A. JAMES CLARK
SCHOOL OF ENGINEERING

SPRING 2006

TECHSTRACKS

MATERIALS SCIENCE AND ENGINEERING

A newsletter for alumni and friends of the Department of Materials Science and Engineering, A. James Clark School of Engineering, University of Maryland

INSIDE

Maryland NanoCenter Established

Professor Gary W. Rubloff, Materials Science and Engineering and the Institute for Systems Research, is the founding director of The Maryland NanoCenter (formerly the Maryland Center for Integrated Nano Science and Engineering). This unique Center was established as a partnership between three University of Maryland Colleges: The A. James Clark School of Engineering; the College of Computer, Math, and Physical Sciences; and the College of Chemical and Life Sciences, with sustaining support from all three Colleges and the campus. The NanoCenter will encourage cross-disciplinary research and education by bringing scientists and engineers from across the University together to advance research into nanotechnology.

Prior to the formation of the NanoCenter, there were many researchers at the University of Maryland working in the field of nanotechnology who did not know each other and lost many opportunities for collaboration and interaction. The Maryland NanoCenter is designed to foster these connections. Its mission is to enhance the coherence and effectiveness of the university's nanotechnology community through a strategy based on:

- coordinating shared state-of-the-art experimental facilities;
- developing best practices for administrative infrastructure support;
- providing coherent, broad visibility at state, national, and international levels;
- encouraging and facilitating growth of nanotechnology programs and fund-raising;
- guiding the evolution of coordinated educational programs for the nanotechnology workforce of the future; and
- promoting the development and transfer of nanotechnology and related intellectual property to the marketplace.

Contributing to the cutting edge research are the new laboratories in the Jeong H. Kim Engineering Building which was dedicated on September 19, 2005 (see related story on page 2). MSE Labs in the Kim Building include the Keck Laboratory for Combinatorial Nanosynthesis and Multiscale Characterization, the Fab Lab (state-of-the-art clean room), and the Nanoscale Imaging, Spectroscopy, and Properties (NISP) Laboratory.

The NanoCenter also has an educational component. **Prof. Ray Phaneuf**, Materials Science and Engineering, has been instrumental in the establishment of an interdisciplinary undergraduate minor in nanoscale science and technology. This minor was approved by the Faculty Senate in March 2006. Students will be able to declare the minor in the Spring 2006 semester. For more information, please visit the website at: http://www.nanocenter.umd.edu/education.php. (See related story on page 4).

For more information on the NanoCenter, please visit: http://www.nanocenter.umd.edu/.

R.M. Briber
Chair, Materials Science and Engineering

Message From the Chair

This is an exciting time for the Materials Science and Engineering Department at the University of Maryland. The Department is a leader in a number of new initiatives in the College of Engineering and at the University. One such item is the new Nanoscale Imaging, Spectroscopy and Properties (NISP) Lab in the Jeong H. Kim Building. The centerpieces of the new lab are two new transmission electron microscopes (TEM), a JEOL 2100F high resolution field emission TEM and a general purpose LaB_6 JEOL 2100 TEM. In addition, the existing JEOL SuperProbe 840 rounds out the equipment. The NISP Lab will be a true University facility with participation from three colleges, the A. James Clark School of Engineering; the College of Chemical and Life Sciences and the College of Computer, Math and Physical Sciences. You can learn more about the capabilities of the NISP Lab at http://www.nisplab.umd.edu. The NISP Lab is managed under the new Maryland NanoCenter, headed by **Prof. Gary Rubloff** (MSE). There is more about the NanoCenter and the exciting developments in nanotechology in the lead off article in the newsletter.

We are also welcoming two new faculty to the Department, **Prof. John Cumings** who joined MSE in Fall 2005 and **Prof. Joonil Seog**, who will hold a joint appointment with the new Fischell Department of Bioengineering and will be arriving at the start of the 2007 Spring semester.

The Jeong H. Kim Building Dedication

The cross-disciplinary Jeong H. Kim Engineering Building was officially dedicated on September 19, 2005. The dedication ceremony included the induction of two new members into the A. James Clark School of Engineering Innovation Hall of Fame in its new location in the north wing of the Kim Building, and the Charles and Helen White Symposium on engineering innovation, which took place in the Kim Building lecture hall.

The dedication ceremony included speeches by Maryland Governor Robert Ehrlich; Michael Busch, Speaker of the Maryland House of Delegates; William "Brit" Kirwan, Chancellor of the University System of Maryland; C.D. Mote, Jr., President of the University of Maryland; Clark School Dean Nariman Farvardin; and Jeong H. Kim, Clark School alumnus, Professor and benefactor, and head of Bell Labs, Lucent Technologies.

Individual and corporate donors to the Kim Building were thanked for their commitments, and tours of the labs within the building were offered throughout the day. (See additional photo in the photo gallery.)

Standing-room only crowd at the dedication.

Alpha Sigma Mu

The Maryland Alpha chapter of Alpha Sigma Mu was reinstituted at the University of Maryland and eleven students were inducted in a ceremony held on May 11, 2005. The students had the highest academic achievement of all students in the Department. The inductees were Margaret Bennett, Charles Brooks, Melissa Considine, Erin Dreyer, Erin Flanagan, Paul Freese, Neil Griggs, Michael Kasser, Erik Lowery, Joanna Meador, and Scott Wilson. Alpha Sigma Mu is the international professional honor society for Materials Science and Engineering. Congratulations to all of the inductees!

New Officers for Undergraduate Student Group

The following students were elected as new officers for MatES, the MSE undergradute student group:

AY 2005-06

President: Scott Wilson
Vice-President: Mike Figueroa
Secretary: Maeling Tapp
Treasurer: Max Grace
Webmaster: Mike Dollinger

AY 2006-07

President: Maeling Tapp
Vice-President: Maggie Bennett
Secretary: Max Grace
Treasurer: Christina Senagore

Materials Engineering Society Activities During the Year

MatES (Materials Engineering Society) had another busy year assisting at all outreach events for the Department. These events include the open houses for prospective students, as well as other activities organized by the Clark School and the University.

MatES members are actively involved in the monthly ASM chapter dinners which allow them to listen to a speaker working in MSE and network with other professionals in the field. MatES sponsored a student research night to highlight the research activities of student members. The following students shared their research with the members of the group: Erin Dreyer (dental materials, magnetic materials, biofilm characterization), Erin Flanagan (AFM of Gallium Arsenide), Jo Meador (liquid crystals and magnetic fluids, PLD buffer layer for PzM-PzE), Scott Wilson (testing chemical sensor technology, databases, CNT growth), and Richard Elkins (gyroklystron vacuum systems, process optimization). Seven MatES members attended the 2005 TMS meeting in San Fransisco and one member attended the 2006 Meeting in San Antonio to learn more about the field of MSE outside the University. The students attended both technical talks and social mixers at the Conference and met with companies involved in MSE.

Accreditation Visit in the Fall

The Department and the Clark School of Engineering underwent an accreditation review by ABET, the Accreditation Board for Engineering and Technology, which sets standards for undergraduate education for engineering degrees. The visit was quite successful and the Department received many compliments on the curriculum as well as the course evaluation and improvement program that had been implemented. More information on the ABET review process can be found on the Department undergraduate program webpage at http://www.mse.umd.edu/undergrad/, including a copy of the study document that the Department submitted to ABET.

Undergraduate Awards and Honors

Chairman's Outstanding Senior Award

Presented to a graduating senior for scholarship, leadership, and service to the department.

Erin Dreyer 2005
Scott Wilson 2006

ASM/TMS Materials Undergraduate Service Award

Presented to an undergraduate for service to the ASM/TMS Chapter.

Joanna Meador 2005
Maeling Tapp 2006

Outstanding Materials Student Service Award

Presented to a graduating senior for outstanding service to the department's recruiting efforts and the student society.

Melissa Considine 2005
Erin Flanagan 2006

Clark School of Engineering Student Co-op/Intern

The award is presented to students who have demonstrated scholastic excellence, exceptional work performance as documented by their supervisor, and an outstanding potential for a successful career in engineering.

Scott Wilson 2005

departmentNEWS

University Ranks First in Nano Education and Research

The University of Maryland was ranked number one in both nanotechnology research and education in 2005 by Small Times magazine. The article stated that "The Univesity of Maryland offered five nanotechnology-related undergraduate courses and six nanotechnology-related graduate-level courses to engineering and sciences students in 2004. That allowed at least 48 graduates–the majority getting doctorates–to add a nanotech-speciality to their credentials. Expect the undergraduates to gain ground in the near future, though. The University will begin offering an interdisciplinatry minor in nanoscience and technology through its Maryland NanoCenter." (See related story below.)

Nano Minor Coordinated in the Department

A new minor has been approved beginning in the Spring 2006 semester for undergraduate students at the University of Maryland, coordinated by Materials Science and Engineering and involving the Colleges of Computer, Math and Physical Sciences; and Chemical and Life Sciences. The program is open to any student majoring in Engineering, Physics, or Chemistry. The minor will consist of 5 courses which have been identified from courses in the participating Colleges. A faculty committee has been appointed to oversee the curriculum and **Prof. Ray Phaneuf** will be the Coordinator. For more information please contact Prof. Phaneuf at phaneuf@lps.umd.edu or visit the website: http://www.nanocenter.umd.edu/education.php.

BOV Meeting Held

The Department of Materials Science and Engineering Board of Visitors met during the Fall 2005 semester to provide advice to the Department and to the College on the long range planning for the Department's educational and research programs. The Board of Visitors is comprised of leaders from industry, academia and government and meets annually to review the programs in the Department. Members include: Dr. Nora Beck Tan, W. L. Gore & Associates; Prof. Surya R. Kalidindi, Chair, Materials Science and Engineering Department, Drexel University; Prof. Alexander H. King, Professor and Head, Materials Engineering Department, Purdue University; Dr. Toni Marechaux, The National Academies (Sciences, Engineering, Medicine) Director, Board on Manufacturing and Engineering Design; Dr. Marion Mecklenburg, Smithsonian Center for Materials Research and Education; Dr. Deborah P. Partlow, Advisory Scientist and Project Leader Electronic Sensors and Systems Sector, Northrop Grumman Corporation; Prof. John Rabolt, Chair, Materials Science and Engineering Department, University of Delaware; and Dr. Leslie E. Smith, Director, Materials Science and Engineering Laboratory, National Institute of Standards & Technology. We look forward to continued support from the Board.

New Staff Members

Mike McNicholas was appointed Director of Administrative Services in December 2004. **Kay Morris** joined the Department as a Payroll and Benefits Coordinator in September 2005. **Taizhu Zhou** serves as the departmental contact for the Clark School IT staff. **Olivia Noble** joined the staff as a Business Manager in April, 2006. The newest staff member is **Faye Levine**, our Communications Coordinator, who joined us in May, 2006.

Ladan Mohaddes Ardabili Recipient of an NSF EAPSI Fellowship

Ladan Mohaddes Ardabili, MSE graduate student, received a fellowship from the National Science Foundation under the East Asia and Pacific Summer Institutes for U.S. Graduate Students (EAPSI). EAPSI provides U.S. graduate students in science and engineering first-hand research experience in Australia, China, Japan, Korea, or Taiwan, an introduction to the science and science policy infrastructure of the respective location, and orientation to the culture and language. Ladan did her research in "Growth and Characterization of Vertically Aligned Carbon Nanotubes on Self-Assembled Iron Nanowires" in Korea. Congratulations, Ladan!

MSE Graduate Student Wins Best Poster Award

Israel Perez

MSE graduate student **Israel Perez** has won the Best Poster Award at the MEMS Alliance Special Topics Symposium, held Tuesday April 4, 2006 at Johns Hopkins University's Applied Physics Laboratory. Izzy has been able to produce high-K dielectric nanotubes using ALD HfO_2 onto **Prof. Sang Bok Lee's** (Chemistry Department) nanoporous alumina templates. He is a graduate student in **Prof. Rubloff's** group.

Graduate Council Representative

Erin Robertson has agreed to represent Materials Science and Engineering at the University wide Graduate Council. She is the first graduate student in MSE to serve in this capacity. This organization is dedicated to the improvement of the life of graduate students. Erin provides

input to the Council from our graduate students and brings back information to them. Thanks for volunteering for this important function Erin!

Chris Long wins Bruker AXS Scholarship

Members of Prof. Takeuchi's group celebrate with Chris Long at the MRS meeting.

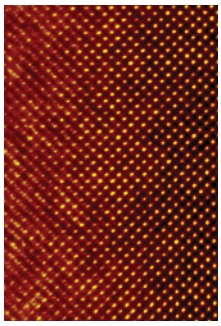
Graduate student **Chris Long**, working with others in **Prof. Takeuchi's** group won the first Bruker AXS Excellence in X-ray Diffraction scholarship for unique applications in the category of Nanotechnology and Materials Science. The award was announced at the Fall MRS Meeting in Boston, MA. It was given for their work in advanced visualization and analysis techniques of X-ray microdiffraction data from combinatorial thin film libraries of functional materials.

This work is part of the materials informatics research effort in Takeuchi's group. It was published in Review of Scientific Instruments (vol.76, 062223 (2005)), and animation of the figures are available at http://www. combi.umd.edu.

Upgrade of Maryland University Training Reactor for Nuclear Health Medicine

Through funding provided by the DOE program Innovations in Nuclear Infrastructure and Education and in collaboration with the Georgia Institute of Technology, modifications have been made to the Maryland University Training Reactor. The upgrade will allow simultaneous high and low linear energy transfer irradiation and provide the ability to house the samples near the core, blocking gamma-rays produced within the water tank while maintaining a high neutron flux. Thermalized neutrons will be used for research involving enhanced boron neutron capture therapy of prostate cancer cells which have absorbed a novel boron-containing cholesteryl carborane ester compound. This project is led by **Prof. Al-Sheikhly** and graduate student **Ian Gifford**.

New Microscope



Atomic-level image of gold, taken using the JEOL 2100F.

A new high resolution JEOL 2100F field emission transmission electron microscope (TEM) has been delivered to the Nanoscale Imaging, Spectroscopy and Properties (NISP) Lab in the Jeong H. Kim Engineering Building. The new TEM is capable of resolving individual atoms and with the field emission gun has extremely high brightness allowing compositional information to be obtained from regions as small at 0.5 nm in diameter. The microscope will form the centerpiece of a new University-wide center for electron microscopy and will be managed under the University of Maryland NanoCenter. For more information, see the NISP Lab website at: http://www.nisplab.umd.edu/.

Kathleen Hart Wins Clark School Staff Service Award for 2005-06

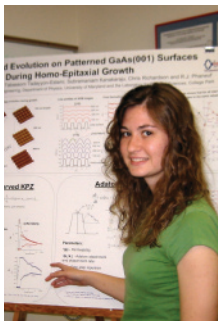
Kathleen Hart, the Assistant Director for Student Services in the Department, won the Clark School of Engineering Staff Service Award for 2005 for her exemplary service to the Department and MSE students. Kathleen works tirelessly to improve the educational programs at both the undergraduate and graduate levels, working with students from before they have set foot on campus through graduation. In addition, she was a key architect in our recent ABET accreditation.

Undergraduate Student Wins ARCS Fellowship

Max Grace, a senior in MSE, received the first ever Achievement Rewards for College Scientists (ARCS) undergraduate fellowship for his research on room temperature deformation of alpha titanium alloys. Max is working on this research with **Prof. S. Ankem** and graduate student **Greg Oberson**. The ARCS Foundation is a national all volunteer, all-women organization dedicated to providing scholarships to academically outstanding students pursuing degrees in certain fields of natural science, medicine and engineering. The Foundation makes awards to 46 schools across the country, and in 2004-05 the cumulative total since its founding grew to more than $53 million in scholarships to over 10,000 students.

Undergraduate Student Presents Paper at National Conference

Erin Flanagan, MSE senior, presented her paper "Self-Organized Evolution on Patterned GaAs (001) Surfaces During Homo-Epitaxial Growth" at the American Physical Society national conference held in Baltimore, MD, March, 2006. Erin also presented the paper at the Clark School Board of Visitors meeting on April 10, 2006 as an example of the types of research Clark School undergrads are involved in. She works in **Prof. Phaneuf's** group.



Erin Flanagan

facultyNEWS

Cumings Joins Department

Prof. John Cumings

Prof. John Cumings has joined the Department of Materials Science and Engineering as an Assistant Professor. He previously was a postdoctoral scholar in the Department of Physics at Stanford University. He received his Ph.D. in physics (experimental condensed matter) from the University of California, Berkeley. He received his Bachelor of Arts from Boston University. Cumings' research interests are in nanoelectronics and nanodevices.

Profs. Oehrlein and Phaneuf Receive NSF Grant for Nano Research

Profs. Gottlieb Oehrlein and **Ray Phaneuf** were awarded a NSF-Nanoscale Interdisciplinary Research Team grant ($1.2M) for a proposal to investigate "Nanotechnological Manufacturing: Nanostructured Polymers Designed for Plasma/Energetic Beam Templating of Materials". The objective is to establish an atomistic understanding of the interactions of nanostructured polymers with the plasmas and energetic beams used during pattern transfer, and to identify the molecular design parameters and the plasma processing parameters required to control patterning at nanoscale dimensions. A strong motivation for this work is the recognition that molecular design of organic materials for emerging nanolithographic approaches based on soft lithography and self-assembly is not constrained by the requirement for transparency at short optical wavelengths. This profound change provides the opportunity to design organic masking materials for greatly enhanced stability in plasma environments. The research project will bring together an interdisciplinary team of academic and industrial researchers, which also includes Prof. C. Grant Willson, University of Texas, Austin, Prof. David Graves, University of California, Berkeley, and Dr. Azar Alizadeh, Polymer Division, General Electric Global Research Center.

Takeuchi and Collaborators Runners-up for UMD Invention of the Year

Prof. Ichiro Takeuchi and collaborators W. Yang, K.-S. Chang, R. D. Vispute, T. V. Venkatesan were runners-up for the invention of the year (2004) in the physical sciences from the University of Maryland Office of Technology Commercialization. Their invention, titled: "Continuously Graded Thin Films for Functionally Broadband Device Arrays," improves on device arrays for microelectonics. In current arrays, each device performs a function with a slightly different specification relative to the adjacent device in the array. This new technology assembles functionally changing device arrays from composition spread thin films. Existing technology requires production of functionally varying devices separately, then physically integrating them to create the array. This new, more compact and elegant technology has varying physical properties pre-embedded in individual chips. The technology provides compact monolithic chips where relevant parameters, such as the energy band gap, continuously change across the chip. Such chips provide novel means for constructing compact device arrays at reduced expense. A single chip has been created where different wavelength light signals can be detected and distinguished. Such a detector has medical, environmental and military applications. A U.S. patent application is pending.

Oehrlein Receives the 2005 Prize in Plasma Science and Technology

Prof. Gottlieb S. Oehrlein has been awarded the 2005 Prize in Plasma Science and Technology by the Plasma Science and Technology Division of the American Vacuum Society "for groundbreaking contributions in the development of knowledge bases for plasma surface interactions in materials processing."

Al-Sheikhly elected President of the CIRMS

Prof. Mohamad Al-Sheikhly has been elected the President of the Council of Ionizing Radiation Measurements and Standards (CIRMS). His term began on October 26, 2005. CIRMS is an independent, non-profit council that draws together experts involved in all aspects of ionizing radiation to discuss, review and assess developments and needs in this field. CIRMS was established and is sponsored by the National Institute of Standards and Technology Physics Laboratory. Drawing upon expertise from government labs, agencies and departments, academia and industry, CIRMS has issued its third triennial report on "National Needs in Ionizing Radiation Measurements and Standards." For more information, see http://www.cirms.org.

Ankem finishes term as Director of NSF Metals Program

Prof. S. Rama Ankem served as the Program Director of Metals in the NSF Division of Metals Research from August, 2004–August, 2005. He performed a variety of tasks such as proposal reading, reviewer selection, panel moderator, approval or disapproval of annual and final reports, and interfacing with other program offices.

Briber receives Grant

Prof. R.M. Briber was awarded a $15M five year grant to work with the National Institute of Standards and Technology Center for Neutron Research to work on Spectroscopy and Scattering using Cold Neutrons for Applications in Materials Science and Engineering, Condensed Matter Physics and Chemistry.

Professors on Sabbatical

Prof. Gottlieb Oehrlein will be spending a Fall 2006 sabbatical at the Max-Planck Institute for Plasma Physics in Garching, Germany, an internationally recognized lab for plasma research. He will be collaborating with scientists in understanding plasma/materials interactions, which will play a crucial role in any future potential use of fusion as an energy source.

Prof. Ray Phaneuf will be on sabbatical in 2006 at the National Nanotechnology Lab in Lecce, Italy where he will work on nanoparticle enhancement of electroluminescence from protein and organic systems. This work will have potential applications for extremely high sensitivity biological sensors.

Faculty Honors

Prof. Luz Martinez-Miranda has been elected a Fellow of the American Association for the Advancement of Science (AAAS). The award is for: "Her achievements in advancing science and education among women and underrepresented minorities and for excellence in communicating the excitement of a research career to school children." The award was presented at the 2005 AAAS annual meeting.

Profs. Mohamad Al-Sheikhly and Rama Ankem have been promoted to the rank of Professor of Materials Science and Engineering.

Combinatorial Synthesis: A New Method of Discovery

Combinatorial synthesis is a newly emerging paradigm of research methodology which aims to drastically increase the efficiency at which new materials are discovered and improved. Using this technique, up to thousands of compositionally varying samples are synthesized, processed, and screened in a single experiment in order to rapidly survey large materials phase spaces. **Prof. Ichiro Takeuchi** and his research group are actively involved in the combinatorial approach to materials and its applications to a variety of materials systems. The materials systems of particular interest include magnetic materials and smart materials.

New materials tend to have increasingly complicated structures, often consisting of a large number of elements. The combinatorial techniques can be used to address materials issues at different levels in a wide variety of topics ranging from semiconductor manufacturing and thin film smart materials to catalytic powders and biomaterials. It is widely anticipated that combinatorial approach to materials will lead to accelerated innovation in various industries broadly benefiting our society.

The application of the combinatorial approach to technologically relevant electronic materials is best implemented in the form of thin film libraries. Combinatorial thin film libraries encompassing large compositional variations can be generated using different thin film deposition techniques. Prof. Takeuchi and his group have developed several deposition chambers at the University of Maryland. They also work on a number of collaborative projects with NIST on combinatorial investigations of functional materials using a 12-pocket dual electron beam combinatorial deposition system.

Recent developments include the establishment of the W. M. Keck Laboratory for Nanosynthesis and Multiscale Characterization located in the new Jeong H. Kim Engineering Building (Co-P.I.s: Profs. **Ichiro Takeuchi** [MSE], **Gary Rubloff** [MSE] and **Ellen Williams** [Physics]). In this Lab, combinatorial laser molecular beam epitaxy is used to generate libraries of functional oxide materials through atomic layer-by-layer controlled deposition. *In situ* electron diffraction is used to monitor the unit cell by unit cell construction of perovskite materials.

Takeuchi's combinatorial research effort is a significant component of the NSF funded International Materials Institute on Combinatorial Sciences and Materials Informatics Collaboratory. It also plays a key role in exploring new multiferroic materials, which are being pursued under NSF MRSEC.

photoGALLERY

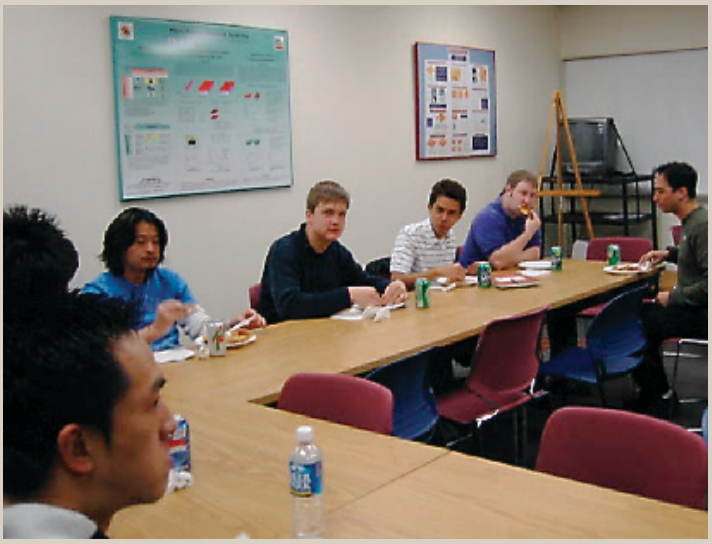
Dean Farvardin presents Jeong H. Kim with a clock for his office at the dedication ceremonies for the Jeong H. Kim Engineering Building on September 19, 2005.

Inductees into Alpha Sigma Mu. L-R: Erik Lowery, Scott Wilson, Michael Kasser, Erin Flanagan, Charles Brooks, Paul Freese. Not pictured: Margaret Bennett, Melissa Considine, Erin Dreyer, Neil Griggs, and Joanna Meador.

Erin Dreyer, selected as a University of Maryland Philip Merrill Presidential Scholar, identified Prof. Isabel Lloyd as her faculty mentor. Both are shown at the awards ceremony.

Left to Right: Cornelia Kennedy, Director of Alumni Affairs, Clark School of Engineering; Scott Wilson, MSE, Intern at Johns Hopkins Applied Physics Lab; Bob Raybits, Employment Manager, Northrop Grumman; Doug Tilley, ENCE, Intern at Structural Preservation Systems; Jodi Tallman, ENEE, Intern at Northrop Grumman and Nariman Farvardin, Dean, Clark School of Engineering.

Maryland Day attendees visit the MSE Department's information table *(above)* and Prof. Martinez-Miranda explains how a shape memory alloy works *(below)*.



MSE graduate students enjoy lunch provided by the Department during Graduate Student Appreciation Week.

Above: Graduate students hard at work! *L–R:* Erin Robertson, Susan Beatty, Allan Jaworski.

Left: Max Grace presents his research at the Achievement Rewards for College Scientists (ARCS) meeting. He received a fellowship for the 2006-07 academic year.

Team of Maryland Grads at Intel

Four recent Ph.D. graduates of the MSE graduate program will continue to see each other at Intel in Chandler, Arizona. **Zhengkun Ma, Hongxia Feng, Yuhong Cai and Ladan Mohaddes Ardabili** have all accepted positions at the facility which specializes in electronic packaging. They work in the same building but on different projects. **Olugbenga Famodu** has also joined Intel, but he is working a little farther north in Portland, Oregon. He received his Ph.D. in 2005.

Dr. Ma is working on failure analysis for electronic packaging materials to support pathfinding projects which are for applications in the next few years. Dr. Feng is focusing on the use of polymers for packaging of microelectronic devices. Dr. Cai is a pathfinding engineer, designing and developing a low density integration (LDI) semiconductor product based on the future market trend. She specifically is working on two projects: Stacked Package-on-Package (PoP) Design and WLAN product design. Dr. Mohaddes will work in the research and pathfinding sector to develop new electronic packaging methods. Dr. Famodu is working in the Thin Films group on the fabrication of semiconductor processing by using high purity metal sputtering. He is also part of the exciting new manufacturing process development, including the transition to 300 mm (12 in) wafers, as well as the migration from 0.13 micron to 90 nanometer technology. We wish them luck in their future endeavors!

Jun Ouyang Receives Award

Jun Ouyang received his Ph.D. from the Department of Materials Science and Engineering in 2005 under the direction of **Prof. Alex Roytburd.** He recently received a 2005 Chinese Government Award for Outstanding Students Abroad. He was one of 53 current and former Chinese Ph.D. students in the U.S. and the only one at the University of Maryland receiving this prestigious, merit-based award. Dr. Ouyang currently works at Seagate Technology in Minnesota involved in developing new high density consumer electronic data storage.

All the World's a Stage

Two years ago, **Chen Kung** had just received his Bachelor's degree in Materials Science and Engineering at the University of Maryland. Now, he is working in China for Ford Motor Compnay in their China Sourcing Office.

During his senior year, he received a job offer from Ford Motor Company to join their Ford College Graduate (FCG) program. Ford's FCG program consists of five developmental assignments throughout various areas of the company with each assignment lasting 6 months. Participants in FCG can also elect to pursue an advanced degree while working. Chen states that "the FCG program was the transition I needed from school to the 'real world' so I accepted their job offer. I'm now on my third assignment at Ford and am pursuing a Masters of Science in Industrial Engineering at Purdue University-West Lafayette."

His first assignment at Ford was as a corrosion engineer for their North American operations. He learned about general corrosion science, accelerated weather testing, and the importance of tetanus shots. Following corrosion, Chen joined Ford's Asia Pacific and Africa's (AP&A) technology deployment group. His responsibilities in AP&A included engineering parts for experimental research projects and implementing materials management systems to ensure that their vehicles meet global environmental standards. Currently, he is on an international assignment in China. He states that it is an exciting time to be in China. He has been mentoring and training newly hired employees and assisting in material selections for the parts Ford is sourcing. His next assignment may be in the area of hybrid vehicle and fuel cell design.

Please feel free to email him if you have any comments or questions at chen9358@gmail.com.

There is Always More to Learn

About half of the graduates of the undergraduate MSE program go onto graduate school either immediately following graduation or as they pursue careers.

Joanna Meador graduated in Spring 2005 and went directly to graduate school at Carnegie Mellon in Pittsburgh, PA. She is enrolled in the Ph.D. program working on a project exploring Praseodymium Calcium Manganate ($Pr_{0.7}Ca_{0.3}MnO_3$) as a possible material for storage material based on resistive switching. Resistive switching is being able to obtain two different resistances based on applied voltage. Joanna is happy to correspond about life as a graduate student with interested undergraduates. Her email address is jmeador@andrew.cmu.edu.

Kunal Thaker also went directly to graduate school after graduation. He attends the Massachusetts Institute of Technology. He is working on his Masters degree on a project involving the design and process control/characterization of hot micro-embossing. He reports that this is a promising method being investigated for the fabrication of polymer-based micro-devices (micro-fluidics and micro-optics). Kunal will graduate in June 2006 and will join the DC based consulting firm Booz-Allen-Hamilton.

Adding to the Knowledge Base

While many of our students go to work in industry or for government labs after graduate school, some decide to remain in school, but this time as faculty members. **Mutsuhiro Shima** received his Ph.D. in 1998, was a guest researcher at the National Institute of Standards and Technology and completed a post doctorate at Massachusetts Institute of Technology. He is an Assistant Professor of Materials Science and Engineering at Rensselaer Polytechnic Institute. He teaches both graduate and undergraduate courses.

Alumnus Receives Tenure

Pamir Alpay received his Ph.D. in 1999 under the direction of **Prof. Alex Roytburd**. He is a MSE faculty member at the University of Connecticut and was recently promoted from Assistant to Associate Professor with tenure.

Micron Memories

Several recent graduates have taken positions at Micron Technologies in Manassas, Virginia. **Chandler McCann, Erin Flanagan, Adam Haughton and Bryan Orf** will join the company which is a leader in advanced semiconductors and flash memory devices.

Calling All Alumni!

Have you changed jobs recently? Have you gone to graduate school and received a diploma? Maybe you have recently gotten married or have had a child. We will try to publish information about our grads so that we all will remain in touch. Of course, we will only publish information if you say it is okay! Please let us know what you are doing. Email **Kathleen Hart** at **hart@umd.edu**.

recentGRADUATES

2004–2006 B.S. Graduates

Charles Brooks
Richard Elkins
Paul Freese
Michael Kasser
Bryan Sadowski
Melissa Considine
Nathan Fierro
Adam Haughton
Chandler McCann
Matthew Stair
Erin Dreyer
Erin Flanagan
Mark Hanna
Joanne Meador
Scott Wilson

2004–2006 M.S. Graduates

Vivekananda Adiga
Chinmay Gowardhan
Bryan Orf
Erin Dreyer
Kevin McCarthy
Brian Harris
Greg Oberson

2004–2006 Ph.D. Graduates

Cai, Yuhong "Multiplexed Chemical Sensing and Thin Film Metrology in Programmable CVD Process" Advisor: Rubloff

Chen, Lang "Effect of Electric Field on Piezoelectric Response of Ferroelectric Thin Films" Advisor: Roytburd

Dai, Liyang "Elasticity of Ferromagnetic Shape Memory Alloys" Advisor: Wuttig

Famodu, Olugbenga "Combinatorial Investigation of Ferromagnetic Shape Memory Alloys" Advisor: Takeuchi

Feng, Hongxia "Suppression of Dewetting in Polymer Thin Films by Nanoparticles" Advisor: Briber

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endNOTES

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