still more than 33 million people living with AIDS. The vast majority of those people live in developing countries, where there is limited access to antiretroviral drugs that can control the infection.

"Even though we have treatments, the number of people in need globally is outpacing our ability to provide these drugs," says Harvard Medical School Professor Bruce Walker, director of the Ragon Institute and a senior author of the new paper. "The only real solution is development of an effective vaccine."

Lead authors of the paper are Vincent Dahirel, a former postdoc in Chakraborty's lab who is now a professor of chemistry at the Université Marie et Pierre Curie in Paris; and Karthik Shekhar, a chemical engineering PhD student at MIT.

Co-evolution

Viral vaccines usually consist of killed or weakened versions of a virus that prime the body's immune system to respond when it later encounters the real thing. Most experimental HIV vaccines include some proteins found in the virus's genetic material.

Vaccines provoke the recipient's immune system to generate two types of responses: antibodies that can battle viruses in blood or outside cells, and memory T cells, which attack cells that display viral proteins on their surfaces — a sign of infection. However, HIV can escape these responses when its viral proteins evolve to new forms that the vaccine-induced antibodies and T cells no longer recognize. Most researchers believe that an effective HIV vaccine will have to include both an antibody and a T-cell component.

In recent years, designers of the T-cell arm of a vaccine have looked to target single amino acids (the building blocks of proteins) that seem unable to evolve to a different form, with the goal of inducing mutations that incapacitate the virus. So far, this strategy has had limited success, because mutations elsewhere in the viral protein can help restore the loss of fitness.

The Ragon Institute researchers took a broader approach, looking not just at single mutations, but trying to determine if there might be groups of amino acids within viral proteins that evolve together in a coordinated way. After identifying some such groups, they determined whether multiple mutations in those groups tended to be beneficial or harmful to the virus's survival. A group in which multiple mutations are most harmful could be a good vaccine target, because the virus may undermine its own survival if it tries to mutate those sites, and escape pathways would be limited.

The Ragon team analyzed available HIV protein sequences obtained from infected patients using a mathematical approach, including a method called random matrix theory, which was developed by Eugene Wigner in the 1950s to study high-energy physics. Since then, it has been used in many other areas of physics, but has also been applied in other fields, including economics (to study stock market fluctuations) and biology (to analyze sequences of an enzyme family).

For example, Boston University physicist Eugene Stanley has used random matrix theory to find inherent correlations among the stock prices of companies whose economic activities are coupled. He was able to identify groups of companies whose prices fluctuate collectively, but independently of the fluctuations of other groups

"Vaccines that prime immune cells to specifically target those vulnerable regions could prove much more effective than previously tested vaccines,"

- Arup Chakraborty, the Robert T. Haslam (1911) Professor and senior author of the study

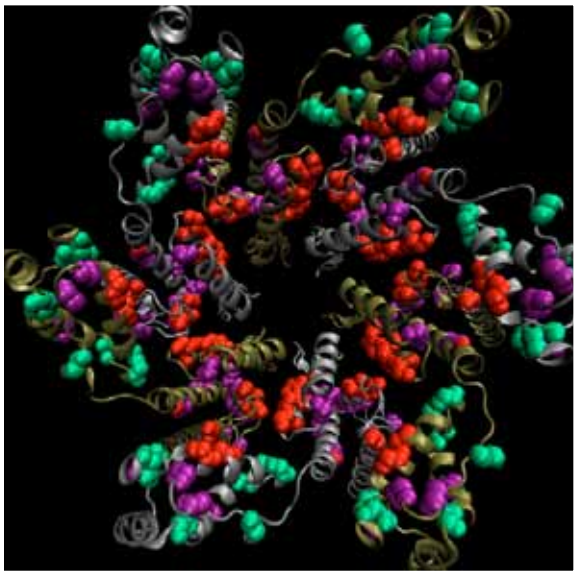
of companies. (For example, he found that oil and gas company stock prices fluctuate together, but essentially independently of stock prices in the financial sector.)

Multiple mutations

The Ragon team focused on an HIV polyprotein called Gag, which gives the virus much of its structure, and identified five co-evolving groups of amino acids within the protein. The researchers looked at each pair of sites within the groups, calculating whether a double mutation was beneficial or detrimental to the virus's survival. (They also analyzed triplets and larger groups.) They discovered that one of the groups, which they term sector 3, had the highest proportion of detrimental multiple mutations.

Structural analysis revealed that amino acids in sector 3 are located at interfaces between proteins that form the viral capsid surrounding the virus's genetic material. If you make multiple mutations to these amino acids, Chakraborty says, it is difficult for the virus to assemble the capsid.

The Ragon team then tested its findings against human clinical data, discovering that T cells in patients who control HIV without medication do in fact disproportionately target sector-3 amino acids at multiple points, and HIV strains with multiple mutations in this sector are rare, indicating that those strains are less likely to survive.



Ragon Institute researchers identified potential HIV vaccine targets in a subunit of the Gag protein. Six of those subunits come together to form the hexagonal proteins that make up the viral capsid. Image: Vincent Dahirel

This finding strengthens the argument that these protein sequences would make good vaccine targets, notes Gregory Petsko, professor of biochemistry and chemistry at Brandeis University. "Tying it to the patient population is what sets this apart, in my mind, from a traditional computational study," Petsko says.

The Ragon researchers suggest designs for test vaccines based on the vulnerabilities they found in the Gag protein, and are now looking for vulnerable targets in other HIV proteins.

Rafi Ahmed, professor of immunology at the Emory University Vaccine Center, says the paper offers an exciting new approach to designing HIV vaccines. "It breaks new ground in terms of vaccine design and potential insights into why elite controllers are more effective at controlling HIV infection, and it provides additional protein regions to examine," Ahmed says. ◊

Other Fall 2011 Course X Research News

- Michael Strano develops new sensor to detect tiny traces of explosives
- Karen Gleason's technique could produce manufacturing filters that select molecules according to their chemical properties and dimensions
- Bob Langer and grad student Pedro Valencia develop 3-D microfluidic system for better control of drug-delivering nanoparticles
- Karen Gleason's "microworm" implants could produce fluorescent tattoos for easy monitoring of biomedical indicators
- Paula Hammond's layer-by-layer assembly can help prevent infection from surgery

For more information on these stories and other Departmental news, go to *web.mit.edu/cheme/news/*

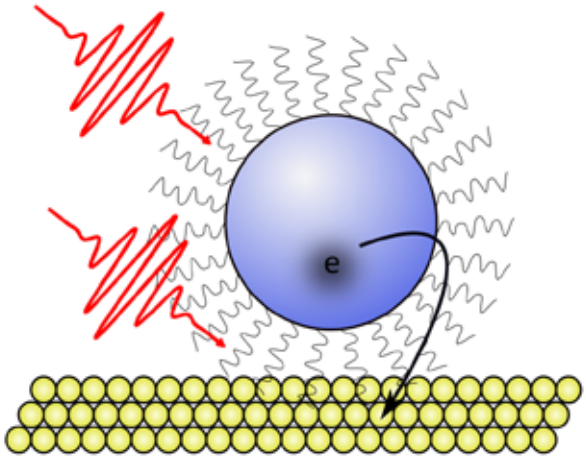
The Department Welcomes New Faculty Member

William A. Tisdale joins as assistant professor

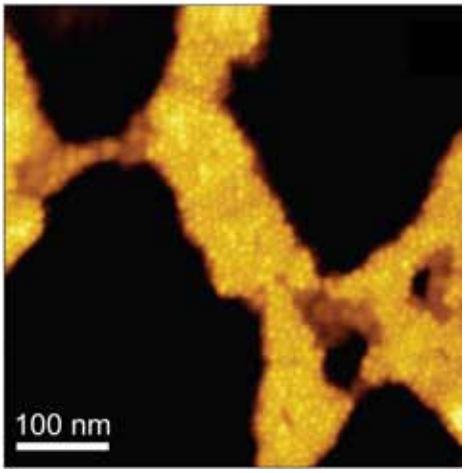
On January 1, 2012, MIT Chemical Engineering will welcome its latest faculty member: Assistant Professor William A. Tisdale. Tisdale received his bachelor's degree in Chemical Engineering (magna cum laude) from the University of Delaware in 2005. In July 2010, he completed his Ph.D. in chemical engineering at the University of Minnesota under the joint direction of Professors Eray Aydil, David Norris, and Xiaoyang Zhu (Department of Chemistry). Most recently, Tisdale was a postdoctoral associate with Professor Vladimir Bulović in the Research Laboratory of Electronics at MIT, where he studied exciton diffusion and energy transfer in nanostructured thin films.

Tisdale is the recipient of an NSF IGERT Fellowship and a University of Minnesota Doctoral Dissertation Fellowship. His research interests surround excited state dynamics near surfaces and interfaces and the application of this understanding toward development of novel photovoltaic and optoelectronic technologies.

Professor Tisdale's research program's theme is the understanding and controlling of the flow of energy in nanostructured materials. His laboratory will investigate excitonic energy transfer, charge and heat transport, and charge separation at interfaces between organic and inorganic nanostructured materials that are promising components of next-generation solar cells, high efficiency lighting, and flexible electronics. A central aim of his research is to correlate morphology and disorder with dynamics and electrical and optical properties on a local scale. He uses a variety of tools to address these challenges, with particular emphasis on ultrafast spectroscopy and nonlinear optical imaging in both the near and far field. ◊



Cartoon illustration of ultrafast electron transfer from a semiconductor nanocrystal to a conducting electrode – the fundamental process underlying the operation of futuristic solar cells.



Atomic force micrograph of a two-dimensional array of PbSe nanocrystals supported on atomically flat rutile TiO2." This image appeared in the Journal 'ACS Nano'

ChemE Student Office Wins Award

Presented with Infinite Mile Award for Excellence

The MIT School of Engineering hosted its 11th annual Infinite Mile Awards ceremony on Wednesday, May 25, 2011, to recognize and reward members of the school's administrative, support, service and sponsored research staff. Nominations are made by department heads and laboratory directors, and awards are presented to individuals and teams whose work is of the highest quality — who stand out because of their level of commitment, energy and enthusiasm.

This year, the Infinite Mile Awards for Team Diversity and Community went to the Chemical Engineering ACCESS Team/Student Office, Suzanne Maguire, Katie Lewis and Fran Miles. Recipients of this award promote diversity and harmony in the workplace by taking positive steps to promote cross-cultural sensitivity and a strong sense of community. They create or help to create a welcoming and supportive environment in which all are encouraged to excel.

ACCESS was created in 2009, with support from the Dow Chemical Company, to increase the diversity of qualified applicants to PHD programs in hemical engineering throughout the United States. ACCESS is a weekend of educational and informative events that introduce talented sophomores, juniors and seniors to the benefits of a graduate education in chemical engineering. The goal of ACCESS is not to prepare students for graduate school at MIT specifically, but rather to introduce them to the advantages of choosing a graduate career path at an institution that best meets each participant's individual needs.

Considered a success, the ACCESS program for 2011 was expanded to include the departments of chemistry and materials science.

(I to r) Katie Lewis, Suzanne Maguire and Fran Miles of the MIT ChemE Student Office pose during the 2011 Commencement activities.

Chemical Engineering Introduces New Flexible Undergraduate Degree

10-ENG to offer concentrations in energy, environment, biomedicine and materials

On April 20, MIT faculty voted to approve the Department of Chemical Engineering's new flexible degree program, called 10-ENG. Launching in fall 2011, the 10-ENG program will lead to the Bachelor of Science in Engineering, as recommended by the department.

This degree will incorporate many of the core components of the traditional undergraduate chemical engineering degree, while including coursework from other departments across the Institute, in subject areas including energy, environmental studies, biomedical engineering and materials design and processing. Other concentration areas will likely be added in the near future based on student feedback and developing areas of interest in the chemical engineering field.

The field of chemical engineering has seen growth in areas involving significant interdisciplinary effort. They include new energy technologies; biomedical engineering applications; control, protection and remediation of the environment; micro- and nanoscale materials design and manufacture; and multi-scale computational modeling. The department established 10-ENG to address this changing environment, as well as in response to an expressed need by undergraduates for more flexible options in their chemical engineering education.

"The 10-ENG degree responds to changes in the professional and multidisciplinary world engineering graduates face, while upholding the educational rigor and depth in engineering education MIT is known for," said Bayer Professor of Chemical Engineering Paula Hammond, the department's executive officer and author of the proposal for the newly established degree.

The new 10-ENG is the third flexible engineering degree to be offered at MIT; the Department of Mechanical Engineering and the Department of Aeronautics and Astronautics have also established flexible degrees. ◊

For more information, go to http://web.mit.edu/cheme/academics/undergrad/10eng/.

Tester Lab Alumnus Continues a Cyclical Tradition for a Cause

Rocco Ciccolini PhD '08 bikes to honor those lost to cancer

In 2008, the MIT News Office published an article on the laboratory of Professor Jeff Tester. It covered not work inside the lab, but what the members did outside their long research hours. In the February 13 issue of MIT's Tech Talk, Anne Trafton wrote:

"Every spring, Tester leads a group of people, mostly his students and members of his lab, on a 65-mile bike trip along the Connecticut River from Lancaster, N.H., through Vermont and then into the Great North Woods of New Hampshire, near Canada. Some riders tack on an extra trip to the Canadian border at Fourth Lake that brings the round-trip total to about 100 miles.

Tester and his wife, Sue, started making the trip, which includes an overnight stay at a former hunting-and-fishing lodge called the Glen, in Pittsburg, N.H., more than 25 years ago. After a few years, students started asking if they could join the trek through the breathtaking scenery of northern New England.

'We decided to take whoever wanted to go,' says Tester, the H.P. Meissner Professor of Chemical Engineering and an avid cyclist. 'For some of the students it becomes sort of a rite of passage. It becomes a great achievement for them to make it to the Glen.'

Over the years, more than 100 students and spouses have gone on the trip, which serves to build team spirit among members of the lab."

One of these members was Rocco Ciccolini, who has since been able to use cycling to get through tough personal times and support an important cause. He writes:

"While working on my PhD with Jeff Tester, my family unfortunately dealt with the losses of both my brother and then my father two years later. The Department offered a tremendous amount of support and I'm still grateful to this day. Inspired by Jeff's interest in cycling and a desire to contribute to a good cause, I created the "Cycling4Causes" movement and rode my bicycle independently on a self-supported ride across America in 2008. With the help of MIT peers, family, and friends, we raised over $12,000:

- $5,000 to the Leukemia Lymphoma Society in honor of my father, Rocco E.
- $5,000 to the American Heart Association in honor of my brother, Anthony.
- $2,000 as a college fund for Madaleine Hunt. Maddy is three years old and the daughter of Ronny J. Villarreal and Andy Hunt. Andy was a MIT MechE graduate working in Jeff's lab during my tenure with the group. Ronny was coping with breast cancer at the time of the donation and was an incredible source of support and inspiration during my dad's illness and then during my cross-country trip in 2008. She unfortunately passed away during my East Coast cycling trip in 2011.

In the spirit of continued awareness, I recently completed another self-supported ride in 2011 -- this time from Key West, FL to Newark, NJ. The trip also completed my journey up the East Coast of America (I had ridden from Canada to Boston and then Boston to Newark, NJ in 2009 and 2007, respectively; actually, the trip from my home in Boston to my parents' home in NJ was my first-ever solo and self-supported ride).

I dedicated the latter trip to Ronny -- who had the courage to stand up to cancer." ◊

"Much like the focus within our group, cycling with Jeff has taught me how to persevere through tough times and has really led me to appreciate group interaction. We're a team." - Rocco Ciccolini (PhD '08) in the Feb. 13, 2008 TechTalk

(far left) Prof. Jeff Tester & Rocco at 2008 Commencement.

(left) Rocco makes it to CA during his cross-country trip in 2008.

(right) Rocco poses with his father and mother before he rides with his lab mates in 2008.

Rocco's 2008 VA to CA ride was captured in real time via: http://www.cycling4causes.com/.
The 2011 FL to NJ section of his East Coast trip was documented at: http://www.cycling4causes-eastcoastusa.blogspot.com/

La Vie en ChemE

MIT alumna spends time at a French biofuels company

by Rachel B. Licht '10, 2010 Fulbright Scholar

During my senior year at MIT, I received a Fulbright Scholarship to do biofuels research at IFP Enérgies Nouvelles (IFPEN) outside Paris for nine months. I had two primary motivations in applying for a Fulbright Grant: the research opportunity and the international experience. After doing the MIT International Science & Technology Iniatives (MISTI) in France in the summer after my sophomore year I knew I wanted to come back to France, and with graduation approaching I was still unsure as to whether I wanted to pursue graduate studies or an industry career. Fulbright was the perfect opportunity for me to both live abroad and work on a long-term research project that could help me decide if I wanted to continue in a research field.

When I first arrived at IFPEN, not only did I have to get oriented to a different collection of equipment and integrate into a new laboratory culture, but I also had to get accustomed to working entirely in French. I had minored in French at MIT, however, words such as "beaker" and "graduated cylinder," not to mention more advanced research terminology, were not part of my education. Luckily, everyone in the lab was incredibly nice, putting up with my mispronunciations and explaining things twice when needed. They even took it upon themselves to teach me their favorite French colloquial expressions, resulting in some hilarious lunchtime conversations.

The overall goal of my Fulbright project was to research and optimize the production of cellulase enzymes from the Trichoderma reesei fungus. Cellulase enzymes are currently the biggest obstacle facing economical bioethanol fuel production from waste cellulosic material. At the current productivity levels, the cost of producing enough cellulase enzymes to degrade the available cellulose into its component sugars for ethanol fermentation is prohibitive. Cellulases are naturally produced by T. reesei, however only in limited quantities under specific environmental conditions. I worked with the fermentation group of IFPEN's biotechnology department, where I analyzed genetically modified strains developed by the microbiologists, studied the effects of various run and feeding profiles, and worked on process scale-up. My experiments covered a wide range of possibilities, including batch, fed-batch and continuous processes, pure synthetic and natural cocktail substrates, high- and low-producing strains, and everything from 250-mL to 20-L bioreactors.

The most valuable lesson from my working life here was the process of taking an experiment from conception to conclusion. At the beginning, it definitely made me a little nervous to have so little supervision in my research, especially since the topic was relatively unfamiliar to me. However, each experiment taught me a lot about both the problem spots in a fermentation experiment and, more generally, how to successfully guide an experiment to be able to extract the most information from each run. Everyone in the lab was very supportive and would stop what they were doing to answer my questions, which helped me be more successful in my research. By the end of my time at IFPEN, I was really enjoying the freedom of only discussing the overall goal and final results of each experiment with my advisor, biological engineer Fadhel Ben Chaabane (see photo).

Halfway through my internship, we received the 20-L bioreactor that I would use for my scale-up experiments. I was the point person for the process of integrating this new piece of equipment into the lab, including helping with the installation, talking with the vendors, learning the intricacies of the reactor and controllers, troubleshooting the frequent problems, and finally writing a user's guide for my colleagues so they would be able to run it once I left. The opportunity to set up this reactor gave me an insight into another side of research, and I am sure the experience will help guide me in the future when I have to set up my own laboratory.

The process of working on a project from start to finish was something I first experienced at MIT in 10.26. During my Fulbright, I got to research my own projects with much less supervision, though still with a number of resources to call on when needed. I greatly enjoyed the experience of doing such independent research and it motivated me to begin a Ph.D. program in chemical engineering in the fall of 2011 at UC Berkeley. Outside the laboratory, the entire Fulbright experience of living in another country has been both enjoyable and invaluable in such a global world, and I have already started brainstorming on possible future international research experiences! ◊

Chemical Engineering and MIT's 150th

During the 2011 spring semester, MIT held a 150 day celebration of its sesquicentennial. Chemical Engineering faculty and students took a significant role in helping to demonstrate the Institute's "inventional wisdom."

- Professor Robert S. Langer and Professor Emeritus Kenneth A. Smith were interviewed as part of the "MIT 150 Infinite History" video project.
- Professors Paula T. Hammond, Douglas A. Lauffenburger, and Robert S. Langer, as well as graduate student Rebecca Ladewski, contributed to the symposium, "Conquering Cancer through the Convergence of Science and Engineering." Professor Hammond also participated in the Lobby 7 flash mob that occurred during the April 30 open house.
- During the campus-wide open house on Saturday, April 30, 2011, Course X undergraduate and graduate students hosted chemical engineering demonstrations outside the Landau Building. Throughout the day, these fun interactive activities enthralled alumni, children, teenagers and their parents, as they learned about biofuels, drug delivery systems, non-Newtonian fluids and new water-repellent technology being created for the US Air Force. The cornstarch-based non-Newtonian fluid demonstration was described by one of the young observers as "the coolest thing I've seen all day."

The open house, entitled "Under the Dome," was the "kick-off" for the concurrent Cambridge Science Festival. With over 200,000 visitors on that day, the event was a success and generated talk of more in the future. This was MIT's first open house in more than 30 years.

For more information on the open house and to see a video of the flash mob starring President Susan Hockfield and Tim the Beaver, go to http://web.mit.edu/newsoffice/2011/open-house-0430.html.

Images from the April 30th open house and MIT ChemE's demonstrations are below.









ChemExploration

ChemE alumni and students discuss life as a Course Xer

On February 1, 2011, a group of recent Course X alumni teamed up with current ChemE upperclassmen to speak with MIT freshmen about their experiences in the department, summer internships, job opportunities and potential career paths for chemical engineers. "ChemExploration," sponsored by the AIChE and Society of Biological Engineers student groups, Phillip Kim '10 and Mariah Hoover '08 joined current Course X students in presenting career opportunities after graduation.

"I decided to go in Chemical Engineering/Course X, among many other things, mainly because of its flexibility in career choice. Course X is not just about oil, which is a great field, but it's also a great path to biotechnology, pharmaceuticals, consulting, finance, medicine, consumer products, grad school, academia, etc. To me it meant one of the strongest engineering majors that allows me a variety of great career options." Phillip Kim

(left) Current Course X graduate student Caroline Chopko and Mariah Hoover '08 look on as Phillip Kim '10 discusses how Course X prepared him for medical school.

(right) One of the student presenter's slides shows different areas of chemical engineering.

Daeyeon Lee PhD '07 Alumnus Highlight

Daeyeon Lee (PhD '07), assistant professor in the department of Chemical and Biomolecular Engineering at the University of Pennsylvania, has received an NSF CAREER award for his proposal, "Understanding Electrostatic Interactions in Non-Polar Media for Generation of Nanostructured Thin Films." The CAREER award is the NSF's most prestigious award in support of junior faculty who exemplify the role of teacher-scholars through outstanding research, excellent education and the integration of education and research within the context of the mission of their organizations.

Lee's research goal is to extend the basic understanding of soft matter such as colloids, polymers, and nanomaterials to fabricate functional structures with properties designed for advanced applications. The techniques used in his lab include layer-by-layer assembly, microfluidics, optical microscopy, electron microscopy, scanning force microscopy, and dissipative quartz crystal microbalance. Using these techniques, the group studies the interactions of various materials at gas-liquid, liquid-liquid and liquid-solid interfaces. Intermolecular and capillary forces between materials are used to generate functional thin films and microcapsules for applications in renewable energy, sustained release, and encapsulation.

Lee's CAREER proposal aims to understand the fundamental aspects of electrostatic interactions in non-polar solvents, which will further extend a new layer-by-layer assembly technique for nanostructured thin films into alternative energy applications. This CAREER award also integrates educational activities into the research plan with the goal of fully utilizing visual and hands-on aspects of layer-by-layer assembly to enrich the educational experiences of pre-college students and educators.

Alumnus Highlight

Herb Stone ScD ’53

Herb Stone ScD ’53 retired in 1988, after 35 years in upstream crude oil production research with ExxonMobil. Thereafter, he consulted with BP extensively, and also with Saga Petroleum, Amoco and Bass Brothers. His area of expertise is enhancing oil recovery from petroleum reservoirs by simultaneously injecting water above gas, a process he patented in 2004, (US 7,303,006 B2). A relatively high rate of water injection slows the vertical upward flow of gas, and so results in a several-fold better vertical sweep of the reservoir by gas.

In 2008, he and his wife Beverly built a new house adjacent to Rice University, from which he received his Bachelor’s degree. They take advantage of that location by attending many concerts, sporting events and lectures at Rice. Rice has been competitive in baseball recently, and we have attended four College World Series in Omaha.

He is grateful for the Graduate Fellowship received while attending MIT, and he and Beverly think education is of prime importance to both the individual and the Country. Accordingly, we have testamentary trusts that will establish Graduate Fellowships at MIT, and Undergraduate Scholarships at Rice.

Allyn J. Ziegenhagen SM ’59

Alumnus Highlight

Allyn J. Ziegenhagen SM ’59 has been selected by the MIT Alumni Association as one of the 2011 recipients of the Harold E. Lobdell ’17 Distinguished Service Award. The Lobdell Award, established in 1979, is given in recognition of alumni relations service of special depth over a sustained period.

Allyn has been actively engaged as an MIT alumni club volunteer for the last fifteen years, during which time he has held a number of leadership roles with the MIT Club of Wisconsin and the MIT Club of Princeton. His club activities began in 1995 with the MIT Club of Princeton, for which he served as treasurer and president. Following his move to Wisconsin, Allyn quickly got involved with the MIT Club of Wisconsin where he has excelled in various leadership roles, including vice president of programs, vice president of membership, and treasurer. Allyn is a founder and driving force behind two annual premier technology events in Wisconsin that have transformed the local tech community and its awareness of MIT-The MIT Club of Wisconsin Achievement Awards and the EM Fly-In. The EM Fly-In is the world’s largest aviation celebration, bringing together aviation enthusiasts totaling more than 500,000 attendees from more than 6o countries. Each year Allyn leads the MIT community component of this event by identifying speakers, and arranging a special access VIP pavilion for MIT alumni and friends. With more than 170 attendees last year, this event is a wonderful opportunity for MIT alumni to reconnect with each other and the Institute.

Allyn also devotes time to the MIT K-12 STEM program, serving as a consultant with Lego League Organizers in Madison. In 2004 he created the local MIT Summer Jobs program that connects local alumni and students with jobs. Allyn’s sustained dedication and commitment to MIT and its community of members exemplifies all that the Lobdell Award represents.

Blast from the Past

In the Spring 2011 edition, fellow alumnus Jean Paul Viennois (SM '65) shared images from his time in Course X. Several alumni had updates:

(to the left) W. H. (Bill) Speaker '66 writes: I recognize myself as the far left student. Same face, same glasses, same grey cotton shawl-collar sweater I wore when I wasn't cutting Walker pies into 10ths for lunch service. And I did enjoy Thermo and PChem.

(to the right) Peter Brown '62 states: I believe that the unidentified Bayway Station Director pictured in the lower left hand corner of page 46 is Harris J. (Pete) Bixler.

Paul Premo SM'65 helped identify people as well: First of all, I am the "x" person (fifth from left). Second, the unidentified Station Director is Jon Valbert. Third, the far right person identified as Mike Modell is actually Walter Wuerth---who was Assistant Director (Mike Modell is not Walter! Mike was Director and I enjoyed reading his two-page piece in the same issue). We all had a great experience! I believe the woman in the picture may be a staff member who (blessedly) did the typing, filing, etc. for us at Bayway.

Warne P. Johnson '42 (SM '47) shares a photo of his Practice School group at the Bangor Station from the fall of 1946.

Front row: Duch Voorhees, Charlie Trilling, Warne Johnson, Jim Lago
Back row: Bill Twaddle, Joe Schreier, Herb Twaddle, Alan Bralove

He writes: "We were 'practicing' at the Great Eastern Paper plant in Brewer. Our leader was Keith Rumble. Our prior station was the Bethlehem Steel Plant in Lackawanna, PA. While working on top of the coke oven there, we nearly lost Joe Schreier when one of the man holes, on which he was standing, blew open. It was a wonderful education to see how these plants operated."

Do you have a photo you'd like to share? Email *chemealum@mit.edu*.

Alumni News

We want to hear from alumni like you! Please send us your news and photos.
Please direct news to: ***Melanie Miller, Editor***
Email: ***chemealum@mit.edu***, Phone: ***617-253-6500***, Fax: ***617-258-8992***

Harold A. Ricards, Jr. (MS '41) thinks fondly of days at Ashdown House and the good friends there. Sadly, he says, few are alive today. All of his X-A Practice School class are departed except Hagenbush and Stern. He misses his days as a graduate assistant to Hottel and McAdams.

Gabe de Roetth '44 (MS '48) retired in 2009 from substitute teaching in the public high schools on Maui. Now at age 86, he enjoys gardening and the beautiful Kihei, HI weather.

On May 10th, 2011, **Eduardo Ochoa-Castiello '46** became 86 years old and, he says, is in good health, thank God. He has a big family: his wife, five sons, five daughters, and 24 grandchildren. All are alive and in good health.

John Steven Wilson Kellett '47 (MS '48)'s John Steven Kellett Foundation has recently gone online. For general inquiries, info@kellettfoundation.org.

Philip J. Closmann (SM '48) and wife Madeline and their six children lived in Houston, TX, where Phil retired after 33 years with Shell Dev. Co. Some consulting and engineering workshop presentations followed, along with overseas pleasure travel. The last four years, they have lived in Austin, where they are near to three of their children.

Verity Carlisle Smith '48 just retired as the "Professional Chemical Engineering Representative" on the Board of Fire Prevention Regulations of the Department of Public Safety of the Commonwealth of Massachusetts after 55 years of being reappointed by the various governors. During that time he was on the Governor's Council on Radiation Protection for 40 years and served on the Fire Protection and Fire Prevention Subcommittee of the State Building Code. At the moment he is the treasurer of the class of '48 and is a Fellow of AIChE.

Marc Leon Aelion '51 (MS '53 ChE '54) Marc had originally arrived in Brazil in 1954 where he specialized in plant construction and erection (factories for production by fermentation of tetracycline antibiotic for Bristol Laboratories; foundry for production of stainless steel – his own investment, finally sold to Sulzer Brothers, a Swiss company for production of stainless piping material; fine chemicals for JT Baker Chemicals; cosmetics for Yardley of London; frozen grape juice concentrate for Welches; self-adhesive stock for the printing of self-adhesive labels). At this point, he changed venue to company finances, auditing, and financial valuation of companies and projects.

Marc now resides in Jaguariuna SP, Brazil, in a sugarcane growing area and is looking into production of ethanol and farmasene, a cleaner substitute for gasoline, diesel, and other combustibles. Farmasene is obtained by fermentation of sugarcane liquor. He says, "Funny how the world goes round and round, as I am back to production of chemicals by fermentation, which is where I started in 1954!"

William B. Chandler '52 graduated in uniform, having joined advanced ROTC in the fall after the Korean War broke out, and went to work for then-ESSO for three months before going into the Chemical Corps. Back to ESSO in September 1954 (which melded with Humble Oil and then became Enco under Standard Oil) until 1966, then on to Pure Oil, Sinclair Refining and Sohio. In 1985, he began with Bailey Controls Co., selling DCS systems overseas until his retirement in 2002.

Robert M. Lurie '52 (ScD '55) writes, "Next year is our 60th reunion which is hard to believe. Hopefully many classmates will come back for a few days of renewal of friendships. I need to update the class of 52 website. I retired in 1990 (earlier than most) when an offer for our company (Nyacol Products Inc.) was difficult to refuse. Since then I've been active in the Harvard Institute for Learning in Retirement, where the members run 13 week seminars of each other on every conceivable subjects. Nancy and I are doing well and our three children, and six grandchildren are all terrific."

Thomas Unger '55 (ScD '58) worked at Institut Français de Petrole in 1959. He was director of Rhodia in Brazil (chemicals, synthetic fibers, pharmaceuticals, veterinary, cosmetics, household products, mining, pesticides) from 1960 to 1982. At the time, it was the largest chemical industry in Latin America. From 1982 to 1996, he was president of Prochrom in Brazil (fine chemicals mainly isocyanates, pesticides). This was sold to DuPont in 1996. From 1998 to the present, he has been working in pesticides in Brazil, India and China. Thomas is still active. Very much so.

A. David Rossin (MS '55) was inducted into the Cleveland Heights High School Alumni Hall of Fame on May 5, his 80th birthday. Over the past 20 years they have selected 10 alumni each year for this honor. His wife, Sandy, and he were able to attend the ceremony.

Herschel Specter (MS '57) just completed an analysis of our energy situation and what to do about it. Its title is "A Call to Action." Digital copies available upon request by writing to mhspecter@verizon.net.

I enjoyed seeing reminiscences in the last X newsletters; comments on Doc Lewis and others really brought back our time, which was certainly the "Golden Age of Chemical Engineering". Hope to see you all next June [at the 60th reunion]." ***- Robert M. Lurie '52 (ScD '55)***

Henri A. Slezynge '57 (MS '58) is very active as owner & CEO of Unigel, a US$ 2 billion chemical company active in acrylics & styrenics in Brazil & Mexico. He has just been elected for the 2011-2013 term as chairman of Abiquim - the Brazilian Chemical Association, and also a member of the ICCA Board.

Alvaro Barrera-Rueda (SM '59), as of July 2008, is general advisor and director of Canacol Energy Ltd. Canacol is a Canadian public company operating oil fields in the Llanos area in Colombia. Total production is 30,000 BPOD.

Gerald Schroeder '59 (SM '61 PhD '65) has a handful of kids and a baker's dozen of grandkids with that number changing. Barbara (his wife Barbara Sofer, see her at barbarasofer.com) just back from a week's set of lectures in Hawaii, literally halfway around the world from his home in Israel. His fourth book, God According To God (HarperOne), made it to number 57 on Amazon for about 2 days after a radio interview on Michael Medved's program. He writes that it's "fantastic what radio can do!! Now all we need is peace for all humankind." His son Avi is currently a postdoc in the MIT Chemical Engineering Department.

Richard Reznik '64 and his wife lived many years in Maracaibo, Venezuela. He was a lab manager at CICASI [Centro de Investigaciones Carboniferas y Siderurgicas] which had an emphasis on coal analysis. They also did missionary work while in Venezuela.

When his mom became ill, they returned to the U.S. and he obtained a teaching job at Asbury College [now Asbury University] as a chemistry professor, eventually serving as department chair. He is now semi-retired, still teaching an occasional class and serving on the assessment committee. Richard and his wife are active at their church and have many friends in the college community. His main hobby is now gardening - there is nothing like a home-grown tomato!

Bernard Horn '65's book, Our Daily Words, winner of the Old Seventy Creek Poetry Prize, is a finalist for the 2011 Massachusetts Book Award in Poetry. In March he read his poems and translations from the Hebrew at Bar Ilan, Tel-Aviv, and Haifa Universities in Israel, and on November 16 he will be giving a poetry reading at the Marblehead Library in conjunction with an exhibit of paintings by his wife, Linda Klein.

Joseph J. Cramer (SM '68) was scheduled to retire on June 30th from his position as director, technical programming, AIChE, but the retirement has been postponed for six months. He's busy with multiple meeting planning projects and also chair AIChE's Admissions Committee. Joe is also working hard to identify candidates for his current position. If anyone has a suggestion please contact Joe at josec@aiche.org.

James S. Alder '72 will retire in October2011 after more than 37 years with Celanese Corporation, a $6 billion technology and specialty materials company headquartered in Dallas. His most recent position was senior vice president, Operations and Technical, with responsibility for manufacturing, supply chain, and technology, plus participation on two joint venture boards. Jim will stay active in his retirement with travel and as a member of an external board.

After moving to Switzerland in 1999 to follow his wife's career (she was recruited by the UN to manage a team of lawyers dealing with environmental damages from the first Gulf War), **Howard Klee (ScD '72)** has been working with the World Business Council for Sustainable Development in Geneva.

While there he managed the startup and ongoing activities of a global program addressing sustainable development issues in the cement sector. He has hired a replacement as director of this program, but continues to deal with some aspects, particularly focused on new Chinese members. This takes him to China several times each year, which continues to develop at an amazing rate. For more news from Howard, please go to http://web.mit.edu/cheme/alumni/.

Pieter Stroeve (ScD '73) became Distinguished Professor of Chemical Engineering and Materials Science at UC Davis in 2010. He has been a professor there since 1982.

Twelve years after founding Target Discovery, Inc., to develop new enabling technologies for proteomics (including their modification states, hence "isoformics"), **Jeffrey N. Peterson '76 (MS '75)** is now developing personalized medicine diagnostic applications for treatment guidance in cancers. He writes:

"Away from work, I'm still highly active on the tennis court and ski slopes, and took the time to teach about 40 new tennis players in the first half of the year, who are now competing in entry level USTA District Championships. While this might seem to be a particularly magnanimous undertaking, the truth is that this is the smart way to teach your girlfriend to play tennis!"

For more news from Jeffrey, please go to http://web.mit.edu/cheme/alumni/.

Alumni news continued

Deanna C. Miller '83 opened her first business, Rising Sun Animal Care, a veterinary hospital on the east side of Denver, where she is enjoying taking care of animals. She says it's quite a far stretch from ChemE, though the classes did count as pre-reqs for entry to veterinary school.

Douglas Ng '83 (MS '83) has been working in Hong Kong since 1992, when he moved there with the management consulting firm of Booz Allen Hamilton. Currently, he is with Headland Capital Partners, a private equity firm which spun off from HSBC late last year. His wife and he have three daughters and a son. Their oldest daughter is going off to college this year!

Kevin Brown '83 has been living and working in southern California since 1998. He is married to Sandee Paige (Course 16, '84) with a 4 year old daughter. Kevin moved from chemicals to electronics shortly after graduation, and is currently VP / GM for a business of Broadcom, a communications chip company in Irvine.

Ian A. Webster (ScD '84) writes, "Having grown a successful nationwide environmental consulting company in Project Navigator, Ltd., I've decided (what am i thinking!?) to try it all over again in the somewhat complementary business area of commercial-scale PV solar power development on Brownfield sites. "Got impacted land?" fellow industrialists, then see www.PVNavigator.com."

Jeffrey L. Collett, Jr. '84 began an assignment as Department Head of the Atmospheric Science Department at Colorado State University on July 1, 2011.

Selina Lin '84 spent two weeks in January 2011 at a rural mission hospital in north India helping to train the OB/GYNs in laparoscopic surgery.

Arunava Dutta (ScD '85) is now the director of R&D for Solid State Lighting for Osram Sylvania North America Consumer Lighting Division. Osram Sylvania is a Siemens Company. His team is actively pursuing development of environmentally friendly LED based high efficacy light sources right here in the US. They recently launched the best LED PAR lamps in the industry with the highest CRI and lumen package.

Michael Flanagan '85 is still enjoying engineering after all these years. Covidien acquired Aspect Medical Systems, and then, after a successful year, announced they are closing the Norwood facility. So he's taken a new position at Medica, a medical diagnostics company that still manufactures in MA!

After the world financial meltdown in 2008 nixed funding options for Carbon Nanotechnologies, Rick Smalley's nanotube company, **David Karohl (MSCEP '86)** founded My Best Plan, LLC, which uses patent-pending technology to make sure that residential customers in Texas' deregulated electricity markets always have the best plan from among the 250+ choices available. They do the work, and clients save on average $600 per year on their home electric bills, ranging from $60 to more than $6,000 per year. In addition, he serves as chief marketing officer for AgriTec Systems, which transforms waste rice hulls from rice mills into electricity, steam, precipitated silica, and activated carbon. Its primary markets are India, China, and Brazil, due to local availability of rice hulls and market demand for energy, silica, and carbon.

After spending the last 8 years away from the Northeast (first in Seoul, Korea from 2003-05, and then in Austin), **Vivek Mohindra (MSCEP '90 PhD '96)** finally returned back to CT/NY area. He and Debbie (MBA'96) now have 3 children - twin girls who are 10, and a 4.5 year old son. After 9.5 years at McKinsey, 3.5 years at Dell, 2 years at Freescale Semiconductor (a TPG portfolio company), he has now joined the world of private equity at TPG Capital (~$50B under management, 65+ portfolio companies worldwide). Vivek is an operating group partner focused on high-tech investments and portfolio companies. He also serves on the board of directors of GlobalFoundries - a leading semiconductor foundry in the world. Vivek and Debbie look forward to renewing ties with all of their friends in the Northeast!

Chun-Hyuk Lee (PhD '94) is currently CEO and President of Dongjin Semichem Co., Ltd. Dongjin is a fine chemical company making electronic materials for semiconductors, LCD, PDP, OLED, and solar cells, and a national R&D project leader for DSSC (dye sensitized solar cell).

Ridwan D. Rusli (MSCEP '93) has had almost twenty years of work since MIT, initially as a chemical engineer in Germany, then as energy sector specialist and financial advisor to governments and firms in energy, resources- and infrastructure sectors across Asia and Europe. He is now fulfilling his dream of returning to academia. He writes, "To students of Course X and MIT-wide: beyond the unparalleled knowhow and contacts you win, what's most valuable from MIT is the confidence you gain in yourself. No matter what your dreams, all you need are passion and hard work."

In 2005, **Michael Kezirian (PhD '96)** took a position in Houston, Texas on the Space Shuttle Program to perform engineering analyses addressing flight safety in the propulsion and fluids areas of the Orbiter Vehicle. As the Boeing Vehicle Safety Lead for the Endeavour Vehicle, he developed safety products and represented the safety team to NASA Management during flight operations. Since 2006, he has lead the analysis team for the Composite Overwrapped Pressure Vessel (COPV) Safety Investigation.

In addition to his industry responsibilities, since 1997, Michael has been on the faculty at the University of Southern California. In 2009, he was elected an Associate Fellow of the American Institute of Aeronautics and Astronautics (AIAA) and was awarded the Astronauts' Personal Achievement

"To students of Course X and MIT-wide: beyond the unparalleled knowhow and contacts you win, what's most valuable from MIT is the confidence you gain in yourself. No matter what your dreams, all you need are passion and hard work." ***- Ridwan D. Rusli (MSCEP '93)***

Award (Silver Snoopy). For more news from Michael please go to http://web.mit.edu/cheme/alumni/.

Richard Shandross (PhD '96) recently (May 2011) joined Navigant Consulting as an associate director in the Energy Practice, specifically working in the Energy Efficiency Policy & Analysis group.

Doron Levin (PhD '97) received the 2011 Society of Chemical Industry (SCI) Gordon E. Moore Medal, which was presented to him at the 2011 Innovation Day at the Chemical Heritage Foundation in Philadelphia in September.

Michelle Wu (MSCEP '02) and her husband welcomed their first daughter in January, 2011. She continues to work at Ximedica, a medical device company located in Providence, RI, in the design assurance department.

Hareesh Nair '03 was recently promoted to lead large initiatives around connecting patients and physicians for Medtronic, and posted on assignment in Singapore for the next few years to work directly with the President of International to move these programs forward. He writes, "Quite an exciting move for me and my fiancee, Ewa Szymanska, whom I got engaged to recently. Please let me know if you are in the city!"

Benjamin F. Nicholson '03 has been hired as a project manager for the start-up Micromidas in West Sacramento. Micromidas is harvesting the biodegradable plastic polyhydroxyalkanoate from bacterial fermentation of waste streams, such as sewage sludge. He is enjoying his new home in downtown Sacramento.

After many years in and out of training, Christopher Bettinger '03 is currently starting up his laboratory in the Materials Science and Engineering at Carnegie Mellon University. He also teaches "Introduction to Biomaterials" for advanced undergraduates in the fall. He says that it's a great opportunity to pass on the knowledge and problem solving skills he acquired in Course X on to the next generation.

Nupur Garg '07 will finish up medical school at Yale in 2012. She plans to pursue EM with a special interest in global health. She is also the proud sister of an incoming MIT student!

Melike Yersiz '07 moved back to Santa Monica, CA, after graduation and has been working as a process engineer in the Chevron El Segundo Refinery for the past 3.5 years, and enjoys it very much! In the fall of 2011, she is starting her studies as a Master's student in chemical engineering at USC while continuing to work full-time. Melike still juggles a variety of extracurricular activities, including choir, learning to play violin, and making websites, and sits on the boards of two clubs: MIT Club of Southern California (Secretary) and the LA Turkish American Association (Publicity).

Joe Shuga (PhD '07) just finished a postdoc at UC Berkeley and is now working as an R&D scientist at Fluidigm in South San Francisco. He is developing methods for single cell genetic analysis in Fluidigm's microfluidic chips. He and Laura now have 2 kids: Zoe is now 4 years old and Max is 2 years old. They keep them very busy when they're not at work.

W. Shannan O'Shaughnessy (PhD '07) is now the Chief Technology officer of GVD, a spin-out from Professor Karen Gleason's lab founded in 2001. GVD provides nanoscale polymeric coating solutions for industrial, biomedical, and aerospace applications.

Natalia Rodriguez '09 just started her PhD in bioengineering at the University of Pennsylvania in the fall of 2011.

1st Lt. Stephen C. Toth '09, USMC, just returned from a combat deployment as a Rifle Platoon Commander in Company E, 2d Battalion, 8th Marines to Sangin, Helmand Province, Afghanistan in support of Operation: ENDURING FREEDOM.

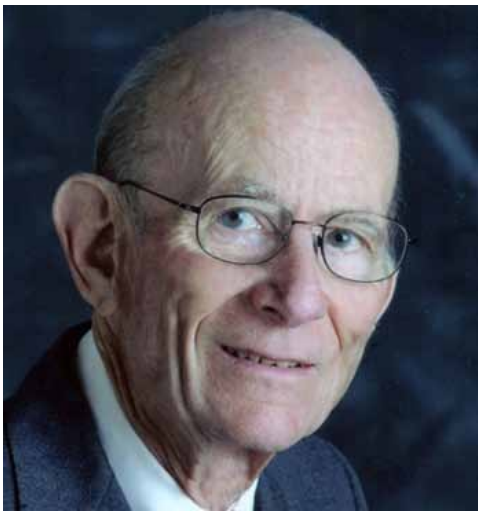
Mark Chew (SM '10) is an internal consultant at PG&E in San Francisco, focusing on renewable energy and energy management. He is excited that his wife Catherine (Sloan MBA 2011) just graduated, moved to the Bay Area, and started at Google! ◊

William Chandler '52
remembers "Doc" Lewis:

"I had him for an Industrial Stoiciometry class, in 1951 I believe it was. One night I worked late, and as I walked to leave the Chemical Engineering building, I passed by Dr. Meissner's office complex. Inside the empty outer office the door to Dr. Meissner's office was open, and I saw Dr. Lewis standing in front of the desk. He was leaning over it – almost in the face of Dr. Meissner, who was sitting in his desk chair. Evidently at the end of a serious discussion 'Doc' may not have won, he exclaimed loudly, 'Meissner, you'll NEVER be an engineer!!'"

In Memoriam

John Haas (SM ’42)



John Haas SM ’42, who for 24 years was an active member of the MIT Corporation and still retained the status of life member emeritus, died Saturday, April 9, 2011, at his home in Villanova, Pa. He was 92.

After graduating from Amherst College, Haas earned a master’s degree in chemical engineering at MIT. Having enlisted in the Naval Reserves, he worked briefly for the chemical company his father had co-founded, Rohm and Haas, before being called to active duty in 1942. Discharged from the Navy in 1946, he returned to Rohm and Haas as a process engineer and, later, as an assistant plant manager in Knoxville, Tenn., and Houston, Texas. Although he met Chara Cooper, his future wife, at a dinner party in Houston, she, like him, was a native of the Philadelphia area.

According to his profile on the Rohm and Haas website, Haas felt that during his four years in the Navy, he had fallen behind on the rapid advances in the field of chemical engineering, so he moved into what he described as the “people side of the business.” In 1953, the year after he and Cooper married, he was named vice president of personnel at Rohm and Haas. In 1959, he became vice chairman of the board and in 1974 chairman.

Haas joined the MIT Corporation as a term member in 1965, and during two five-year terms, he chaired both the Chemistry and the Chemical Engineering Committees. He became a life member in 1975, and in 1987, one of his family trusts endowed the Haas Family Fellowship in the David H. Koch School of Chemical Engineering Practice. Two years later, he stepped down from active service to the Corporation, becoming a life member emeritus.

Throughout his life, Haas was a noted philanthropist. In 1960, when his father died, he began a 32-year tenure as chair of the charitable foundation — now the William Penn Foundation — that his parents had established in 1945. In 2009, when Dow Chemical bought Rohm and Haas for more than $15 billion, the family shifted $747 million to the Penn Foundation, as part of $1.25 billion in bequests to four charitable trusts.

Haas was also a major supporter of the United Way and the Boys and Girls Clubs, among other organizations. In 2009, he converted a 160-acre property that had been in his family since 1928 into a nature conservancy, the Brandywine Conservancy, augmenting the bequest with another 200-acre property he and his wife had bought in 1968.

After Haas’s death, Ed Rendell, the two-term governor of Pennsylvania, was quoted in the digital edition of The Philadelphia Inquirer as calling Haas “a gentle, extraordinarily decent and honorable man.” “If you met him for the first time, you would never have guessed he was extremely successful,” Rendell continued. “He didn’t care much for the trappings of wealth or success. He only cared about using his resources to help others.” Indeed, according to the 5, Haas was known to his neighbors as “the spry old man who roamed the local roads picking up litter.”

In addition to his wife, Haas is survived by a daughter, Barbara; four sons, David, Leonard, Frederick and Duncan; and 10 grandchildren. A public memorial service is being planned.

Contributions in his memory may be made to the Boys and Girls Club of Philadelphia, attn. Development Dept., 1518 Walnut St., Suite 605, Philadelphia PA 19102, or to the United Way of Southeastern Pennsylvania, 1709 Benjamin Franklin Parkway, Philadelphia PA 19103. ◊

Crawford McDonald ’48 (SM ’49)

Crawford McDonald moved from profession to profession, industry to industry, seamlessly throughout his life. Sometimes he even did so on wheels.

“He roller skated,” said Crawford’s son, Webster. “I was 21 when (my parents) last skated at Skateland on Summer with me. Mother and Dad were so smooth, all my friends were saying, ‘Wow, your parents are unreal.’ My dad would do this pirouette thing in the middle of the floor, and everybody would be watching him -- this older gentleman doing spins.”

Frances McDonald, Crawford’s wife, remembers her husband on roller skates even before the two Memphis natives married.

“We lived about four blocks apart,” said Frances. “He used to skate over to see me.”

The McDonalds also excelled at ballroom dance, and never missed an opportunity to show off their steps.

“At any Christmas parties I had at my office or any place we went, my parents would be the first up to dance,” said Grady, the McDonalds’ youngest son. “It was that kind of ballroom dancing that no one is used to.”

Crawford McDonald died of a stroke in late February 2011. He and Frances had been married 64 years, raising Grady, Webster and a third son, Ford. His many careers took him through chemical engineering, law, and banking. But it all began with a film-like romance during World War II, when he left Frances in Boulder, Colo., to fly bombers over the Pacific.

“When (Crawford) left, he asked me to marry him, and I said this isn’t a good time,” said Frances. “He was getting ready to leave for overseas. He said, ‘When I come back, you’re the first person I’m going to see.’”

So Frances saw him off at the train station, and Crawford wrote her letters every day. When he returned in 1945, he kept his word and came first to see Frances before his parents.

“We went skiing that weekend,” said Frances. “We were real good friends. We could talk, and I thought I could trust him. He was in his uniform, and that gets you every time.”

Crawford went back to MIT, where he had received his undergraduate degree in chemical engineering, and got his master’s degree. There he was a star squash player. After graduating, the McDonalds moved to Los Alamos, N.M., to work for the Department of Energy.

Crawford couldn’t tell his family about his work because of his security clearance, but 25 years later he told Webster what his job had been.

“He was responsible for making sure that the hydrogen bomb, if it was dropped accidentally, that it wouldn’t go off,” said Webster.

Crawford later left Los Alamos to work at Standard Oil in California, then later for Grace Corp. in Louisiana. In 1958, he began law school at the University of Virginia. He practiced law in Memphis with his father’s firm, McDonald, Kuhn, McDonald.

Still later, Crawford transitioned into banking at First Federal Savings & Loan, now BankTennessee, which his father co-founded, eventually becoming its president and board member.

At home, Crawford loved to read, mainly newspapers and magazines about science and business like The Wall Street Journal, Fortune, and Barron’s. A sofa underneath a window in the den became his library in the evening.

“He would read himself to sleep every night,” said Grady. “That was his relaxation.”

But despite his analytical mind and background in science, McDonald seemed to have no conflicts between science and faith, something his sons admired in him.

“He had a mind for science, but he was a strong Christian,” said Grady. “I thought if he could believe, there must be something to it.”

First published March 20, 2011 in the Memphis Commercial Appeal *as a “Life Story” by Jonathan Devin.*

Thank You for Your Support!

This honor roll is a special salute to those who have given over $100 to the MIT Chemical Engineering Department for the period of July 1, 2010, through June 30, 2011.

Thank you to everyone who has supported us throughout the year!

Every effort has been made to ensure the accuracy of this list.
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Fall 2011 Chemical Engineering Dept. Seminar Schedule

All Seminars are Fridays at 3pm in 66-110, unless otherwise noted.

October 7
(Title TBD)
Jeffrey Hubbell, Director
Institute of Bioengineering, EPFL – Lausanne

October 14
Room 32-123
FRONTIERS OF BIOTECHNOLOGY LECTURE
Development of liquid fuels from lignocellulose
Chris Somerville, Director
Energy Biosciences Institute, UC Berkeley

November 4
Rheo-x-ray methods for studying complex polymer fluids under flow
Wesley Burghardt
Chemical & Biological Engineering, Northwestern University

November 18
(Title TBD)
Grant Willson
Chemical Engineering, UT Austin

December 2
Protein adsorption on surfaces: Nightmare or blessing?
Jan Genzer
Chemical & Biomolecular Engineering, NC State

Going to AIChE in Minneapolis in October?

You are invited to attend the

MIT Alumni Reception

Monday, October 17th, 2011

7pm-9pm

Hilton Hotel Minneapolis

Ballroom E