MS&E News

Cornell University

Department of Materials Science & Engineering

May 2005

Also in this issue

Dr. Lara Estroff joins the faculty

MS&E is pleased to announce that Dr. Lara Estroff will join the faculty in summer 2005 as an assistant professor. She is the first faculty member to be hired in the College of Engineering as part of the New Life Sciences Initiative within Cornell. She was hired under the search for faculty that teach and conduct research at the physical sciences/life sciences interface.

Prior to joining the faculty at Cornell University, Dr. Estroff has been an NIH-funded postdoctoral fellow in Prof. George M. Whiteside's laboratory at Harvard University.

Estroff received her Ph.D. in Chemistry from Yale University for work done in Prof. Andrew D. Hamilton's laboratory on the design and synthesis of bio-inspired organic superstructures to control the growth of inorganic crystals. Based on this work, she received both a graduate student silver award from the Materials Research Society and a graduate fellowship from the Division or Organic Chemistry of the American Chemical Society. Also, Estroff spent time at the Weizmann Institute for Science, Rehovot, Israel, working in the labs of Profs. Lia Addadi and Steve Weiner where she studied both biomineralization and chemical approaches to archeological problems.

Estroff's research interests include the area of bio-inspired materials synthesis. In particular: the integration of self-assembled monolayers with natural and synthetic hydrogels to create systems in which both nucleation and crystal growth are controlled; the design and synthesis of new families of self-assembled, bio-compatible hydrogels; and, the design and synthesis of peptides to inhibit pathological mineralization and, alternatively, to control the growth of organic crystals.

Estroff received her B.A. with honors from Swarthmore College, with a major in Chemistry and a minor in Anthropology. She is a member of the Materials Research Society, the American Chemical Society, Phi Beta Kappa, and Sigma Xi.

Dr. Lara Estroff

Alumni:

☛ Are you coming for Alumni Weekend?

MS&E will hold its annual breakfast for alumni and their families and friends on Saturday, June 11 from 8:30 to 9:30 in Bard 260. Please RSVP to Carol Armstrong:

ca20@cornell.edu

or 607/255–9617

☛ Please send your email address, with your degree and year of graduation, to matsci-web@ccmr.cornell.edu.

To view alumni addresses on mse.cornell.edu, click on People and then Alumni; the user word is "alums" and the password is "bardthurston".

MS&E in 2020:

Celebrating 40 years of Materials Science and Engineering

The Department of Materials Science and Engineering is celebrating its Fortieth Anniversary in 2005. To commemorate this milestone occasion we are having a daylong celebratory event on **September 20th,** including panel discussions, a poster session featuring the work of our students, socializing and reminiscing, including a wine and cheese reception which will be attended by our faculty, directors of the Cornell research centers, the Dean of Engineering, and corporate research partners. Our panel discussions will feature prominent alumni from companies and institutions such as Cascade Engineering, the Department of Energy, Xerox, Kodak, Intel, MIT, and Corning.

The theme of our celebration is *MS&E in 2020*. We are not only celebrating forty years of excellence in Materials Science and Engineering, but also exciting possibilities for future innovations in our field. Our mission is to be leaders in our field and to educate tomorrow's leaders. To accomplish our goal we have identified four strategic areas, each of which is the topic of a panel discussion, that we believe will make an impact in our field as well as serve the larger community. These areas are: nanotechnology, energy and environmental technology, information and telecommunications technology, and biotechnology and life sciences.

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MS&E News

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Recent issues of *MS&E News* are available on the Web.

From the Director

It is with great pleasure that we bring you the Spring 2005 *MS&E News*. This year is especially exciting for the entire MS&E community, because we are celebrating the 40th Anniversary of the Department. On September 20, 2005, we will have a daylong celebratory event to commemorate 40 years of MS&E, as well as reflect upon the promising future and direction of our department. We hope that you will be able to join us. For more information, please contact Johanna Montgomery at jm455@cornell.edu.

We have many things to celebrate this year:

- I am pleased to announce the following faculty promotions: Professor van Dover was appointed Full Professor with tenure, George Malliaras was promoted to Associate Professor with tenure, and Uli Wiesner was promoted to Full Professor.
- The MS&E faculty would like to welcome its newest member, Dr. Lara Estroff, from Harvard University, who will join us Fall 2005.
- This past year MS&E has been focusing on strengthening and growing our department in accordance with our strategic plan. This includes examining our current programs, which began with our ABET review that we successfully completed this spring. In addition to our ABET review, we have recently completed a self-study of our MEng program as well as an extensive review of our undergraduate and graduate curriculum. We are offering new courses in our strategic focus areas of energy, biomaterials and information technology and technology management and ethics.
- MS&E has not only made improvements to its curriculum we have also been working on providing more lab space to our groups so that they have the facilities they need to support their research. Toward this end, we are excited about the recent completion of the renovations in our subbasement, the Nanotechnology Research Suite. To improve the overall appearance of Bard Hall, we have just renovated our lobby, hallways and student lounge.

MS&E is pleased to announce the 2005 Advisory Board Members:

Graciela Blanchet, DuPont; Peter Charvat, Intel; Duane Dimos, Sandia National Laboratories; Fiona Doyle, University of California Berkeley; Gregory Galvin, Kionix; Keith Horn, Corning Incorporated; Fred Keller, Cascade Engineering; William La Fontaine, Jr., IBM Microelectronics; Donald Morel, Jr., West Pharmaceutical Services; Yonn Rasmussen, Xerox; Mike Rubner, Massachusetts Institute of Technology; Harvey Schadler, GE, retired; John Spoonhower, Eastman Kodak Company; Richard Vaia, Wright Patterson Air Force Base.

We would also like to thank the following people who served on the 2004 Advisory Board for their service, dedication and vision: Duane Dimos, Sandia National Laboratories; Lina M. Echeverría, Corning Incorporated; Katherine Faber, Northwestern University; Keith A. Horn, Corning Incorporated; William R. LaFontaine, Jr., IBM Microelectronics; Angelo Lamola, Rohm and Haas; D. Bruce Losee, Chrysalis Technologies; Peter Charvat, Intel Corporation; William Nix, Stanford University; Romek Nowak, Applied Materials Global University; Hira V. Thapliyal, MedVenture Associates.

Their guidance was invaluable in helping us formulate and implement key components of our strategic plan, negotiate our ABET review, and ensure that direction of the department continued to move toward excellence, and on behalf of the faculty and students of MS&E I would like to extend to them our deepest gratitude.

I hope to see you at our Reunion Weekend, 10-12 June, and at our 40th Anniversary Celebration, 20 September.

Emmanuel P. Giannelis, Director,
Department of Materials Science and Engineering

MS&E in 2020:

continued from page 1

The nanotechnology panel is presented with the support of the Kavli Institute at Cornell for Nanoscale Science. This will be a day to celebrate our accomplishments and inspire future achievements.

If you are interested in attending our 40th anniversary celebration, please R.S.V.P. to Johanna Montgomery at jm455@cornell.edu. For more information regarding this event, please feel free to contact Johanna, or visit our website http://www.mse.cornell.edu.

Ulrich Wiesner becomes Full Professor

We are pleased to announce that Ulrich Wiesner has been promoted to Full Professor. After joining Cornell from the Max Planck Institute for Polymer Research (Mainz, Germany) Uli has continued to distinguish himself in research, teaching and service.

Uli's distinguished career exemplifies a passionate pursuit for innovative and effective solutions to complex problems. His research program in Nanohybrids is both well funded and internationally recognized. Since coming to Cornell, Uli's research group has focused on interfacing polymer science with solid state chemistry, particularly with hybrid silicon-based glasses. His research group has focused on six interrelated areas: Block Copolymer Synthesis, Bioinspired Nanostructured Hybrid Materials, Mesoporous Materials, Nanoparticles, Nanobiotechnology, and Complex Fluids. Besides the Graduate Field of Materials Science and Engineering, Uli is a member of the Cornell Fields of Chemical and Biomolecular Engineering and Chemistry and Chemical Biology.

Uli manifests the traditional goals of scholarship in his teaching. By modeling excellence in research he educates present students to become leaders in the scientific community. He has been a guest lecturer for the Bioengineering Seminar (BMEP501) and Nanobiotechnology course (AEP663/MSE563/BioG663). He has taught a range of courses including: Chemistry of Materials (MSE 204), Physics of Soft Materials (MSE 523), and Properties of Solid Polymers (MSE 521). Aside from teaching these courses, Uli has supervised students and researchers ranging from undergraduate and graduate students to postdocs and research associates.

Uli has always been willing to serve on departmental, college and university committees. Currently, he is a member of the MSE Faculty Search Committee. In the past he has served as Co-organizer of the MSE Herbert Johnson Memorial Lectures, served as the Faculty Editor for the MSE Graduate Studies Brochure, and was our Director of Graduate Studies (for three years) and Department Safety Representative. On the University level he is presently serving as a member of several committees such as: the Biological and Environmental Engineering Faculty Search Committee, the CCMR Executive Committee, the Physical Science/Life Sciences Interface Focus Committee, the Physical Sciences and Life Sciences Interface Search Committee, and he is the CCMR faculty advisor of the CCMR "*Hudson Mesoscale Processing Facility.*"

In addition to serving Cornell University, Uli is dedicated to being a contributing member of the national and international scientific communities. He is a member of key professional affiliations including the American Chemical Society, Materials Research Society and the American Physical Society. He is serving as an Advisory Board Member of *Chemistry of Materials* (2003-2005). He is co-organizer of the Fall ACS Symposia, on Bio-inspired Polymeric Materials and Defects in Polymer Nanostructures, both set to take place in Washington, D.C., 2005. He recently established a NSF funded Nanoscale Interdisciplinary Research Team (NIRT) on Nanohybrids and Nanobiohybrids. He also established a new Interdisciplinary Research Group (IRG) at Cornell's NSF funded MRSEC center (CCMR) on nanophotonics (2004). Uli truly is a credit to MS&E and to Cornell University.

Ulrich Wiesner

Staff Highlights

Many of you will remember **Carol Armstrong** from your time at Cornell, a familiar face in MS&E. Carol is being recognized this spring for 30 years of service at Cornell University with most of her career spent in our department. In addition to a department reception celebrating her contributions, Carol will participate in a university event in June. Carol also received the **Geyer Award** in December 2004. The award was established by the department in remembrance of Robert Geyer, who was director of administrative operations for over a decade. The award honors contributions to the goals of the department.

Johanna Montgomery joined the staff in October 2004 as assistant to the director. Johanna is new to Ithaca and Cornell. Her previous position was administrative assistant to the Associate Dean of Corporate Outreach and International Programs at Fordham University. She has a BA in philosophy from the University of Michigan, Dearborn, and an MA in political science from the University of Toronto. In addition to her work in MS&E, Johanna is completing her doctoral studies in philosophy from Fordham University.

Left: Emmanuel Giannelis presents the Geyer Award to Carol Armstrong. Above: Johanna Montgomery celebrates a recent birthday.

van Dover group research:

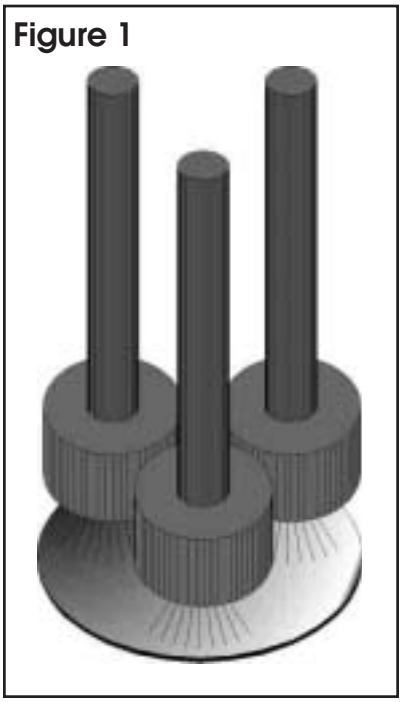
Dielectric, magnetic and catalyst materials explored with high-throughput techniques

It normally takes hours or days to synthesize a single research sample, so even the most enthusiastic and dedicated researchers might make only a few thousand samples in a career. What if this process could be accelerated by orders of magnitude? Suppose someone could make thousands of different materials in a single experiment one day, and then measure their properties (or at least some of their properties) in another experiment the next day. What new materials would be discovered? What new composition/property trends would be uncovered? What hypotheses could be tested?

Prof. Bruce van Dover and his research group have been using a combination of old and new techniques to synthesize and characterize thousands of compositions in a single experiment, that can take as little as a day from start to finish. They are using an approach called the "codeposited composition spread" to explore a wide range of materials, including dielectrics, optical materials, magnetic materials, and catalysts. The materials are synthesized as thin films, prepared in a vacuum chamber with three or four independent sources known as "sputter guns". In sputtering, a target—typically a elemental metal—is bombarded by inert gas ions (Ar^+) whose impact ejects atoms from the target. The sputtered atoms condense on a substrate located close by (see Figure 1, which shows a three-gun configuration). The composition of the resulting thin film varies continuously as a function of position on the substrate. If oxide films are desired, they can be made by introducing oxygen along with the inert gas, or by mounting oxide targets in place of metal targets.

Figure 1: Schematic of the composition spread technique. The three sputter guns operate in a high-vacuum chamber and produce three fluxes of atoms simultaneously, which condense on the substrate. The thin film so produced has a natural composition gradient.

Figure 1



This composition spread technique has now proven its use in disparate studies. For instance, in one research program, members of the van Dover group are preparing amorphous oxide spreads aimed at identifying materials, which can be used for optical amplifiers in photonic integrated circuits. In discrete photonics systems, such as the telecommunications system, Er-doped fiber amplifiers are the solution. There a small concentration of Er is introduced into the SiO_2 glass fiber; a pump laser creates a population inversion in the Er atomic levels, leading to stimulated emission and thus amplification of the lightwave signal. But, fiber amplifiers require 10's of meters of fiber, which cannot be accommodated on a photonic IC. The van Dover group is looking at the effect of adding modifiers to the Er:SiO_2 glass material. These modifiers could increase the solubility of Er, allowing higher doping levels without clustering that leads to nonradiative energy loss, or they could increase the radiative cross section by modifying the crystal-field environment of the Er atoms. The compositions spreads are characterized in collaboration with Prof. Alex Gaeta (Applied and Engineering Physics) using a custom-built scanning fluorescence apparatus. The groups are able to identify trends and hone in on compositions with improved performance. They have already identified some promising new materials with this technique, though the data are preliminary.

In another "combinatorial materials science" research program, the aim is developing new catalysts for low temperature fuel cells. This work is motivated by the breakthrough discovery, by Professors Frank DiSalvo and Hector Abruña, that intermetallic compounds, such as PtPb and PtBi, are much less susceptible to poisoning than the conventional Pt (or $Pt_{1-x}Ru_x$ solid solution) catalysts. Rather than prepare candidate materials one at a time using conventional chemistry, the van Dover group is preparing composition spreads comprising three metals (e.g., Pt-Pb-Bi). Figure 2 shows the range of compositions obtained on a single wafer. The resulting composition spreads are evaluated using electrochemical techniques developed and executed in collaboration with the Abruña and DiSalvo groups. A quick method to identify catalytic activity is to mount the film in an electrochemical cell with a fluorescent dye indicator, such as quinine, to monitor hydrogen ion production under an applied bias between the film and a counterelectrode. Digital images are acquired under UV illumination, and the resulting images are examined to identify "hot" spots; and, more detailed data can be obtained using a scanning electrochemical microscope.

Additionally, some of the projects in van Dover's group focus on making unconventional devices using the materials synthesized in his lab. In one of these projects a new amorphous dielectric (originally discovered using composition spreads by van Dover while at Bell Labs) is being developed for use as a gate dielectric for exotic semiconductors. This material, $Zr_{.2}Sn_{.2}Ti_{.6}O_2$, can support a surface charge density eightfold higher than the conventional dielectric used in integrated electronics, SiO_2. As a result, new regimes of physical effects can be explored on the surface of materials such as or-

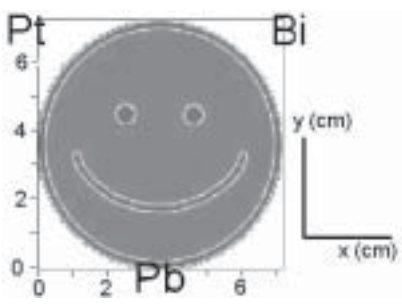
Prof. Bruce van Dover and some members of his research group in front of Duffield Hall last summer.

ganic semiconductors, carbon nanotubes, and copper oxides. While a second project is developing a new type of magnetic device—the magnetostrictively-transduced surface acoustic wave (SAW) devices. Unlike conventional devices that generate waves in a piezoelectric single crystal, these use a magnetic transducer that can be deposited and processed under mild conditions that are compatible with standard Si IC (back-end) limitations. (See Figure 3). Propagation of the SAW is very sensitive to the condition of the surface, so if the surface is chemically sensitive, the presence or absence of a sensand can be detected. By depositing a wide range of sensitizing layers on an array of sensors, a versatile "electronic nose" could be made. The current focus of this unique project is the development of devices with better performance by identifying and introducing superior magnetostrictive materials, refining the processing, and improving the device layout/design. All of the device-oriented projects in van Dover's group are making use of the extraordinary facilities available in the Cornell Nanofabrication Facility, located in Duffield Hall.

van Dover's research group at Cornell currently includes one postdoctoral researcher—Ji-Won Choi; seven graduate students—Karen Downey, Sara Barron, Yuqing Yu, Mark Prochaska, Jon Petrie, Steve Kirby, and Noble Woo; and seven undergraduates—May Martin, Steve Tsai, Jeremy Lieberman, Mark Polking, Cheong-Yank Koh, Xinning Ho, and Dan Ruebusch. His work is supported by the National Science Foundation, the Cornell Center for Materials Research, the Cornell Fuel Cell Institute and the Learning Initiatives for Future Engineers program.

Bruce van Dover's leadership capabilities and excellence in research have enabled him to establish a world-class well funded research group. Since arriving at Cornell University, he has dedicated himself to his research and teaching, as well as departmental activities. Currently, he is serving as Chair for the MS&E Search Committee. He truly is an asset to MS&E, and we are very pleased that he has recently received tenure as full Professor.

Figure 2



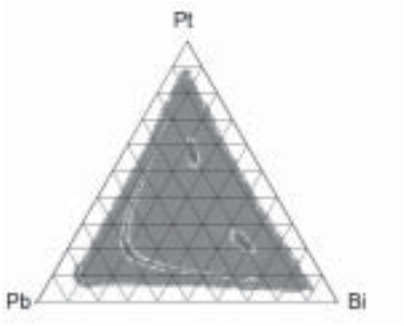


Figure 2. Left: schematic showing location of the 7.5 cm-diameter Si substrate relative to the centers of the three sputtering sources. The smiley face is added to provide reference points for this illustration. Right: compositions obtained in a typical deposition are mapped onto a ternary phase diagram. A single experiment comprises most of the possible ternary compositions.

Figure 3

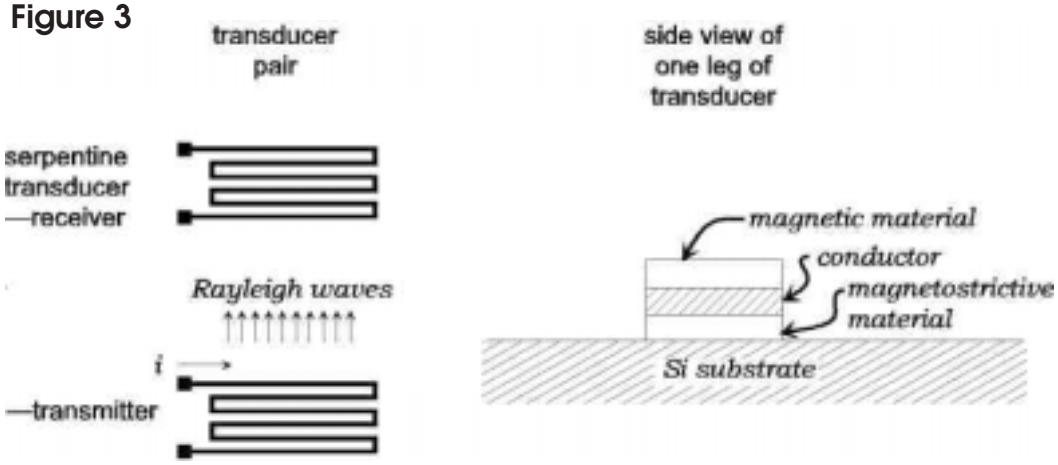


Figure 3. Left: schematic top view of a transducer pair. Right: cross section of one leg of a transducer, indicating the magnetic layers.

George Malliaras is promoted to associate professor with tenure

George Malliaras

We are excited to announce that George Malliaras was promoted to the position of Associate Professor with tenure. His contributions to research, teaching and outreach have been quite considerable since joining Cornell University.

George's excellence in research has been recognized with a National Science Foundation (NSF) Young Investigator Career Award. His research effort has focused on three interrelated objectives: a) establishing the connection between growth and morphology of organic semiconductor films, b) understanding the mechanism of charge injection and transport in organic semiconductors and c) building (opto)electronic devices based on these materials. George's first seminal work involved understanding transport and doping in organic semiconductors and relating these fundamental properties to device performance. He and his group pioneered the study of charge injection at metal/organic interfaces. He has developed experimental techniques to isolate the interface current and measured its dependence on parameters such as electric field, temperature, mobility, charge density and sample dimensions. These studies led to the first complete phenomenological description of injection in organics, as well as a set of guidelines for the formation of ohmic contacts in organic-based devices.

George is a very dedicated member of the department, whose service is exemplified by the enthusiasm he brings to his current role as Director of Graduate Studies. George is also a natural born teacher, who is highly rated by his students and has already won one of the College's Excellence in Teaching Awards. In addition to his service to the department, George has also been involved in K-12 educational outreach. He has given lectures in local high schools, participated in various outreach programs like the "Curie Academy" and "Expanding your Horizons" and has hosted several high school teachers in his lab. His outreach activities also include establishing a collaboration between the Cornell Center for Materials Research (CCMR) and Simmons College (a women's college in Boston, MA), funded by NSF, to develop a new Materials Science Undergraduate program at Simmons.

On an international level he recently became an overseas editor for the Japanese Journal of Applied Physics. George has already organized symposia for the Materials Research Society (MRS), the American Physical Society (APS), the Minerals, Metals and Materials Society (TMS), and the Society of Imaging Science and Technology (IS&T). Perhaps his most ambitious undertaking yet was the organization of the Sixth International Symposium on Functional -Electron Systems (F6) on the Cornell University campus, this past June, with more than 500 researchers participating.

George and his fiancée Róisín celebrated this milestone event with a spectacular party for friends and colleagues at their home.

MS&E facilities improve

If you have the opportunity to visit MS&E for Alumni Reunion or the *MS&E in 2020* Fortieth Anniversary event, you will be surprised by the many improvements to department facilities in Bard and Thurston Halls. Six faculty research groups also have labs and student offices in Duffield Hall.

Bard Hall has newly renovated common spaces including the lobby, hallways, conference room and student lounge. Research lab renovations include six new laboratory spaces created from the outdated lab spaces in the north end of the subbasement. The Nanotechnology Research Suite opened this spring and includes labs assigned to the Baker, Estroff, Ober and Wiesner groups. Plans are underway for a similar renovation of the south end of the subbasement, which should begin this fall. Some laboratory spaces in Thurston Hall are being improved and a conference room was renovated to accommodate meetings and presentations with the many visitors to MS&E.

Duffield Hall is now home to researchers from the Giannelis, Liddell, Malliaras, Ober, van Dover, and Wiesner groups. Researchers benefit from student and visitor offices, as well as laboratory space, in close proximity to facilities of the Cornell Nanoscale Science and Technology Facility (CNF), Cornell's Nano-biotechnology Center (NBTC) and the Cornell Center for Materials Research (CCMR). In addition, the interdisciplinary environment fostered by having researchers from several departments within the College of Engineering working in Duffield Hall offers tremendous opportunities for research collaboration.

Alumni Highlight

Fred Keller, '66, a leader in sustainable business

The Department of Materials Science and Engineering (MS&E) is proud to highlight graduate Fred P. Keller, B.S. '66, who exemplifies both the department's and Cornell University's dedication to excellence, community service and leadership.

Fred P. Keller is chairman and chief executive officer of Cascade Engineering, a leading provider of plastics solutions for the automotive, industrial, and solid waste industries. Under Keller's leadership, Cascade Engineering has grown from a small injection molding company with six employees into a complex manufacturing organization with 1,200 employees and 13 facilities worldwide.

A materials engineer by training, Keller founded Cascade Engineering in 1973 following an earlier career as a metallurgist with Pratt & Whitney. Cascade Engineering was built as a reflection of his belief that businesses should be "sustainable" and committed to realizing lasting and socially beneficial goals. His model for sustainable business focuses equally on three types of capital: financial, social, and ecological. With a clear focus on this model, and an emphasis on the potential impact each individual employee can make, Keller has created not only a successful business enterprise but also an organization dedicated to achieving broader community and environmental goals. His managerial excellence and dedication to corporate social responsibility have earned him many awards and distinctions, including Chrysler's "Technology Role Model," number 8 in the country as 'Best Medium Company to Work for in America' at the National Human Resource Conference, the Hugh Michael Beahan Foundation's "Faith in Humanity" Award, the White House's Ron Brown Award for Corporate Leadership, and Goodwill Industries' "Employer of the Year." In 2004, Keller was named to the United States Department of Commerce Manufacturing Council, chair of the Workforce Committee and received a "Distinguished Service Award" from the National Governors Association.

Keller has also made lasting contributions to the Cornell community through his willingness to attend conferences, give lectures and most recently to serve on the Materials Science and Engineering advisory board. Both the Department of Materials Science and Engineering and Cornell University College of Engineering are proud to have Keller as an alumnus and are grateful for his willingness to share his vision and knowledge to help lead the department and college toward a future of excellence and prosperity.

Fred Keller, '66

MS&E and T&AM communities mourn death of Professor Emeritus Edward Hart

Professor Emeritus Edward W. Hart passed away on December 22, 2004. Dr. Hart was Professor of Theoretical and Applied Mechanics and Materials Science and Engineering from 1976 to 1988. He was appointed Professor Emeritus when he retired in 1988.

Dr. Hart was a graduate of Townsend Harris Hall in New York City and The City College of New York and received his M.S. and Ph.D. from the University of California at Berkeley. He was a theoretical and experimental physicist. During World War II, he worked for the U.S. Navy in Washington, DC and then in San Diego, CA. He invented magnetic compass correctors and a better ship compass, for which he earned a Meritorious Civilian Service Award. He then spent 25 years at the General Electric Research and Development Laboratory in Schenectady where he developed the tensile test theory.

Dr. Hart was a Fellow of the American Physical Society and served as the Batelle Visiting Professor for Distinguished Service at Ohio State University in 1973. He was awarded the Alexander von Humboldt Senior Scientist Award by West Germany in 1982, and in 1989, conducted research at the Nuclear Research Center in Karlsruhe, Germany, as a visiting scientist. His biographical sketch appears in Who's Who in America.

A true Renaissance man, Dr. Hart was as dedicated to the arts as to the sciences. As a young man, he studied composition under composer Aaron Copeland. He played guitar, viola and piano, and directed a choir and a chorus. He studied modern dance with Welland Lathrop as a young man and was a founder and President of the Schenectady Civic Ballet Co. from 1960-63. A longtime member of the Adirondack Mountain Club, he loved nature, mountain climbing and camping.

Dr. Hart's family has planned a private memorial service in June 2005. He is survived by his wife, Joanne, daughters Enid Hart Boasberg and Dr. Lucinda Hart-González, stepchildren Stephen Grubb, Robin Paulus and Brian Grubb, as well as seven grandchildren.

MS&E undergraduates receive honors

The undergraduate program in MS&E continues to grow. Class sizes of nearly 40 students are entering each year and the students are of the highest caliber in their qualifications. Students are attracted to MS&E, in part, by the opportunity to conduct research early in their academic career.

Kevin Joon-Ming Huang, a junior in MS&E, was awarded a Barry M. Goldwater Scholarship. He is one of 320 Goldwater Scholars selected this year from 1,091 candidates. The scholarship provides $7,500 for undergraduate study to students committed to careers as scientists. Kevin conducts research in Prof. Chekesha Liddell's research group on novel photonic/optical materials. He is a Cornell Presidential Research Scholar, the president of the Engineering Student Council and involved in numerous other academic and volunteer activities. Kevin plans to conduct research and teach at the university level.

MS&E awarded the 2004-2005 Junior class prizes. The students are pictured above with Prof. Shefford Baker, Director of Undergraduate Studies. Nanotechnology Fellowships were awarded to six students for excellence in academics. Recipients were **Ian Witting, Timothy Lau, Daniel Bonner, Kevin Huang, Camille Man Yin Luk and John Stechschulte**.

Jonathan Rivnay, also pictured, received the James L. Gregg Memorial Prize as the outstanding junior in MS&E. Jonathan is an excellent student who grew up in Israel, Palo Alta, California and the Boston area. He conducts research with Prof. George Malliaras' research group on Organic Light Emitting Devices (OLEDs), specifically with lifetime and humidity studies as well as general lighting applications. In addition to research and academics, Jonathan is on the executive board of Engineers for a Sustainable World and involved with the Cornell Lunatic, a campus humor magazine.

Senior **Timothy Lau** received a **National Defense Science and Engineering Graduate Fellowship** funded by the Office of Naval Research. With this 3-year fellowship, he will attend MIT and plans to conduct research in multiscale modeling of bearing steel weakening under stress with Professor Krystyn van Vliet as his advisor. While at Cornell, Timothy conducted research under the direction of Professor Rüdiger Dieckmann using the finite element method to simulate the kinetics of a diffusion rate-controlled solid state reaction.

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