



CONNECTIONS

ELECTRICAL AND COMPUTER ENGINEERING

Newsletter of the
Department of Electrical
and Computer Engineering

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Howard Milchberg named Distinguished Scholar-Teacher

"When Dr. Milchberg walked into the laboratory, he asked what people were doing and why they were doing it. These questions usually started a marathon discussion, often continuing over a couple of hours. The funny thing is, this often made him forget why he had come down to the lab in the first place."

That's a typical "Milchberg story," told by one of ECE Professor **Howard Milchberg's** former grad students, **Kiyong Kim**, who received his Ph.D. in Physics in 2003. Milchberg's teaching methods are indeed the stuff of legend, and recently, the University of Maryland validated his reputation by honoring him for both his teaching and his research as a Distinguished Scholar-Teacher.

Milchberg is happy about the honor, but adds, "Even if I hadn't been chosen, I am really pleased that the university has this program. It recognizes that teaching and research form a continuum. Even at the undergraduate level students are beginning to realize that ideas and even facts have a development history."

It's the third year in a row the A. James Clark School of Engineering has had a faculty member chosen for the award. ECE faculty member **Rama Chellappa** was an earlier recipient.

Kim recalls that while mingling in the lab may have been an unorthodox technique,

learning and discovery were taking place. Indeed, Kim believes that what he learned outside the classroom was often as valuable as what he learned inside it.



"Dr. Milchberg's enthusiasm in teaching never burned out, and his invaluable lessons really influenced me to break through the wall from student to researcher," says Kim.

Milchberg holds joint appointments with ECE, the Institute for Physical Science and Technology and the Physics Department. He is a recipient of the NSF Young Investigator Award and a Fellow of the American Physical Society.

Milchberg is at the forefront of research in intense laser pulses and their various applications. His highly regarded research focuses on the interaction of laser pulses with matter and measuring the ultra-fast, ultra-hot and ultra-dense processes that ensue. "Professor Milchberg has demonstrated for the first time ever a plasma-formed optical fiber for extreme intensity laser pulses," says ECE Professor **Isaak Mayergoyz**. "This was a land-

See *Milchberg*, page 2



Message from the Chair

At ECE we train and prepare the next generation of electrical and computer engineers, a mission we approach with great commitment and vigor. We recently redefined our undergraduate educational objectives and program outcomes to better prepare our students for their next step after graduation—whether it be in private industry and government careers, or in graduate study. We have worked diligently, using input from our faculty and others directly affiliated with our program. On page 4 we list and explain our redefined educational objectives and program outcomes.

In this issue of *Connections*, we again highlight the research of our talented faculty. In our cover story, we congratulate Professor **Howard Milchberg**, who has been named a Distinguished Scholar-Teacher by the University of Maryland. He is greatly respected for his research and appreciated for his teaching ability. I am proud to say that a faculty person from the A. James Clark School of Engineering has received this honor each of the last three years, and that two of the last three awards winners have been ECE faculty—Professor Milchberg this year, and previously, Professor **Rama Chellappa**.

On page 8 we profile Assistant Professor **Sennur Ulukus**, who recently won an NSF CAREER Award for “A Network Information Theoretic Approach to Wireless Ad-Hoc and Sensor Networks.”

Undergrad **Jane Lin**, who graduated this December with honors, has been selected as a runner-up for the Computing Research Association’s 2005 Outstanding Undergraduate Award. This honor reflects well on the quality of students within our program. Read about Jane on page 11.

We also include a profile on an outstanding alumni, **Ramesh Rao**, on page 6. Ramesh, whose Ph.D. advisor was Professor **Tony Ephremides**, was appointed the first holder of the Qualcomm Endowed Chair in Telecommunications and Information Technologies at the University of California, San Diego. He also directs the San Diego division of the California Institute for Telecommunications and Information Technology. Much of his ground-breaking work in wireless communications will help people during times of great difficulty and need. In the article, Professor Ephremides states that he has enjoyed watching Ramesh’s career take off. I think Tony puts it best when he says that the best is yet to come.

ECE is only as strong as its faculty and staff working together. I would like to say farewell to a person known by countless students and alumni who have come through our graduate program. **Dorothy Chu** worked for two decades with ECE and has now retired. In reading her profile on page 5, many of you, will, no doubt, remember her as a supportive member of our staff who took a real interest in students. I was not surprised at all to read how among her many memories she especially cherished working with students. I know that she made a difference by being there for them. We thank you, Dorothy!

Finally, on our back cover we honor the memory of **Brent Mayer**, a courageous undergraduate student diagnosed with cancer in 2004 who earned his degree this December, just one month before he passed away. We are setting up a scholarship fund in his honor, to which we hope you will consider contributing.

Steve Man

Milchberg

...continued from page 1

mark in the international efforts to develop compact laser-driven accelerators as well as laser-driven short wavelength sources.”

In addition to his accomplishments as a researcher, Milchberg is continuously praised by students for his teaching style. “Everyone enjoys his classes because of the knowledge and clarity with which he explains difficult technical subjects,” says Kim.

Milchberg joined the university in 1988. He says that he finds the most challenging and rewarding aspects of teaching involve the ability to “take complex concepts and explain them in terms that resonate.” ECE Professor **Christopher Davis** notes that students praise Milchberg for his teaching ability even though the subject matter he teaches—such as Quantum Electronics—is often considered intimidating by those same students. “He is consistently described by his students as ‘fantastic’; ‘best instructor I’ve had since I’ve been in graduate school’; and ‘an awesome person,’” says Davis.

Milchberg credits one of his own instructors with inspiring him as a teacher and researcher. “I had an undergraduate physics teacher, Carl Stager at McMaster University in Canada, who, in a mathematical development, checked if it made ‘physical’ sense every step of the way,” says Milchberg. “As a bonus, he was entertaining throughout. That was both a philosophical step for me—keeping theories always well grounded in reality—and a very useful way to check the work.”

After receiving his Ph.D. from Princeton, Milchberg worked at Bell Labs, where he discovered his area of research. “I was presented with basically an empty lab and a decent-sized budget to buy and fabricate lasers and experimental chambers,” he recalls. “One of the suggested areas for work was laser-matter interactions, as Bell Labs was interested in using x-rays from hot laser-produced plasmas as a source for advanced semiconductor microchip lithography. I built up the laser and the lab and proceeded to do the experiments with a new sub-pico-

second laser, which was state of the art for the time.”

The results were impressive. “It turns out that the experiments were so rich in basic physics that we never got around to the application originally intended, which was fine given how Bell Labs operated at the time,” says Milchberg. “Some of those experiments were among the first in this new field, and these days I am one of many researchers still pursuing this still-rich area, using much more powerful lasers.”

Currently, he is engaged in research on novel plasmas, including the study of intense laser-cluster interactions. Clusters are aggregates of approximately 10 to one

million atoms bound together by Van der Waals forces, and are most easily produced by high-pressure expansion through a pulsed nozzle.

“We recently temporally resolved the dynamics of the laser-induced cluster plasma explosion using a novel single-shot diagnostic technique,” Milchberg says. “This led to an understanding of the evolution of the exploding cluster dipole moment, which then led to the discovery of intense pulse self-focusing in gases of clusters. We are now setting up a new experiment to explore the role of multiple intense laser fields on the restraining of cluster explosions.”

Milchberg is passionate about his work,

in the lab and in the classroom. “He is confident, diligent and a true leader,” says Kim, now a postdoctoral research fellow at Los Alamos National Laboratory.

Kim was the second of Milchberg’s graduate students to receive the 2004 Marshall N. Rosenbluth Outstanding Doctoral Thesis Award in Plasma Physics given by the American Physical Society. Kim followed **Tom Clark**, an earlier graduate student of Milchberg’s, who received it in 1999. No other research group in plasma physics has won the award more than once. Kim notes, “This reflects both Professor Milchberg’s excellence in mentorship as well as scientific scholarship.”

Major awards to ECE faculty

Ephremides, Ulukus, Tassiulas part of new ‘Modeling, Analysis and Control’ MURI

Professor **Anthony Ephremides**, Assistant Professor **Sennur Ulukus**, and Research Professor **Leandros Tassiulas** are part of a recently announced Department of Defense Multidisciplinary University Research Initiative (MURI) grant under Army Research Office topic “Cross Disciplinary Approach to the Modeling, Analysis and Control.” The lead institution is the University of California, Santa Cruz, where J.J. Garcia-Luna-Aceves is the principal investigator. The grant provides for up to five years and \$5 million in funding, and the Maryland team’s portion represents about 20 percent of the total.

The project will address energy efficiency, cross-layer optimization, interaction between physical layer, MAC, routing, compression, and scalability of protocols. Special attention will be given to sensor networks where there is a need to map mission-specific performance measures to classical networking performance metrics.

Dr. Ephremides is the principal investigator for the Maryland portion of the

MURI. Besides UCSC and Maryland, other participating institutions include the Massachusetts Institute of Technology; Stanford University; the University of Illinois Urbana-Champaign; the University of California, Berkeley; and the University of California, Los Angeles.

NSF grant to André Tits for research to develop optimization algorithms

Professor **André Tits** is the principal investigator for a three-year, \$200,000, National Science Foundation grant for “Feasible Point Optimization Methods for Design and Other Engineering Applications.” The research will develop, analyze, implement, and test numerical algorithms for the solution of constrained optimization problems with a large number of inequality constraints. Such problems are common in engineering applications. The resulting algorithms and software should have a significant impact in a wide range of application areas.

Davis, Tretter, get MIPS contracts

ECE faculty are associated with two new Maryland Industrial Partnerships (MIPS)

contract awards. The MIPS program provides matching funding for university-based research projects that help companies develop new products. MIPS projects must deal with innovative technological or scientific concepts and have direct commercial applications.

Professor **Christopher Davis** is working with Techno-Sciences, Inc., of Lanham, Md., to develop a sensor package for weapons performance monitoring, target location, and automatic counter-fire. The system could identify the characteristic signature of a munition, and with multiple acoustic sensors and time interval management, triangulate its origin in real time.

Professor **Steven Tretter** is working with TeleContinuity, Inc., of Rockville, Md., to create a capability for seamlessly providing interoperable wireless communications for first responders in and around disaster areas. A proof-of-concept demonstration will be developed using a common physical backbone to interconnect off-the-shelf, air-interface, access-point hardware. The goal is to help police, fire department, and FEMA workers communicate using cell phones, UHF radios, PDAs, and other devices even when normal communication lines are destroyed.

ECE redefines educational objectives and program outcomes

ECE approaches its mission to train and prepare the next generation of electrical and computer engineers with great commitment and vigor. Recently, the department redefined its undergraduate educational objectives and program outcomes to better prepare students for their next step after graduation—whether it be in private industry and government careers, or in graduate study.

“The faculty felt it was time to revisit them in light of changes in policies by the Accreditation Board for Engineering Technology (ABET) in the last five years,” says ECE Department Chair **Steve Marcus**. “Working with IEEE and other professional organizations, ABET has defined sets of program outcomes for all fields of engineering. Here in ECE we have taken the ABET program outcomes for electrical engineering and computer engineering and reworked them to make it clear what we are trying to achieve.”

The educational objectives and program outcomes were derived through intense study and discussion by ECE’s Undergraduate Affairs Committee, then sent on for review and approval to Dr. Marcus, the Department Council, the department’s Outside Advisory Board, which consists of members from academia and industry, and finally the faculty as a whole.

The educational objectives are broadly stated goals pertaining to accomplishments or level of achievement desired of students three to five years after graduation:

- **Technical Knowledge:** The department aims to graduate engineers trained in the fundamentals of electrical or computer engineering and relevant specialties and prepared to succeed in graduate school and/or be productive

engineers in government or industry.

- **Laboratory, Design, and Research:** The department aims to graduate engineers who can design and perform experimental projects to solve diverse problems, with special emphasis on exploiting diverse technical knowledge and skills so they can engage in design work or research.
- **Preparation for Further Study:** The department aims to graduate engineers who have the educational foundations and skills necessary to engage in lifelong learning in every sphere of their life.
- **Professionalism:** The department aims to graduate engineers who have the professional skills they need to succeed in their chosen profession and who are prepared to fulfill their professional responsibilities as engineers. These include their ethical obligations to society, employers, employees, and fellow engineers.

A comprehensive set of program outcomes which include and expand on the ABET defined outcomes has been derived from the educational objectives. “These are skills our students are expected to know and perform by the time they graduate so the educational objectives can be achieved,” Associate Chair of Undergraduate Studies and Professor **Jon Orloff** says. “We believe that these redefined outcomes make it easier to understand how we assess whether the programs are achieving the outcomes and how we will use the results of the assessment to improve the programs.” The program outcomes are:

- **Broad Foundation:** Understanding of and ability to apply relevant mathematical, scientific, and basic engineering knowledge.

- **Disciplinary Foundation:** Understanding of and ability to apply core electrical or computer engineering technical knowledge.
- **Specialization:** Understanding of and ability to apply the skills and concepts within one or more of the specializations within electrical or computer engineering.
- **Laboratory:** Understanding of and ability to employ standard experimental techniques to generate and analyze data as well as use state-of-the-art software and instrumentation to solve electrical or computer engineering problems.
- **Design:** Theoretical understanding of and ability to engage in the creative design process through the integration and application of diverse technical knowledge and expertise to meet customer needs and address social issues.
- **Research:** Ability to formulate and answer empirical and theoretical questions through participation in undergraduate research projects for interested and qualified students.
- **Leadership:** Awareness of the need for engineering leaders both within the profession and the larger community as well as some preparation to assume those leadership roles.
- **Communication Skills:** Ability to communicate effectively through both oral presentations and the written word.
- **Interpersonal Skills:** Ability to interact professionally with others in the workplace, to engage effectively in teamwork, and to function productively on multidisciplinary group projects.
- **Engineering Ethics:** Understanding

of the engineer's responsibilities to employers, society, and their fellow engineers as well as an ability to recognize potential and actual ethical problems, analyze critically those situations, and formulate sound ethical decisions.

- **Engineering & Society:** Understanding of the symbiotic relationship between engineering and society—specifically, how engineering artifacts are shaped by and incorporate human values as well as the ways in which engineering solutions impact society—and the

larger social obligations this entails for engineers.

- **Lifelong Learning:** Skills necessary to engage in lifelong learning and an understanding of the need to continually exploit those skills in refining and updating one's knowledge base. 

Dorothy Chu retires after 22 years of 'being there' for students

Dorothy Chu spent two decades working in the ECE graduate program. In all that time she never tired of seeing students graduate and as she puts it, "go on with their lives. That was especially rewarding for me," says Chu, who recently retired as a coordinator.

Chu came to the university in 1970, working in the registration office. "My husband was pursuing his Ph.D. in education at the University of Maryland, so I applied for a job there," she recalls. Chu eventually joined ECE in 1982 as a Classified Secretary III. Throughout the years, Chu gained the respect and admiration of her co-workers and others throughout the department and campus. Chu has been described as a "one-woman show" and someone who "always knew what she was doing."

Countless times, Chu provided a friendly shoulder or sympathetic ear for students when things were not going well. "Sometimes students would be very discouraged. Perhaps they had failed an exam. I was always trying to encourage them and tell them, 'Don't give up,'" she says. "I tried to be there for them."

Originally from China and later from Taiwan, Chu frequently was called upon to help translate for students who came through the graduate program. "I would be asked to speak with them and then help explain what they wanted," she recalls. "I

was very glad to be able to help the students in that way."

At one point, working for ECE and the university became a family affair when Chu was joined by her daughter Jennifer, who worked for ECE during her summer breaks from school. Today, Jennifer, who went on to obtain her Ph.D., is a senior research scientist for Pfizer in Connecticut. "She didn't want to eat lunch with me when she worked here!" Chu recalls. "She wanted to spend time with the other student workers. But we did ride in and back home together each day. That was nice."

In addition to the many students she has seen graduate, Chu has seen several deans and department chairs pass through, including deans **George Dieter**, **William Destler** and **Nariman Farvardin** and department chairs **Lee Davisson**, **Destler**, **Farvardin** and **Steve Marcus**. She also has worked with several graduate directors, including **Gilmer Blankenship**, **Fawzi Emad**, **Charles Silio**, **André Tits** and **Elisabeth El-Khodary**. "I enjoyed it all," she says.



Dorothy Chu with Senior Vice President for Academic Affairs and Provost William Destler, one of those who served as ECE department chair during her tenure.

Chu and her husband, who also just retired from directing learning resource services at Northern Virginia Community College, are now preparing to travel the world. The couple plans to not only return to China but also to visit Greece and New Zealand in the coming months. They are eagerly preparing, says Chu, by thoroughly studying the history and culture of the different places they will visit. "Before, I didn't have enough leave," says Chu of her busy travel agenda. "Now, I don't have to worry about that." 

Ramesh Rao's wireless communications research could impact countless lives

Alumnus believes 'technology is there for people'

Alumnus **Ramesh Rao** designs research to have a real and direct impact on the lives of many people during a natural disaster or to help one person suffering a stroke—all through better understanding and use of wireless communications technology.

His humanitarian research focus is no accident, says Rao, the Qualcomm Endowed Chair in Telecommunications and Information Technologies in the Jacobs School of Engineering at the University of California, San Diego (UCSD). "These projects reinforce my belief that technology is there for people. Technology can make a real difference in the needs of society."

A specialist in network protocols, performance analysis and energy-efficient communications, Rao also is the director of the San Diego division of the California Institute for Telecommunications and Information Technology. The institute is one of four created by California in 2000 to ensure that the state maintains its leadership in cutting-edge technologies.

"Ramesh Rao was from day one an inspired and imaginative individual," says ECE Professor **Anthony Ephremides**, Rao's Ph.D. advisor. "He was unquestionably one of the best students in our department and his doctoral research had far-reaching consequences in the field of wireless networking that was merely emerging at the time."

Today, Rao's research is highly regarded and well-funded by the National Science Foundation (NSF), the National Institutes of Health (NIH), and the Naval and Army

Research Offices, among others. Rao has also served on a federal government panel to review the status of research, development, and applications in wireless communications in the United States, Japan and Western Europe.

He is co-principal investigator for the NSF-funded multidisciplinary "Responding to Crises and Unexpected Events (RESCUE) project." The five-year, \$12 million grant is designed to examine how information technology can revolutionize response to crises, such as natural disasters. "The project," says Rao, "will develop new tools and strategies for first responders. The goal is to transform their ability to act as human sensors to gather, manage, use and disseminate information and help reduce casualties, economic loss and social disruption."

The project incorporates two interrelated research approaches—scalable and robust information technology solutions that facilitate access to appropriate and timely information by individuals and organizations; and social science research that clarifies the distinctive nature of dynamic virtual organizations and the social and cultural aspects of information sharing across organizations and individuals.

"Such information systems must provide access to the right information by the right individuals and organizations at the



right time," says Rao.

Rao is also engaged in research through the Wireless Internet Information Systems for Medical Response in Disasters (WIISARD) project. Funded by NIH, WIISARD can be deployed at the site of a terrorist attack or natural disaster to support the care of large numbers of victims for several hours or several days while national medical resources are being marshaled.

"The difficult-to-accept truth of our present era is that the United States faces a future clouded by the threat of terrorist actions involving nuclear, biological and chemical agents," says Rao. "Such actions could produce large numbers of civilian casualties that would overwhelm existing healthcare facilities, jeopardizing the lives of both victims and healthcare providers. We believe current technologies supporting the acute field care of victims of disasters are simply inadequate and that new systems and technologies for care need to be developed."

WIISARD is an integrated application that will bring cutting-edge wireless Internet technologies "from the hospital to

the field treatment station.” Rao says it has components that enhance the situational awareness of first responders, facilitate recording of medical data, aid in the monitoring of severely ill patients, and help communicate data to hospitals.

For individuals, there is StrokeDoc, formally known as the Multimedia Telemedical Diagnostic System. This project harnesses high-speed, multimedia delivery to allow specialists to examine possible stroke victims remotely, a potentially life-saving process. “StrokeDoc can determine whether stroke victims are candidates for a drug therapy that can limit the lasting damage,” says Rao.

Rao is engaged in many other projects as well. He looks at the world around him to see the ways technology can be used to meet needs. “As we speak,” he says, “my colleagues and I are looking to respond in concrete ways to the problems the recent tsunami presented.”

Born in Sindri, India, Rao’s father was a chemical engineer, so engineering seemed

a logical career path for the young Rao. After receiving a bachelor’s degree in electronics and communications with honors from the Regional Engineering College of the University of Madras in 1980, he knew he wanted to go to the United States for graduate school. “The University of Maryland had a good and large program. I didn’t apply to too many other places,” he says. “I still can vividly recall receiving the letter offering a research assistantship with Professor Ephremides,” says Rao.

Rao describes his time in the ECE Department as a “rebirthing experience. It reprogrammed my brain,” he says. “There was a certain mathematical emphasis in the area that I was studying. I learned to approach topics with way more rigor than I had been exposed to before.”

He received both his master’s and Ph.D. degrees from the University of Maryland in 1982 and 1984, respectively. As he was finishing up his graduate studies, he remembers being called into Ephremides’

office one day. “Tony told me, ‘There is a faculty opening at the University of California, San Diego, and I want you to apply for it.’” Rao did, and was hired. While at UCSD and prior to his current positions, he served as the director of the UCSD Center for Wireless Communications and was the vice chair of instructional affairs in its Department of Electrical and Computer Engineering.

Through the years he has remained fond of his alma mater and it of him. When he was awarded the Qualcomm Endowed Chair, two very important people in his life traveled to California for the formal ceremony. “My mother was there, and Tony was there. That meant a lot to me,” says Rao.

Ephremides wouldn’t have missed it. “I knew he would be highly successful, and I have been gratified to witness his spectacular accomplishments,” says Ephremides. “But the best is yet to come.”

Ranjan works for tsunami relief

Dr. Priya Ranjan, who earned his Ph.D. in Electrical Engineering in 2003, is very active in humanitarian work for



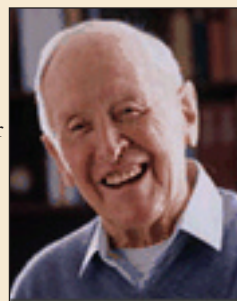
his native India through his involvement with Association for India’s Development (AID). Priya’s faculty advisor was Professor **Eyad Abed**, director of the Institute for Systems Research (ISR), and he is currently a postdoctoral researcher at ISR. Most recently, Priya and AID have been active in efforts to assist Indian victims of the tsunami. Priya has been a spokesperson for the effort on local TV news and was quoted in a story in *The Washington Post*.

Plummer, Miller receive Draper Prize

In February, **James W. Plummer**, ECE ’53, received the Charles Stark Draper Prize—one of the world’s preeminent awards in engineering—from the National Academy of Engineering (NAE). Plummer was honored for his pioneering work in the top-secret Corona Project.

Another A. James Clark School of Engineering alumnus, **Edward A. Miller** (ME ’50), also received the award for his work on the project.

The Draper Prize honors an engineer “whose accomplishment has significantly impacted society by improving the quality of life, providing the ability to live freely and comfortably, and/or permitting the



access to information.”

In all, five members of the Corona Project were presented with the award. Mr. Plummer went on to become Under Secretary for the Air Force and had a successful corporate career as well.

The Corona Project (1959 to 1972) created the field of satellite surveillance, providing vital photographic information that permitted the United States to gauge the nuclear threat posed by the Soviet Union during the Cold War and pursue more effective foreign policies. Mr. Plummer served as project manager and Mr. Miller as project engineer. Their team accomplished the first successful recovery of a man-made object from earth orbit.

Previous Draper Prizes recognized those who pioneered or developed personal computer networking, the global positioning system, fiber optics and other major engineering advances.

Sennur Ulukus receives NSF CAREER Award

Research focuses on information theory in wireless communication



Assistant Professor **Sennur Ulukus** has won a National Science Foundation CAREER Award for “A Network Information Theoretic Approach to Wireless Ad-Hoc and Sensor Networks.” The NSF CAREER program recognizes and supports the early career development activities of teacher-scholars who are most likely to become the academic leaders of the 21st century. CAREER awardees are selected on the basis of creative career-development plans that effectively integrate research and education within the context of the mission of their institution.

“This award is a very significant achievement for me professionally,” says Ulukus. “Information theory is such an exciting area of research and a new frontier in the field of wireless communication.”

Information theory attempts to answer the question of how much information can be transmitted in a communication channel from a transmitter to a receiver. “This information may be mastered in terms of bits per second,” Ulukus says. “However, network information theory

the links between the various transmitter-receiver pairs interact, since the transmitted signals get scrambled altogether in the air. The transmission of the different pairs thus creates interference on the pairs. This gives rise to many difficult but interesting theoretical problems, Ulukus says.

Ulukus hopes to develop a comprehensive information theoretic framework for determining the ultimate capacity limits of such networks and for developing efficient coding, transmission, reception and decoding schemes. She explains that her work is structured into four “heavily interrelated parts—network, data, tools and channel, and will investigate the capacity regions and capacity achieving transmit/receive coding/decoding schemes of basic network structures that are building blocks of general ad-hoc, multi-hop wireless networks, with an emphasis on the interference channel.”

The research develops principles of communicating correlated and common data for the specific goal of determining optimum coding and transmission schemes.

generalizes this question and asks, ‘How much information can we transmit from a set of transmitters to a set of receivers simultaneously?’”

The problem is much more difficult in a wireless communication system because

It also studies the trade-offs between performance and complexity; in particular, the loss in performance when source-channel separation principles are enforced.

Ulukus became interested in this area after joining the University of Maryland faculty in 2001. “This is a very prominent place for my type of research,” she says. “It is one of the best places to be.”

Ulukus received her bachelor’s and master’s degrees in electrical and electronics engineering from Bilkent University in Turkey in 1991 and 1993, respectively. She received her Ph.D. in electrical and computer engineering from Rutgers University in 1998 and went on to work as a senior technical staff member at AT&T Labs-Research from 1998 to 2001. But her heart was always in academia, she says.

“I have always wanted to be a professor, as far back as I can remember,” says Ulukus, who holds a joint appointment with the Institute for Systems Research and is the co-recipient of the 2003 IEEE Marconi Prize Paper Award in Wireless Communications. “I like the idea of teaching and research. I see teaching as such a noble way of living by contributing to people’s lives.”

She was drawn to engineering for many of the same reasons—the impact that her research may have on the lives of the individuals who use it. “Engineering is not abstract,” she says. “You see the applications of it and how it can be used by people and contribute to society.”

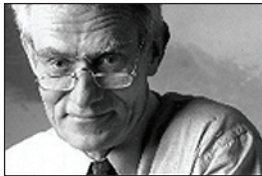
This includes her current research and the possibilities it may hold. “My goal is to understand the ultimate capacity of the wireless communication network. It is an extremely open-ended project with hundreds of people working on it and everyone trying to understand it. We are on the cusp of something very significant.”

Shamma, Melngailis named Fellows

Professor **Shihab Shamma** has been named a Fellow of the Acoustical Society of America, “for contributions to computational modeling and cortical physiology of the mammalian auditory system.”

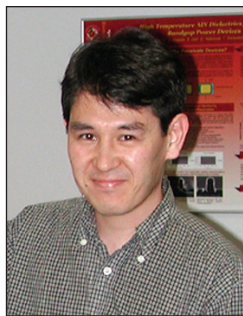


Professor **John Melngailis**, a pioneer in the application of focused ion beams, has been named an IEEE Fellow for his contributions in this field. He has long been recognized as a key figure in the prominence of focused ion beam (FIB) technology, from its many applications in microelectronics and related fields to the central role it now plays in nanofabrication. Melngailis also has been instrumental in the establishment of the new Maryland Center for Integrated Nano Science and Engineering and the Fablab.



Ghodssi, Horiuchi promoted

ECE faculty members **Reza Ghodssi** and **Timothy Horiuchi** (right) have been promoted to Associate Professors with tenure by University of Maryland President C.D. Mote.



In addition, Ghodssi has received a three-year Research Opportunities in Space Science award for Phase Fresnel Lens development. This program had significant visibility at NASA this year, in part due to important contributions by two of Ghodssi's graduate students, Brian

Morgan and Mike Waits, who is currently working full time at the Army Research Laboratory (ARL) while also a Ph.D. student in the ECE Department. “It holds great potential for space applications,” says Ghodssi (above) of the research. The work was done in collaboration with John Krizmanic and his colleagues at NASA Goddard Space Flight Center. “This is excellent news for the MEMS-based Gray-Scale Technology research activity in our research group, which is currently funded by and in collaboration with ARL,” Ghodssi says.



K.J. Ray Liu elected to IEEE Signal Processing Society post

Professor **K.J. Ray Liu** has been elected as Vice President-Publications of the IEEE Signal Processing Society for the 2006–2008 term. This officer position manages *IEEE Trans. on Signal Processing*, *IEEE Trans. on Image Processing*, *IEEE Trans. on Speech and Audio Processing*, *IEEE Signal Processing Magazine* (where Dr. Liu is currently editor-in-chief), *IEEE Signal Processing Letters*, and *IEEE Signal Processing News Letter*. This position also selects and appoints editors-in-chief, Publication Board chairs, and Executive Committee and Board of Governor members of the IEEE Signal Processing Society.

Additionally, Liu is the prime architect and proposer of a new IEEE journal, *IEEE Transactions on Information Forensics and Security*. The journal will provide a unified locus for archival research on the fundamental contributions and the mathematics behind information forensics, information security, surveillance, and systems applications that incorporate these features. It will launch in 2006, and Liu will manage it as part of his Vice President duties.

Min Wu a ‘young person to watch’

Assistant Professor **Min Wu** was named one of 20 “young people to watch in 2005 and beyond” by *Washingtonian* magazine in its annual “Best of Washington” issue. The article, in the magazine’s December issue, calls Wu a “cyberstar,” noting her expertise in digital watermarking. Last fall, Wu was selected by MIT’s *Technology Review* magazine as one of the world’s “100 top innovators.”

Ephremides gives talks, wins awards, named editor

Professor **Anthony Ephremides** has been appointed editor-in-chief of *Foundations and Trends in Networking*, a new high-quality and selective periodical published by a new Netherlands publisher, NOW—The Essence of Knowledge. Ephremides was also an invited panelist to the Network Science Panel at the 24th U.S. Army Science Conference in Orlando, Fla., an invited speaker to the Technical University of Vienna, Austria, and one of eight speakers from around the world at the inauguration ceremony of the enlarged LG Labs in Seoul, South Korea. LG is one of the largest manufacturers of cell phones worldwide and supplies, among others, Verizon and other companies. In addition, Dr. Ephremides recently received an award from the Naval Research Laboratory for his paper, “Performance Evaluation of Random Access in Wireless Networks with Multiple Destinations.”

Discover discovers Taylor

In its story of the 100th birthday of “modern electronics,” *Discover* magazine cites Professor **Leonard Taylor’s** “Thumbnail History of Electronics” web page as a useful source of additional information. *Discover* dated the birth of modern electronics to British engineer John Ambrose Fleming’s patent of the first electronic gadget: a thermionic diode, or vacuum tube,

that converted an alternating current into a direct current.

Jájá and Liu named Iowa State Distinguished Lecturers

Professors K.J. Ray Liu and Joseph Jájá have been named Distinguished Lecturers for Iowa State University's ECE Distinguished Lecture Series. Liu spoke on "Tracing Traitors: Collusion-Resistant Fingerprinting for Multimedia Forensics." Jájá spoke on "Efficient Algorithms for Exploring Large-Scale Multidimensional Time Series Data."

Bhattacharyya named senior specialist candidate

Associate Professor Shuvra Bhattacharyya has been named a senior specialist candidate by the J. William Fulbright Foreign Scholarship Board. For the next five years he will be eligible for two- to six-week international grant opportunities through the Council for International Exchange of Scholars. Bhattacharyya also has been named an associate editor on the editorial board of *IEEE Transactions on Signal Processing*.

Antonsen wins faculty research award

Professor Thomas Antonsen is the recipient of this year's A. James Clark School of Engineering Outstanding Faculty Research Award. The award recognizes exceptionally influential research accomplishments. Antonsen received the award for his major contributions to millimeter wave generation, free-electron lasers, fusion energy science, chaos, nonlinear dynamics and most significantly, laser plasma and laser gas interactions. Antonsen's work has brought him high distinction as a pre-eminent leader in his field of specialization.

Barua receives TEDCO funding

Assistant Professor Rajeev Barua has received a research funding award of \$50,000 for "A Dynamic Memory Allocator for Embedded Systems with Scratch-Pad Memory" from the Maryland Technology Development Corporation. The award is given for new technologies that have significant commercial potential.

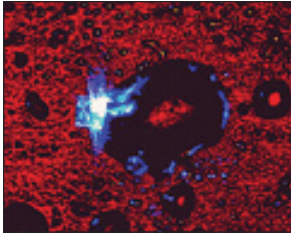
Gomez to chair magnetics conference

Associate Professor Romel Gomez has been appointed as the general chair of the 2006 International Magnetics Conference, the annual flagship conference of the IEEE Magnetics Society.

Plasmon microscope work of Davis and Smolyanivov to appear in *Physical Review Letters*

Professor Christopher Davis and ECE Associate Research Scientist Igor I. Smolyanivov are in the news for their work on a high resolution 2-D plasmon microscope.

Their work has been accepted for publication in an upcoming issue of *Physical Review Letters*,

perhaps the most prestigious of all physics journals. The photo above, taken from the article to appear, shows a 100-micron-wide drop of glycerin (dark ellipse) acting as a parabolic focusing mirror in a new technique that can reveal details smaller than a wavelength of light using an ordinary microscope. The blue color in the image is scattered laser light. 

studentnews

Powers, Ghodssi win Bioscience Research Review Day prize

A poster presented by second-year graduate student Michael Powers and Associate Professor Reza Ghodssi was a winner in the poster competition at the Maryland Bioscience Research Review Day 2004. The work was titled, "Toward a Biophotonic MEMS Cell Sensor." Powers is a member of Ghodssi's research group and also is an Army Research Laboratory Fellow. There were 120 posters entered in the competition.

Waits quoted in *New Scientist*

A *New Scientist* magazine article on micro-engines featured a quote from Ph.D. student Mike Waits, whose advisor is Associate Professor Reza Ghodssi. Waits is an electronics engineer in the Sensors and Electron Devices Directorate at the Army Research Laboratory.

Ahmadi wins prizes for paper

ECE junior Amir Ahmadi has won two prizes for his paper, "Adjustable Time Delays For Optical Clock Recovery Systems." He received the Undergraduate First Prize in the 2005 annual paper competition of the DC Council of Engineers and Architect Societies, as well as the Washington Society of Engineers' 2005 Young Engineer Prize. At a February awards banquet Amir received both awards along with two checks for \$500 each. Amir and his teammate, Elric Von Eden, won first runner-up honors in the 2004 MERIT Fair in the RITE category. Their mentor was Assistant Professor Tom Murphy. 

Undergrad Jane Lin named CRA Outstanding Undergraduate Runner-Up

Recent ECE grad **Jane Lin** has studied the martial arts since she was six. By the time she was a senior in high school, she had earned a black belt in Cuong Nhu Karate. “I’ve learned a lot about determination and perseverance in my academic achievements through karate,” she says.

“If you take a class and you study and don’t do so very well, you have to be determined to try that much harder. I’m not sure I would be as determined if I didn’t have the experience that I’ve had with karate. Karate has helped me build up determination and try to achieve whatever I want to do.”

That includes ground-breaking research on the behavior of solutions to the Boolean Satisfiability (SAT) problem. Lin, who graduated in December with honors, was recently selected as one of the runners-up for the Computing Research Association’s (CRA) 2005 Outstanding Undergraduate Award. The award recognizes undergraduate students at United States and Canadian institutions who show outstanding computing research potential. Each year, the award is given to one female and one male undergraduate student.

CRA is an association of more than 200 North American academic departments of computer science, computer engineering and related fields; laboratories and centers in industry, government and academia engaging in basic computer research; and affiliated professional societies.

Lin has spent the past two years working on the Boolean Satisfiability problem in Assistant Professor **Gang Qu’s** research group. “SAT is one of the most important problems in many fields such as theoretical computer science and artificial intelligence and has found numerous applications,” says Qu.

After graduation, Lin accepted a position in electronic surveillance for Booz Allen Hamilton, a strategic management and technology consulting firm. However, being named runner-up for such a prestigious honor has her seriously thinking about graduate school. She has already been accepted into the graduate program at the University of Maryland. “I’m definitely leaning in that direction,” she says. “Actually, one of the reasons I went to work first was to help me narrow down what I want to do in research if I decide to go back to school.”

The daughter of two computer scientists, Lin was drawn early on to computer engineering. “In high school I took programming courses, everything that was offered,” she says. “I enjoyed learning computer languages. So, when I applied to college, I knew that I wanted something related to computer science and computer engineering.”

“Computer engineering is the underlying foundation for a lot of other fields, and depending on what you want to do you can contribute to so many different areas with this background,” Lin says.

Eager to pursue research, Lin was grateful for the opportunities the university and engineering school afforded her as an undergraduate student. “Unlike a lot of other universities, the University of Maryland offered many different research programs for undergrads,” she says. “Giving undergrads opportunities to do research helps lead us toward graduate school and gives us experience that others students don’t have.”

Lin received the Career and Technology Excellence in Career Technology Internship Award in 2001, has been an undergraduate teaching fellow for ECE and has been on both the university’s dean’s list



and the national dean’s list. Lin received the Best Research Project prize in ECE’s 2003 MERIT summer program in the same research area that she pursued with Dr. Qu. “That was my first experience with research,” she says. Afterwards, Lin designed and implemented a random 3SAT generator that builds 3SAT instances possessing particular properties. Using the generated data, she and her colleagues showed that the difficulty of a problem is related to the number of solutions that an instance has. Dr. Qu says that Lin’s main contribution is in developing software “that automatically creates hard-to-solve SAT problem instances, one thing that many researchers have been working on with little success in the past decade.”

Despite her accomplishments, Lin says she was surprised by the recent CRA honor. “I knew it was very competitive,” she says.

Lin has remained involved with karate throughout her academic career, making certain there is time for it. She now teaches karate classes herself. “I just wanted to contribute something back to the karate community,” she says. “I grew up with it and it has taught me so much.” ☐

Memorial scholarship to honor recent ECE graduate Brent R. Mayer

The ECE Department has set up a special memorial scholarship fund to honor **Brent R. Mayer**, who graduated this past December with a B.S. in Electrical Engineering and died January 20, 2005, little over a year after he had been diagnosed with Acute Lymphoblastic Leukemia.

Mayer was a courageous individual who came from a family of six children and was the first in his family to gradu-

ate from college. He paid for his own education and held down almost a full time job to do so. Mayer loved sports, playing the guitar and electronics. He completed his degree this past fall while undergoing chemotherapy.

His fiancé, **Lori Cumberland**, Marketing '01, recalls that Mayer was "one of the most amazing people that I have ever met. His strength and will to live were inspirational to all who met him. Everyone who knew him instantly became his friend and was encouraged by his love of life and triumph over hardship."

Cumberland continues, "He was supposed to graduate from college in May 2004 but his last semester was delayed [because of his illness]. I was amazed that he decided to go back to school in the fall and thanks to cooperation of the University of Maryland, he was able to graduate in December in the midst of his chemotherapy."

To contribute to the fund, make a check payable to the University of



Brent Mayer and fiancé Lori Cumberland.

Maryland College Park Foundation (UMCPF), specify "Brent R. Mayer Memorial Scholarship Fund" in the memo section, and mail to: Brent R. Mayer Memorial Scholarship Fund, Department of Electrical & Computer Engineering, A.V. Williams Building, College Park, MD 20742.

For more information, contact Radka Nebesky at (301) 405-8072 or radka@umd.edu.

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