

# New MESA Project Brings Solar Energy Education to ECE

The Maryland Educational Solar Array (MESA), a new alternative energy project within the Department of Electrical and Computer Engineering (ECE) organized by Director of Technical Operations **Bryan Quinn** ('01), was launched this spring to offer students new educational opportunities in alternative energy.

Last spring, the University of Maryland Campus Green Fund awarded the MESA project a campus sustainability grant worth \$30,000 in funding, the largest of six grants that were awarded across campus, selected from more than two dozen applications.

"The most gratifying thing is students are saying they want this; they gave their money to fund these projects," said Quinn.

On April 30, an estimated 97,000 visitors Maryland Day visitors viewed technologies of



BRYAN QUINN AT MESA EXHIBIT

the future, including exhibits and demonstrations entirely powered by solar energy, thanks to MESA. Quinn and several volunteer students from Engineers Without Borders put together a solar array outside on the Jeong H. Kim Engineering Building Plaza that powered engineering exhibits using only energy from the sun. The MESA solar array provided over 2.25kW hours of green power

and had the capacity available to provide three times that amount.

Quinn recently installed a solar array on the roof of the A.V. Williams Building as part of an alternative energy teaching curriculum, which will ultimately expand into wind and kinetic energy generation. The facility will support new courses in ECE including an energy/power survey course open to all students. Students will get hands on experience designing and testing alternative energy systems. MESA has already performed demonstrations for courses in the Honors College. When not in use for educational purposes, the facility will be open to researchers and community outreach events. The MESA project coordinators are also constructing a mobile unit to take to area K-12 schools as an educational outreach tool. ☐

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A special thanks to our latest ECE Corporate Affiliate members:



THALES

To learn more about the ECE Corporate Affiliates program, or ways to help advance the ECE Department, please contact Asante Shakuur at [ashakuur@umd.edu](mailto:ashakuur@umd.edu) or 301-405-8189.

Corporate Affiliates, alumni and friends can help make a difference with a gift of any amount!

**CONNECTIONS** is published for alumni and friends of the Department of Electrical and Computer Engineering at the A. James Clark School of Engineering, University of Maryland.

Your alumni news and comments are welcome. Please send them to: Ted Knight, ECE Department, 2457 A.V. Williams Building, College Park, MD, 20742. Visit our web site at:

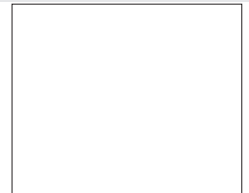
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# @CONNECTIONS

DEPARTMENT of ELECTRICAL & COMPUTER ENGINEERING

A. JAMES CLARK SCHOOL of ENGINEERING

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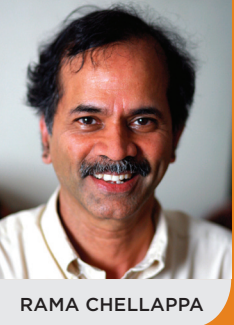
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# message from the chair



## PRIORITIES FOR A NEW YEAR

It is a pleasure and honor to take on the role of Interim Chair of the Department of Electrical and Computer Engineering (ECE) for the period of July 1, 2011 – June 30, 2012. I have served here at the University of Maryland as Professor since 1991, and have also been a member of the Center for Automation Research and the Institute for Advanced Computer Studies. As I undertake this new responsibility as Interim Chair of ECE, I wanted to share with you some of my key priorities and important issues that I will be working on in the next several months.

I would like to first thank Patrick O'Shea for serving as Chair of the department for the past six years. Pat provided valuable leadership and kept the department above troubled waters in difficult financial times. On behalf of the faculty and staff, I would like to express our collective gratitude to Pat and wish him all the best in his new role as the Vice President for Research at the University of Maryland.

Over the course of the next year, I will be focusing on:

### Undergraduate education

I am strongly committed to the importance of undergraduate education, and plan to continue to enhance the undergraduate experience in our department. I will focus on the 100-200 level courses in ECE, and aim to increase the number of Undergraduate Teaching Fellows to make available for these courses. We also hope to bring more Honors students into our research laboratories, and help students take advantage of opportunities to participate in our Research Experiences for Undergraduates programs, such as MERIT-BIEN, as well as the GEMSTONE program.

### Faculty recruitment

We plan to hire two junior faculty members in the emerging area of cybersecurity this year. I have appointed a search committee that concentrates on this area to find the best prospects available. We also hope to hire faculty members from underrepresented groups, particularly focusing on recruiting more female professors in ECE.

### Fundraising

We have increased the level of annual philanthropic funding to the department by a factor of 15 in the last eight years. I hope to continue increasing the level of philanthropic funding to ECE. I will work with our staff and faculty to seek out additional support to enhance our educational programs, make new scholarships available to students, and to improve the quality of our facilities and laboratories.

In addition to these three priorities, I will focus my efforts on the Accreditation Board for Engineering and Technology (ABET) accreditation renewal process, and also plan to streamline the nomination process for awards and named professorships.

The Dean of the Clark School of Engineering, Dr. Darryll Pines, has appointed a search committee to find the permanent chair, who will serve a five-year term. More information will be in the next *Connections*.

I look forward to contributing to our department's continued advance as one of the very finest programs in the country. If you would like to contact me about any of the priorities outlined above, please feel free to share your thoughts with me by sending them to our new Coordinator for External Relations, Carrie Anne Hilmer, at [chilmer@umd.edu](mailto:chilmer@umd.edu). Thank you for your support for our department.

Rama Chellappa


## CLARK SCHOOL RISES IN INTERNATIONAL RANKING

The Clark School rose two spots to #11 among engineering schools ranked in the 2011 Academic Ranking of World Universities annual list of engineering/technology and computer science schools by the Institute of Higher Education and Center for World-Class Universities. Among all public university programs, the Clark School was ranked 8th. The ranking is purely objective based on quantitative measures of productivity with no reputation component.

## STATE RANKED HIGHLY IN TECH AND SCIENCE INDEX

The Milken Institute's 2010 State Technology and Science Index ranked the State of Maryland #2 in the nation, just behind Massachusetts. Maryland ranked first in academic R&D per capita and human capital capacity, which takes into account factors like the number of bachelor's, master's, and doctoral degrees awarded versus a state's population. The index ranks each state's tech and science capabilities, as well as their success in converting them into companies and high-paying jobs.

## UMD AMONG BEST VALUES IN PUBLIC EDUCATION

The University of Maryland continued its rise in Kiplinger's Personal Finance magazine's 100 Best Values in Public Colleges, ranking 5th among four-year institutions for providing outstanding education at an affordable price in 2011. This is a significant advancement from 8th place in 2010; 9th in 2009; and 28th in 2008. Equally impressive is Maryland's 6th place ranking for out-of-state value. Maryland was selected from a pool of more than 500 colleges and universities. The magazine ranked each according to academic quality, including admission and retention rates, student-faculty ratios and four- and six-year graduation rates, as well as on cost and financial aid. 

# Chellappa Named Interim Chair of ECE Department


Minta Martin Professor of Engineering **Rama Chellappa** has been named interim Chair of the Department of Electrical and Computer Engineering (ECE). Dr. Chellappa, who has an affiliate appointment in both the University of Maryland Institute for Advanced Computer Studies (UMIACS) and the Department of Computer Science, was appointed to the position effective July 1, 2011, succeeding Professor Patrick O'Shea, who was recently named Vice President for Research at the University of Maryland.

"Dr. Chellappa will bring to his new position the leadership skills that have made him so effective as Director of the Center for Automation Research, the first President of the IEEE Biometrics Council and the Editor-in-Chief of the prestigious IEEE Transactions of Pattern Analysis and Machine Intelligence," said the Dean of the Clark School of Engineering, Dr. **Darryll**

**Pines**. "We are fortunate to find such an able researcher and educator to ensure the department's continued progress during this transition."

A faculty member at the University of Maryland since 1991, Dr. Chellappa received his B.E. (Hons.) in Electronics and Communication Engineering from the University of Madras; his M.S. in Electrical Communication Engineering from the Indian Institute of Science in Bangalore; and his M.S.E.E and Ph.D. in Electrical Engineering from Purdue University. He has authored and co-authored numerous publications, served as an associate editor for four IEEE Transactions, is a fellow of IEEE, IAPR and OSA, and has received numerous awards, including an NSF Presidential Young Investigator Award, four IBM Faculty Development Awards, the 1990 Excellence in Teaching Award

from School of Engineering at USC, the Society, Technical Achievement and Meritorious Service Awards from the IEEE Signal Processing Society and the Technical Achievement and Meritorious Service Awards from the IEEE Computer Society.

At the University of Maryland he has been elected as a Distinguished Faculty Research Fellow and Distinguished Scholar-Teacher and received numerous awards for research, innovation, mentorship and teaching, including the Outstanding Invention Award from the Office of Technology Commercialization, the Faculty Outstanding Research Award from the College of Engineering and an Outstanding GEMSTONE Mentor Award. Purdue University recently recognized him with its Outstanding Electrical and Computer Engineer Alumni Award. 

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## Former ECE Chair Patrick O'Shea Named UMD VP for Research

The University of Maryland's new vice president for research, Dr. **Patrick O'Shea** – formerly chair of the Department of Electrical and Computer Engineering – is proposing an aggressive plan to build the institution's research profile regionally, nationally and globally, including an emphasis on multidisciplinary, large-scale collaborations with industry and government, and closer relationships with the University of Maryland Medical School and other University System institutions.

O'Shea also promises greater rewards for faculty innovation and new initiatives to encourage entrepreneurship, commercialization and technology transfer.

"This is a critical position for Maryland, with responsibility for more than a half-billion dollars in research funding," said University President **Wallace D. Loh**, announcing the


appointment. "Patrick brings that rare blend of academic expertise, vision, administrative excellence and entrepreneurial spirit to this pursuit. He is well-equipped to increase the University's research and educational impact internationally and within this region."

An alumnus of University College Cork, Ireland, and the University of Maryland, O'Shea has been active in interdisciplinary research and management for decades, both in government and academia. He has served as a project leader at Los Alamos National Laboratory, and director of the University of Maryland Institute for Research and

Electronics and Applied Physics.

In addition to his time as chair of the ECE Department, O'Shea led a new strategic relationship with Lockheed Martin, and the Maryland Cybersecurity Center, a cross-campus initiative launched last fall. Previously he helped launch the Maryland NanoCenter and the Center for Applied Electromagnetics.

He has been honored as a Distinguished Scholar Teacher of the University of Maryland, Fellow of the American Physical Society, Fellow of the Institute of Electrical and Electronic Engineers, and Fellow of the American Association for the Advancement of Science.

"We will be bold, diverse, adaptive, creative, innovative and entrepreneurial," said O'Shea. "Our aim is to take our place among the great institutions of the world." 



## JaJa Part of New \$27.5M Socio-Environmental Synthesis Center

Dr. **Joseph JaJa**, a faculty member in the Department of Electrical and Computer Engineering (ECE) and the University of Maryland Institute for Advanced Computer Studies (UMIACS), is known as both a leader and a scholar in his field.

His leadership talents served him well during his ten year tenure as the director of UMIACS and most recently as VP and interim CIO for the University of Maryland, College Park. It comes as no surprise that Dr. JaJa is a founding, executive team member of the University's newest forward-thinking initiative.

The National Socio-Environmental Synthesis Center (SESYNC) is a revolutionary research center focused on developing novel solutions for today's most pressing environmental challenges. The mission of this endeavor is to foster synthesis research, combining data, models, and knowledge from multiple disciplines to address challenges related to the structure, function, and sustainability of socio-environmental systems.

SESYNC will cultivate collaborative research on critical issues such as water availability, sustainable food production and the interaction between human activity and healthy ecosystems. Science and engineering faculty from the University of Maryland, environmental economists from Resources for the Future, a Washington, D.C.-based nonprofit research organization, and social scientists from the University of Michigan will lead the center's activities.



"This center is different from any other—it is much like a think tank without a set of pre-determined projects," says JaJa. "Our primary goal will be to engage national and international researchers as well as decision makers to co-develop the research questions to be addressed by the center. We cannot be prescriptive; we must be inclusive."

According to JaJa, teams of researchers will be invited to meet at the center three to four times a year with an agenda to tackle big problems, create a plan for collaboration and continue that collaboration after leaving the center.

JaJa will manage the entire cyber-infrastructure of the center and support

the computational and data-needs of all participants. "SESYNC will feature the latest in high-end computing, analysis, and visualization tools that will put scientists and policymakers on the same information plane," he said.

The tools JaJa will implement can synthesize data and models from disparate fields such as economics and biology, making complex information accessible to researchers in a way that promotes collaboration and innovation.

"We intend to create a new model for accelerating environmental discovery which will come from the seamless communication and collaboration between disciplines as diverse as computer science, engineering, biology, public policy, geography and



economics” said Professor JaJa.

Located in Annapolis, Md., the center is supported primarily by the National Science Foundation through a \$27.5 million, five-year grant. Additionally, SESYNC has received substantial support from the state of Maryland. State officials expect the center to take on critical local issues like the health of the Chesapeake Bay, while also addressing issues that affect the mid-Atlantic region and beyond, including sustainable energy and human behavior as it relates to climate adaption.

Maryland Governor Martin O’Malley said it is fitting for the center to have the Chesapeake Bay on its doorstep because the bay and SESYNC each perfectly reflect the multifaceted challenge of today’s major environmental issues and the essential response needed. “The center’s approach to environmental challenges through collaborative science-based responses drawn from many disciplines while factoring in human and ecosystem needs is exactly the approach that the bay needs in our efforts to restore it.”

Senior staff at SESYNC will strive to concentrate the expertise of environmental, social, and computational scientists, engineers, economists, and public policy experts world-wide by inviting them to visit and participate in the exploration of two or more major themes annually. The executive team foresees participation in ten to fifteen ongoing projects at a time.


Dr. JaJa will work with a staff of post-doctoral fellows and programmers to lead computational projects and allocate resources; engaging participants through data and model sharing and interacting with environments based on social networks. The major challenge he and his staff will encounter is to combine and aggregate data, models, and information to foster the synthesis process.

Another equally important goal of SESYNC will be to improve and popularize the research and problem-solving underpinnings of the synthesis process. As this is accomplished across disciplines through the center’s projects, SESYNC plans to develop a foundation to promote the synthesis process, which could be integrated into educational curricula worldwide.

Education research and activities will be embedded throughout SESYNC’s programs to expand the ability of researchers and students to effectively synthesize environmental science with social science research and knowledge. Programs will focus on teaching synthesis methods and strategies for the analysis of complex information on the environment to diverse educational communities, with an emphasis on undergraduate education.

While addressing urgent questions on ecosystem management SESYNC will educate the public—homeowners, watermen, farmers and legislators—on being part of the solution. These efforts will be reflected in the relationship with the greater community--offering tours, visits, workshops, blogs and online forums.

“Engineering and scientific solutions need to be proved feasible through social science, policy makers, and the practical applications initiated by everyday people. I am excited to be at the forefront of this ambitious, and transformative endeavor,” concludes JaJa.


“The collaborations of this new University of Maryland center represent exactly the kind of innovative, interdisciplinary approaches that are essential if we are to tackle the complex environmental challenges facing our nation and world,” said Wallace D. Loh, president of the University of Maryland, College Park. 

## ECE Innovations in Spotlight at Invention of the Year Awards

Researchers from the Department of Electrical and Computer Engineering (ECE) were honored at the University of Maryland’s 24th annual Invention of the Year Awards, organized by the university’s Office of Technology Commercialization.

A team consisting of Christine Yurie Kim Eminent Professor of Information Technology **K. J. Ray Liu**, **Wan-Yi Lin**, and **Nathan Goergen** won Invention of the Year in the Information Science category for their invention, titled, “Active Sensing for Dynamic Spectrum Access.”

The inventors presented a new framework that takes an active approach to spectral sensing for dynamic spectrum access (DSA) applications. In wireless shared spectrum scenarios, licensed digital television stations take a primary user role and are given explicit first-right-of-access to the television spectrum. When a primary user signal is not present, broadband users are allowed to use shared spectrum. The “active sensing” scheme encourages primary users to actively help spectrum sensing by embedding their own unique, ID into the transmitted signal.

Another team, consisting of ECE Professor **Christopher Davis**, Civil Engineering Research Professor **Stuart Milner**, and ECE alumnus **Jamie Llorca**, was a runner-up in the Information Sciences category for their invention, titled, “Self-Optimization, Dynamic Positioning and Mobility Management in Wireless Networks.” The inventors developed novel models and methods for controlling and positioning directional wireless backbone (DWB) platforms in order to guarantee their coverage of mobile and user devices, while ensuring that the backhaul bandwidth and quality of service are maximized. 

## Lin Endowment to Support Innovation, Entrepreneurship

Mrs. **Anchen Lin**, wife of Dr. **Jimmy H. C. Lin** (1919-2009), a beloved, longtime professor in the Department of Electrical and Computer Engineering (ECE), has made a gift to the University of Maryland's A. James Clark School of Engineering to endow a new fund in her husband's name. The purpose of the Jimmy Lin Endowment for Entrepreneurship is to provide annual awards to students, staff, and faculty who transform their ideas into innovations through invention and technology commercialization.

A dedicated and popular instructor who missed only one class in over 20 years of teaching, Dr. Lin joined the University of Maryland as Professor of Electrical Engineering in 1969. He retired in 1990, and subsequently served as Professor Emeritus. Well known to his colleagues for his abundant energy and his warm, familiar smile, Dr. Lin's career spanned more than half a century and was punctuated with many honors, awards, and inventions, including the wireless microphone and the lateral transistor.

The holder of 57 U.S. patents, Dr. Lin was inducted into the Clark School of Engineering Innovation Hall of Fame in May 1990 in recognition of his significant inventions and contributions in semiconductor devices and integrated circuits.

In 2008, Dr. Lin endowed the Jimmy Lin Fund for Innovation and



PROF. JIMMY LIN (LEFT) AND MRS. ANCHEN LIN (RIGHT)

Invention within the ECE Department at the University of Maryland. The goal of his generous gift was to promote innovation among students, staff and faculty by stimulating, encouraging and rewarding the invention and patenting process.

With her recent gift, Mrs. Lin followed Dr. Lin's wish to expand the original fund and established the Jimmy Lin Endowment for Entrepreneurship. Through the Hung Chang and Anchen Wang Lin Fund, this endowment will promote entrepreneurship by supporting the following new awards and scholarships: The Jimmy H. C. Lin Entrepreneurship Competition Award, The Jimmy H. C. Lin Invention Award, The Jimmy H. C. Lin Entrepreneur Internship Award, and The Jimmy H. C. Lin Graduate Scholarship for Entrepreneurship.

An award ceremony was held on Wednesday, September 14, which was attended by Mrs. Anchen Lin and her

trustee, Dr. James Hsu.

The Jimmy H. C. Lin Award for Invention was awarded to Prof. **K. J. Ray Liu**, **Wan-Yi Lin**, and **Nathan Goergen** in recognition of their invention titled "Active Sensing for Dynamic Spectrum Access," which was awarded the University of Maryland Invention of the Year Award.

(More information about their invention


can be found on p. 5 of this

Connections issue.)

The Jimmy H. C. Lin Award for Entrepreneurship was awarded to Prof. **Pamela Abshire**, **Marc Dandin**, and **David Sander** in recognition of their entrepreneurial business plan for Ibis Microtech.

Ibis Microtech is a new venture seeking to equip medical professionals, food quality control technicians, first responders, and national defense agencies with cost-effective diagnostics devices capable of performing laboratory-grade analyses on-site, and in record time.

The Jimmy H. C. Lin Graduate Scholarship for Entrepreneurship was awarded to two graduate program applicants from Shanghai Jiao Tong University, **Xiangyang Liu** and **Faheng Zang**.

More information about the new awards created by the Jimmy Lin Endowment for Entrepreneurship can be found at [www.ece.umd.edu/lin](http://www.ece.umd.edu/lin). 

# Bad Virus Put to Good Use by Researchers

## *In breakthrough batteries, virally structured nano-electrodes boost energy capacity 10-fold*

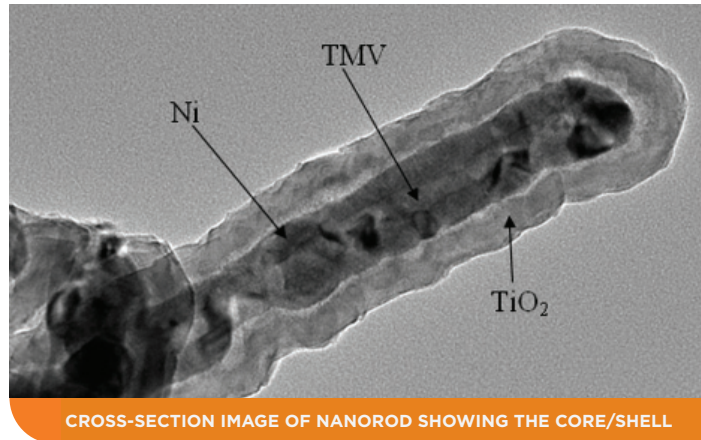
Viruses have a bad rep—and rightly so. The ability of a virus to quickly and precisely replicate itself makes it a destructive scourge to animals and plants alike. Now an interdisciplinary team of researchers at the University of Maryland's A. James Clark School of Engineering and College of Agriculture and Natural Resources, brought together by Professor Reza Ghodssi, is turning the tables, harnessing and exploiting the “self-renewing” and “self-assembling” properties of viruses for a higher purpose: to build a new generation of small, powerful and highly efficient batteries and fuel cells.

The rigid, rod-shaped Tobacco mosaic virus (TMV), which under an electron microscope looks like uncooked spaghetti, is a well-known and widespread plant virus that devastates tobacco, tomatoes, peppers, and other vegetation. But in the lab, engineers have discovered that they can harness the characteristics of TMV to build tiny components for the lithium ion batteries of the future. They can modify the TMV rods to bind perpendicularly to the metallic surface of a battery electrode and arrange the rods in intricate and orderly patterns on the electrode. Then, they coat the rods with a conductive thin film that acts as a current collector activating the battery's material to participate in the electrochemical reactions.

As a result, the researchers can greatly increase the electrode surface area and its capacity to store energy and enable fast charge/discharge times. TMV becomes inert during the manufacturing process; the resulting batteries do not transmit the virus. The new batteries, however, have up to a 10-fold increase in energy capacity over a standard lithium ion battery.

“The resulting batteries are a leap

forward in many ways and will be ideal for use not only in small electronic devices but in novel applications that have been limited so far by the size of the required battery,” said Ghodssi, director of the Institute for Systems Research and



Herbert Rabin Professor of Electrical and Computer Engineering at the Clark School. “The technology that we have developed can be used to produce energy storage devices for integrated microsystems such as wireless sensors networks. These systems have to be really small in size—millimeter or sub-millimeter—so that large numbers can be deployed in remote environments for applications like homeland security, agriculture, environmental monitoring and more; to power these devices, equally small batteries are required, without compromising in performance.”


TMV's nanostructure is the ideal size and shape to use as a template for building battery electrodes. Its self-replicating and self-assembling biological properties produce structures that are both intricate and orderly, which increases the power and storage capacity of the batteries that incorporate them. Because TMV can be programmed to bind directly to metal, the resulting components are lighter, stronger and less expensive than conventional parts.

Three distinct steps are involved in producing a TMV-based battery: modifying, propagating and preparing the TMV; processing the TMV to grow nanorods on a metal plate; and incorporating the nanorod-coated plates into finished batteries.

First a solution of TMV is applied to a metal electrode plate. The genetic modifications program one end of the rod shaped virus to attach to the plate. Next these viral forests are chemically coated with a conductive metal, mainly nickel. Other than its structure, no trace of the virus is present in the finished product, which cannot transmit a virus to either plants or animals. This process is

patent-pending.

While the first generation of the Maryland researchers' devices used the nickel-coated viruses for the electrodes, work published earlier this year investigated the feasibility of structuring electrodes with the active material deposited on top of each nickel-coated nanorod, forming a core/shell nanocomposite where every TMV particle contains a conductive metal core and an active material shell. The researchers have developed several techniques to form nanocomposites of silicon and titanium dioxide on the metalized TMV template. This architecture both stabilizes the fragile, active material coating and provides it with a direct connection to the battery electrode.

In the third and final step, the researchers assemble these electrodes into the experimental high-capacity lithium-ion batteries. Their capacity can be several times higher than that of bulk materials and in the case of silicon, higher than that of current commercial batteries. 



# Awards and Honors for ECE Faculty

## CHELLAPPA RECEIVES POOLE AND KENT SENIOR FACULTY TEACHING AWARD

ECE Interim Chair and Minta Martin Professor of Engineering **Rama Chellappa** was awarded the 2011 Poole and Kent Senior Faculty Teaching Award. He was selected for this award in recognition of his contributions to the Clark School of Engineering as an exceptional engineering educator, and presented with the award at the Commencement Ceremony on May 20, 2011. Prof. Chellappa has successfully brought the passion of his research into the classroom through the development of the image processing and computer vision program. He has also made an enormous impact through his mentorship of students in the Gemstone program focusing on the image processing area, and received the Outstanding Gemstone Mentor Award for his efforts, which included projects aimed at assisting visually impaired individuals through technology. Students have described Prof. Chellappa's teaching as: "passionate," "gifted" and full of "infectious enthusiasm."

## MARTINS WINS IEEE CONTROL SYSTEMS SOCIETY AWARD

Prof. **Nuno Martins** won the 2010 George Axelby Outstanding Paper Award from the IEEE Control Systems Society. Nuno shares this award with Munther Dahleh of MIT for their jointly authored paper, "Feedback Control in the Presence of Noisy Channels: Bode-Like Fundamental Limitations of Performance." This prestigious award is given annually to the outstanding paper published



NUNO MARTINS

in IEEE Transactions on Automatic Control. The award was presented at the 49th IEEE Conference on Decision and Control in December 2010.

## WAKS SELECTED TO RECEIVE DARPA YOUNG FACULTY AWARD

Prof. **Edo Waks** was selected by the Defense Advanced Research Projects Agency (DARPA) to receive a Young Faculty Award (YFA) in recognition of his status as a rising star in university nanophotonics and quantum information research. DARPA, in conjunction with the Navy, will provide Waks with a grant of approximately \$300,000 to further develop his research.

Waks received the funding for his research proposal, titled "Ultra-Fast Quantum Information Processing Using Quantum Dot Spin Coupled to Photonic Crystals." Dr. Waks' research interests include studying the application of photonic crystals to quantum information processing, as well as the use of photonic crystals for practical tools in optical telecommunication and sensing.

DARPA's Young Faculty Award program, sponsored by DARPA's Microsystems Technology Office, is designed to seek out ideas from non-tenured faculty in order to identify the next generation of researchers working in microsystems technology. The selected researchers focus on concepts that are innovative, speculative, and high-risk.

## ECE FACULTY EARN PROMOTIONS

ECE Professors **Min Wu**, **Sennur Ulukus**, and **Bruce Jacob** were promoted to the rank of full Professor. Professor **Martin Peckerar**, who already held the rank of Professor, has been approved for tenure at that rank. Professor **Nuno Martins** has been promoted to Associate Professor with tenure. These appointments have been approved by President **Wallace Loh**, effective July 1, 2011.

## MAYERGOYZ AMONG CLARK SCHOOL ENGAGED FACULTY

Alford L. Ward Professor and Distinguished Scholar-Teacher Dr. **Isaak Mayergoyz** was selected among the first class of Clark School ENGAGED Faculty. This is an honor that has been bestowed upon faculty by the Clark School of Engineering through undergraduate student nominations. The ENGAGED Faculty were nominated by Clark School undergraduates because: they are approachable; they take a genuine interest in and have concern for their students, especially outside of the classroom; are accessible; they have high expectations; and they encourage students and provide support on academic & extracurricular activities. These faculty members have been described as being dedicated and patient. Each has been identified as a positive mentor and role model. The ENGAGED Faculty project is a component of the NSF funded program called ENGAGE: Engaging Students in Engineering (NSF GSE #0833076). The University of Maryland was one of ten schools selected to participate in the first year of the program to implement research-based strategies to enhance the retention of undergraduate engineering students.

## ULUKUS AWARDED ISR OUTSTANDING FACULTY AWARD

Prof. **Sennur Ulukus** was awarded the Institute of Systems Research (ISR) Outstanding Faculty Award. Her decade of accomplishments include scholarly contributions in prestigious journals, a high level of funding in support of her research, and her commitment to mentoring, graduating and placing a succession of outstanding graduate students. She has also been a pivotal member of the Green Communications initiative and has pioneered interdisciplinary research in energy harvesting for communication systems.

## ESPY-WILSON APPOINTED TO NIH ADVISORY BOARD, NAMED ADVANCE PROFESSOR

Prof. **Carol Espy-Wilson** was appointed to the National Advisory Board on Medical Rehabilitation Research. This board advises the National Center for Medical Rehabilitation Research (NCMRR), part of the Eunice Kennedy Shriver National Institute of Child Health and Human Development at the National Institutes of Health (NIH). NCMRR fosters the development of scientific knowledge needed to enhance the health, productivity, independence, and quality-of-life of people with disabilities. Prof. Espy-Wilson is developing an approach to speech recognition based on phonetic features to address the limitations of present recognizers.

Prof. Espy-Wilson was also selected for the position of ADVANCE Professor in the A. James Clark School Of Engineering. She will serve as the ADVANCE Professor for Women Faculty of Color in science, technology, engineering, and mathematics (STEM). The ADVANCE Program for Inclusive Excellence aims to transform the institutional culture of our University by facilitating networks, offering individual mentoring and support, and offering information and strategic opportunities for women faculty in all areas of academia.

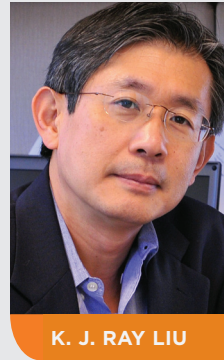
## GHODSSI DELEGATE TO WORLD MICROMACHINE SUMMIT

Prof. **Reza Ghodssi** was one of two U.S. delegates at the 17th World Micromachine Summit in April 2011. The event was held in Ras Al Khaimah, United Arab Emirates, where Centre Suisse d'Electronique et Microtechnique SA partnership with the UAE and École Polytechnique Fédérale de Lausanne Middle East are developing new activities related to renewable energies. The second U.S. delegate was

# Liu Named Kim Professor, Inducted as an ISI Highly Cited Researcher

Dr. **K. J. Ray Liu** was appointed Christine Yurie Kim Eminent Professor of Information Technology in recognition of his sustained and influential scientific and scholarly work in the area of signal processing and communications. Funds from the Christine Yurie Kim endowment will further support Liu's research and education programs. The five-year, renewable appointment began in January 2011.

Prof. Liu was also selected for inclusion in the Institute for Scientific Information (ISI) Highly Cited list of researchers in the field of Computer Science. Prof. Liu was selected to the list due to the high number of citations his publications have received from fellow researchers and scientists. Less



than one half of one percent of all publishing authors meet the criteria for inclusion on ISIHighlyCited.com.

Prof. Liu's research has focused on the areas of wireless communications and networking; multimedia communications and signal processing; information forensics and security; biomedical imaging and bioinformatics; and signal processing algorithms and architectures. In all, he has published over 500 refereed papers, books, and book chapters.

Prof. Liu was named a Distinguished Scholar-Teacher of the University of Maryland, in 2007. He serves as Associate Chair of Graduate Studies and Research of the Electrical and Computer Engineering Department and leads the Maryland Signals and Information Group. □

Dr. **Michael Gaitan**, of the National Institute of Standards and Technology. Started in 1995, the World Micromachine Summit provides a micro-nano technology snapshot to worldwide industrial, academic and government initiatives. Two to five key people from the most important regions and countries in the microtechnology arena participate as delegates in the Summit. As part of the proceedings, Dr. Ghodssi and other delegates met with His Highness **Sheikh Saud Bin Saqr Al Qasimi**, Supreme Council Member and Ruler of Ras Al Khaimah. The discussions during the Summit focused on the challenges of using high-end micro and nanotechnologies for renewable energies, in particular solar energy.

## ECE FACULTY & STAFF HONORED FOR OUTSTANDING COMMITMENT

ECE faculty and staff were among those honored at the 2011 Clark School Faculty and Staff Outstanding Commitment Award Ceremony. The honorees included: **Dorothy C. Chu**, former ECE staff member; **William W. Destler**, former ECE Chair, Clark School Dean and **Nariman Farvardin**, former ECE Chair, Clark School Dean and UMD Provost; **Olivia M. Goetz**, former ECE staff member; and **Steven Tretter**, ECE alumnus and professor emeritus. The ceremony recognizes individuals in the college whose extraordinary contributions have made the Clark School a better place to live and work. The names of the honorees are carved into the fountain in the Martin Hall plaza. □

# Faculty Give Invited Talks, Distinguished Lectures

## ANKUR SRIVASTAVA NAMED ACM DISTINGUISHED SPEAKER

Prof. **Ankur Srivastava** received an appointment to the Association for Computing Machinery (ACM) Distinguished Speaker Panel. This designation provides a platform from which Prof. Srivastava can share his research and ideas with professional organizations, peer institutions, and many others who are seeking speakers in particular topic areas. One advantage of earning this recognition is that Prof. Srivastava will be sought after as an expert in his field, often being offered the opportunity to share ideas and research with new and unique audiences. ACM Distinguished Speakers are appointed after completing a stringent selection process. In recognition of his research and experience Prof. Srivastava will be speaking most often in the broad subject fields of Design Automation and Computer Systems. His speaking topics will highlight his interests in VLSI, design automation, and high performance computing.



ANKUR SRIVASTAVA

## CHELLAPPA INVITED TO GIVE DISTINGUISHED LECTURE AT UNIVERSITY OF DELAWARE

ECE Interim Chair and Minta Martin Professor of Engineering **Rama Chellappa** spoke as the University of Delaware Computer Information Sciences (CIS) Distinguished Speaker on May 11, 2011. His talk was titled, "Representation and Recognition of Patterns in Video." With the ubiquitous presence of video cameras, new challenges to video-based pattern

recognition problems are emerging. Video-based pattern recognition has applications in homeland security, healthcare, battlefield awareness, and video indexing and anomaly detection.

## EPHREMIDES GIVES TALKS AT IEEE GLOBECOM CONFERENCE, UNIVERSITY OF PENNSYLVANIA

Prof. **Anthony Ephremides** gave a plenary talk at the IEEE Globecom Conference on Dec 7, 2010. IEEE Globecom is the main flagship conference of the IEEE Communications Society and was attended by more than 2,000 members. Ephremides' talk, titled "To Schedule or not to Schedule: The Conundrum of Channel Access," dealt with medium access control in wireless networks in a cross-layer fashion. The talk combined recent results obtained in collaboration with many colleagues and students.

Prof. Ephremides also gave an invited lecture at the University of Pennsylvania on Feb. 22, 2011 on "Cooperation at the Network Level." Dr. Ephremides covered a new concept of cooperative communications that yields

significant performance improvements in wireless networks and for which a patent application has been filed. The talk was part of the colloquia series in the University of Pennsylvania's Department of Electrical and Systems Engineering.



TONY EPHREMIDES

## BARAS GIVES INVITED PLENARY TALK AT IEEE-CYBER 2011

Prof. **John S. Baras** gave the invited plenary lecture on March 21, 2011 at the First IEEE International Conference on Cyber

Technology in Automation, Control and Intelligent Systems (IEEE-CYBER 2011), held in Kunming, China, from March 20-23, 2011. IEEE-CYBER is a newly established international conference focusing on intelligent cyber systems in automation and control. Dr. Baras' lecture was entitled "Component-based Architectures for the Synthesis of Intelligent Networked Systems," and its theme was the need for the development of new methodologies and design environments for complex engineered systems.

## MAYERGOYZ DELIVERS KEYNOTE AT HMM 2011 IN ITALY

Alford L. Ward Professor and Distinguished Scholar-Teacher **Isaak Mayergoyz** delivered a keynote address at the 8th International Symposium on Hysteresis Modeling and Micromagnetics (HMM 2011) in Levico (Trento) Italy. The title of his talk was "Plasmon Resonances in Nanoparticles, Their Applications to Magnetism and Relation to the Riemann Hypothesis." HMM 2011 is intended to be a forum for presentation and discussion of the most recent advancements in the fields of hysteresis modeling and computational micromagnetics. Hysteresis can be defined as the phenomenon exhibited by a system in which the reaction of the system to changes is dependent upon its past reactions to change.

## LIU GIVES INVITED KEYNOTE TALK AT VIRGINIA TECH

Christine Yurie Kim Eminent Professor of Information Technology and Associate Chair for Graduate Studies and Research Dr. **K. J. Ray Liu** delivered a keynote talk on June 3 at Virginia Tech's 2011 Wireless Symposium in Blacksburg, VA. The focus of this three-day symposium is to assist professionals and academics





in staying abreast of trends and current research in a rapidly changing, ever-expanding field. His talk, titled “Cognitive Radio Games,” focused on recent advances in the use of game theoretical frameworks for cognitive radios in improving robustness and security. An intelligent wireless communication system, cognitive radio is aware of its surrounding environment and can adaptively change its operating parameters based on interactions with the environment and users. Using cognitive radio technology, it is plausible that future wireless devices will be able to sense and analyze their surrounding environment and user conditions, learn from the environmental variations, and adapt their operating parameters to achieve highly reliable communications and efficient utilization of spectrum resources.

#### GHODSSI GIVES INVITED TALK AT TRANSDUCERS 11

Herbert Rabin Distinguished Professor **Reza Ghodssi** was an invited speaker at the 16th International Conference on Solid-State Sensors, Actuators and Microsystems (Transducers 11). The international conference was held June 5–9 in Beijing, China. Ghodssi spoke on June 8 at the 3-D Integration Session. His topic was “Microball Bearing Technology for MEMS Devices and Integrated Microsystems,” research recently conducted with his Ph.D. students **Mustafa Beyaz**, and **Brendan Hanrahan** in his MEMS Sensors and Actuators Laboratory (MSAL). Ghodssi is well-known for his microball bearing research. Ghodssi’s micro-ball bearing/micro turbine work was recently featured in *Micro Manufacturing*. Also, Ghodssi was featured in a *Mechanical Engineering* magazine cover story. The piece focused on Ghodssi’s research on microscale ball bearings for use in micromachines and Micro-Electro-Mechanical Systems (MEMS) devices. 

## PUBLICATIONS

### ECE RESEARCHERS PUBLISH ARTICLE IN RSC JOURNAL ON FLEXIBLE GALVANIC CELL

A paper co-authored by Professors **Martin Peckerar** and **Neil Goldsman** has been published in the Royal Society of Chemistry journal, *Energy & Environmental Science*. The paper, titled A novel high energy density flexible galvanic cell, was co-authored by ECE alumni **Zeynep Dilli**, **Mahsa Dornajafi**, and **Yves Ngu**, as well as **Robert B. Proctor**, **Benjamin J. Krupsaw** and **Daniel A. Lowy**.

Ultrathin galvanic cells, which can comply with a variety of form factors and electronic system packages, are of technological importance, as they show promise for flexible electronic systems. The paper describes a high energy density flexible galvanic cell, which is non-toxic and environmentally friendly. As the battery utilizes aqueous electrolytes, it is safe in operation, which enables its use in a number of settings and surroundings. The battery can be optimized for volume manufacture at low cost. Given that they function at much lower cell voltage than Li-ion batteries do, these cells can be recharged remotely, at a conveniently low voltage, by harvesting radio-frequency (RF) energy or microwaves, as well as other energy sources. Also, its cycle life of up to 400 charge–discharge cycles is very promising for use as a secondary battery.

*Energy & Environmental Science* is the #1 ranked journal in the field.

The researchers’ technology was awarded the University of Maryland Invention of the Year prize, and took first place in the annual University of Maryland Business Plan Competition.

For more information about the group’s rechargeable, thin-film battery, visit [www.flexelinc.com](http://www.flexelinc.com).

### IEEE SPECTRUM FEATURES LIU ON ‘COGNITIVE RADIO GAMES’

An article by Prof. **K. J. Ray Liu** was featured prominently in the April 2011 issue of *IEEE Spectrum* magazine. The feature, titled “Cognitive Radio Games,” explores how cognitive radio technology and game theory can help address the problem of overcrowded airwaves that must accommodate increasing wireless demands in a world of ubiquitous smart phones and wireless devices.


Cognitive radio refers to intelligent systems of wireless communication in which radios try to achieve the best performance possible by sensing and adapting to changes in their electromagnetic environments, including changes in the way other radios are operating. To read the feature in its entirety, visit the [IEEE Spectrum website](http://IEEE Spectrum website).

### VISHKIN ARTICLE PUBLISHED IN COMMUNICATIONS OF THE ACM

Prof. **Uzi Vishkin** published an article in *Communications of the Association for Computing Machinery*, titled “Using simple abstraction to reinvent computing for parallelism.”

In the paper, Vishkin points out that the recent dramatic shift from single-processor computer systems to many-processor parallel ones requires reinventing much of computer science to build and program the new systems. However, parallel computing research has not focused on ease of programming as a primary objective. Vishkin proposes what he describes as a radical parallel programming and architecture idea: the new parallel systems should start with a simple abstraction that encapsulates the desired interface between programmers and system builders.

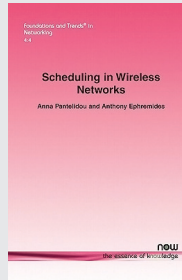
Vishkin also describes his idea for a general-purpose many-core explicit multi-threaded (XMT) computer architecture designed from the ground up to capitalize on the on-chip resources becoming available and reduce single-task completion time.

The article can be read in its entirety on the [Communications of the ACM website](http://Communications of the ACM website). 

## NEW BOOKS BY FACULTY:

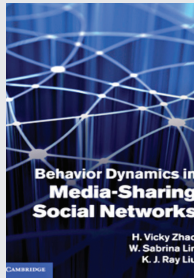
### EPHREMIDES, PANTELIDOU CO-AUTHOR NEW WIRELESS NETWORKS BOOK

**"Scheduling in Wireless Networks"** is a new book co-authored by Prof. **Anthony Ephremides** and alumna **Anna Pantelidou** (EE Ph.D. 2009). The book is published by now Publishers Inc. Providing a reference point for the rich set of problems that arise in the allocation of resources in modern and future networks, it reviews the problem of scheduled channel access in wireless networks with emphasis on ad hoc and sensor networks as opposed to WiFi, cellular, and infrastructure-based networks.



### LIU, LIN AND ZHAO CO-AUTHOR NEW BOOK ANALYZING HUMAN INTERACTION WITH SOCIAL MEDIA

Christine Yurie Kim Eminent Professor of Information Technology and Associate Chair for Graduate Studies **K. J. Ray Liu** has co-authored a new book titled **"Behavior Dynamics in Media-Sharing Social Networks"** with his former advisees, ECE alumnae **W. Sabrina Lin** (Ph.D., EE, '09) and **H. Vicky Zhao** (Ph.D., EE, '04). Published by Cambridge University Press, the book demonstrates how game theory can be used to model user dynamics and optimize design of media-sharing networks. The text investigates the impact of human factors on multimedia design and shows how to improve system performance by modeling and analyzing human behavior using examples from real-world multimedia social networks.

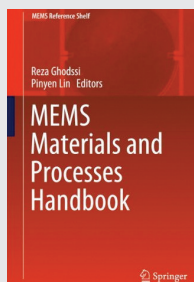


### BARAS CO-EDITOR OF NEW BOOK, "DECISION AND GAME THEORY FOR SECURITY"

Prof. **John S. Baras** is the co-editor of a new book, titled **"Decision and Game Theory for Security,"** published by Springer. The book, co-edited by with **Tansu Alpcan** and **Levente Buttyán**, constitutes the refereed proceedings of the First International Conference on Decision and Game Theory for Security, GameSec 2010, held in Berlin, Germany. The papers are organized in topical sections on security investments and planning, privacy and anonymity, adversarial and robust control, network security and botnets, authorization and authentication, as well as theory and algorithms for security. The 2011 GameSec conference will be hosted by the University of Maryland at the Inn and Conference Center in College Park, on November 14-15, 2011. Prof. Baras is the General Chair of GameSec 2011.

### NEW MEMS HANDBOOK OFFERS COMPREHENSIVE RESOURCE

The new **"MEMS Materials and Processes Handbook"** is an exhaustive design reference for researchers searching for new materials, properties of known materials, or specific processes available for MEMS fabrication. The handbook is co-edited by **Reza Ghodssi**, Herbert Rabin Distinguished Professor and **Pinyen Lin**, Chief Technologist and VP of Business Development, Touch Micro-System Technology Corp. Taoyuan, Taiwan. It features 35 international contributing authors who are MEMS leaders in academic, industrial and government laboratory settings.



## MCKINNEY RECEIVES HIGH HONORS FROM UNIVERSITY SYSTEM

**Jeff McKinney**, director of computing for the ECE Department, the Institute for Systems Research, the Physics Department and the Mathematics Department, was



JEFF MCKINNEY

selected to receive a 2011 Board of Regents Award for effectiveness and efficiency in administrative transformation. This prestigious award is the highest honor the Board bestows to publicly recognize distinguished performance and achievements. Only eight recipients from the entire Maryland University System were selected to receive this honor. In his seven years with UMD, McKinney has devoted his efforts to improving technological resources and performance. ☐

## ECE FACULTY IN THE NEWS

### DAVIS, BALZANO CRITIQUE CELL PHONE STUDIES ON RADIATION

PROF. **CHRISTOPHER DAVIS** AND RESEARCH SCIENTIST **QUIRINO BALZANO** OFFERED A CRITIQUE OF STUDIES THAT CLAIM CELL PHONES TRANSMIT POTENTIALLY HARMFUL RADIATION. DAVIS & BALZANO POINTED OUT THAT THE HIGHEST TEMPERATURE ELEVATIONS IN THE BRAIN DURING CELL PHONE USE ARE ON THE ORDER OF 0.1°C TO 0.2°C, TEMPERATURE ELEVATIONS THAT ARE SMALLER THAN THOSE RESULTING FROM PHYSICAL ACTIVITY.

### KALANTARI IN THE NEWS FOR BRIDGE SENSOR TECHNOLOGY

ECE RESEARCHER AND ALUMNUS **MEHDI KALANTARI** WAS FEATURED FOR HIS UNIQUE SENSOR SYSTEM THAT OFFERS INSTANT, AFFORDABLE WARNINGS REGARDING BRIDGE STABILITY. ☐

# Traveling Engineer: Visiting Michael Faraday

by Professor Emeritus Len Taylor

Astonishingly, the door was partially ajar, so I just stepped inside! Many other times on Albemarle Street in central London, the doors to the Royal Institution had been locked, and my repeated knocking went unanswered. Now, across a small vestibule a wide wooden stairway lead to the basement and a sign read, “Faraday Museum”. With no one in sight, I tucked my camera away, and went down to the birthplace of Electrical Engineering: the laboratory where Michael Faraday had worked.

At the bottom of the stairs, pretending to be at ease, I was ignored by two men in lab coats. Another sign led me into the small softly-lit rooms which Faraday had occupied for four decades. I was alone for the entirety of my visit.

Michael Faraday’s life story is a sort of rags-to-riches chronicle. In 1812, the poor printer’s apprentice attended public lectures by the great scientist of the era, Sir Humphry Davy. Inspired, he sent Davy his notes; requested a job; was accepted after a long delay became Davy’s assistant; and then rose, upon Davy’s retirement, to become director of the laboratory and a renowned scientist.

There is much more to the story. Faraday was treated scornfully by Davy’s patrician wife. Then Davy, who had been knighted and made a baronet, had his own class-conscious ambitions and professional jealousies. He became Faraday’s enemy, accusing him of plagiarism and for a long while succeeded in blocking his election to the Royal Society. But Faraday persevered, refusing other appointments and a knighthood, working in this basement.

Clear of the work benches and lab tables that once filled them, the rooms were now lined with glass cabinets featuring enlarged images of Faraday’s handwritten lab notes. Shelves displayed experimental apparatuses that had darkened and crumbled with age, although they had been carefully made and even designed



THE INNOVATION AND INGENUITY OF MICHAEL FARADAY

to be attractive. I supposed they were used for demonstrations in Faraday’s required presentations during the public subscription lecture series at the Institution.

Two exhibits attracted my attention—they represented experiments that I always taught in undergraduate electromagnetics. The “Faraday disk” experiment showcased a copper disk which rotated between the poles of a magnet to produce an electric potential between the center and the rim, creating the first (homopolar) generator and the progenitor of modern electrical generators. Its descendants turned the 19th Century into the “Age of Electricity.”

The second exhibit contained the hollow conducting and dielectric hemispheres that led Faraday to postulate the existence of an electric induction field. The metal hemispheres were only a few inches in diameter. I had to mentally resolve how they could have been so exactly made using the lathes available at that time. And what about the hollow dielectric hemispheres? (The first plastic was still decades in the future.) These seemed beautifully made of wood, wax, and a black resin, like pitch. A small object in front of the spheres attracted my attention: I took it to be a gold-leaf electroscope, a primitive instrument to measure electric charge by the repulsion of the leaves.

Faraday inveighed against the pollution of the Thames River, refused to participate in the development of poison gases, and

argued against the quackery of his times. A deeply religious Protestant, Faraday’s beliefs have been cited by modern anti-evolutionists as proof that great scientists rejected Darwin’s theory, the most significant issue of the Victorian era. However, they seem unable to cite any specific statements to support that claim. Faraday did say, “I have never seen anything incompatible between those things of man which can be known by the spirit of man which is within him and those higher things concerning his future,

which he cannot know by that spirit.”

Faraday died in 1867, possibly from lead poisoning incurred during his electrochemical experiments. He played a leading role in the formation of the electrochemical industries that appeared in England during his lifetime and is considered the founder of electrochemistry. Some of my forebears worked in the electroplating industry: “That’s a connection,” I thought as I left the museum.

Walking back to our hotel, I tried to imagine those basement rooms in the early 19th Century. They were surely darker, colder, dirtier, and cluttered with laboratory benches and equipment, far different from the shrine-like museum. Still, I felt that I had visited Michael Faraday: he had just happened to be away from the office at the time. ☐

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*Len Taylor has been a faculty member at the University of Maryland since 1967 and has been a pioneer in the field of medical technology. He is now a Professor Emeritus but is still actively teaching in the department. He is the author of over 150 journal articles and conference papers, has had 48 funded research grants, contracts and projects, and holds six U.S. and 16 foreign patents. He is a life fellow of the IEEE and of the American Society for Laser Surgery and Medicine and has been a Distinguished Lecturer of the IEEE Engineering in Medicine and Biology Society.*



## Department Welcomes Two New Faculty Members

As the fall semester begins, the department of Electrical and Computer Engineering welcomes two new professors who count energy conversion among their research interests. Drs. **Jeremy Munday** and **Alireza Khaligh** join ECE as assistant professors.

Dr. Jeremy Munday received his B.S. in Physics and Astronomy from Middle Tennessee State University in 2003 and his Ph.D. in Physics from Harvard in 2008. His thesis work focused on the first experimental demonstration of a repulsive Casimir force and was conducted under the supervision of Federico Capasso. After this, he became a postdoctoral scholar under Harry Atwater in the departments of Applied Physics and Materials Science at Caltech working on plasmonics and photovoltaic devices.

His current research endeavors span a wide range from near field optics, photonics, and plasmonics for energy harvesting to quantum electromechanical phenomena for actuating micro- and nano-mechanical devices.



JEREMY MUNDAY

Prof. Munday is excited to be teaching a course on Solar Energy Conversion this semester and looks forward to future classes on Electricity and Magnetism and Quantum Mechanics. He is also interested in music,

and in his free time he recently designed and built a hybrid electric resonator guitar.

Prior to Maryland, Dr. Alireza Khaligh was an Assistant Professor and the Director of the Energy Harvesting and Renewable Energies Laboratory (EHREL) in the ECE

Department at Illinois Institute of Technology (IIT). Dr. Khaligh was a Post-Doctoral Research Associate at the University of Illinois at Urbana-Champaign (UIUC), Urbana, IL.

Dr. Khaligh is the recipient of the 2010 Ralph R. Teeter Educational Award from the Society of Automotive Engineers (SAE) and the 2009 Armour College of Engineering Excellence in Teaching Award from IIT. He also received the 2001 Distinguished Undergraduate Student Award from Sharif University of Technology presented jointly by

the Minister of Science, Research and Technology and President of Sharif University.

He is the Program Chair of the 2011 IEEE Vehicle Power and Propulsion Conference, the Program Co-Chair of the 2012 IEEE

Transportation Electrification Conference, and the Grants and Awards Chair of the 2012 IEEE Applied Power Electronics Conference (APEC).

Dr. Khaligh is an Associate Editor of IEEE Transactions on Vehicular Technology. He was a Guest Editor for Special Section of IEEE Transactions on Vehicular Technology on Vehicular Energy Storage Systems and also a Guest

Editor for Special Section of IEEE Transactions on Industrial Electronics on Energy Harvesting.

He is the principle author/co-author of more than 80 refereed papers, two pending patents, as well as two books including Energy Harvesting: Solar, Wind, and Ocean Energy Conversion Systems (CRC Press, Dec. 2009), and Integrated Power Electronics Converters and Digital Control (CRC Press, May 2009). His research interests are mainly focused in the areas of power electronics, renewable energy systems, energy harvesting, and sustainable transportation. ☐

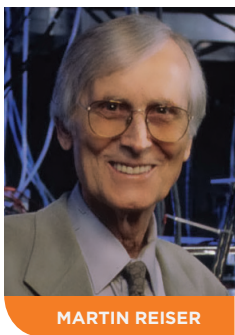


ALIREZA KHALIGH

## In Memoriam: Prof. Martin Reiser (1931-2011)

Professor Emeritus **Martin Reiser** passed away peacefully at his home on May 1, 2011, three weeks after celebrating his 80th birthday.

Throughout his long career at the University of Maryland, which began in 1965, he contributed greatly to the success of the university's vibrant research programs. Beginning with the design of the Maryland Cyclotron, he later moved on to form the Charged Particle Beam Group, and co-founded the Institute for Research in Electronics and Applied Physics. He also led the creation of the University of Maryland's



MARTIN REISER

applied electromagnetics and beam physics programs. Both nationally and internationally, he played a major role in establishing particle beam physics as an academic discipline, and was one of the leaders in the creation of the Beam Physics Division at the American Physical Society in the late 1980s.

Reiser received his doctorate in physics in 1960 from the Johannes Gutenberg Universität in Mainz, Germany, while working as a Research Physicist at the AEG-Forschungsinstitut Frankfurt (from 1958 to 1961) on the design of the sector-focusing cyclotron for the Karlsruhe Nuclear Research

Center. From 1961 to 1964, he was Assistant Professor in the Physics Department of Michigan State University, and from 1964 to 1965 he worked as a Supervisory Research Physicist at the Naval Radiological Defense Laboratory in San Francisco. In September 1965, he joined the University of Maryland as Associate Professor, with a joint appointment in the Electrical Engineering Department and the Department of Physics, and became a Full Professor in 1970. He was co-founder of the University of Maryland's Institute for Research in Electronics and Applied Physics, established in 1981.

Martin Reiser is survived by his wife Inge, daughter Bettina, and son Christopher. ☐



# ECE DEPARTMENT ANNOUNCES FORMAL REDEFINITION OF UNDERGRADUATE PROGRAM EDUCATIONAL OBJECTIVES

The Department of Electrical and Computer Engineering (ECE) has announced a formal redefinition of the program educational objectives and program constituencies for both the electrical engineering (EE) and computer engineering (CP) undergraduate majors.

The Department's two undergraduate programs are guided by a set of Program Educational Objectives (PEOs). The PEOs are determined by the needs of the programs' constituents and designed to be in harmony with the department mission statement. PEOs focus on what is expected of a program's graduates early in their careers, specifically, within 3-5 years after graduation.

Success in achieving the PEOs is regularly evaluated by soliciting feedback from alumni, employers, ECE faculty, and other program constituents. Representatives from each program's constituencies are also involved in re-evaluating and recommending revisions to the PEOs.

These activities constitute just one component of the Department's commitment to continuous improvement in undergraduate education. In addition, all of these efforts directly support accreditation, of both the electrical and computer undergraduate programs, under the Engineering Accreditation Commission (EAC) of ABET, Inc.

In 2009, ECE held a constituent retreat to review and revise the PEOs for both undergraduate programs. Attended by students, alumni, leaders from industry, and faculty, the retreat was a great success. The participants drafted new PEOs designed to take the undergraduate programs in new and exciting directions. The proposed PEOs were distilled and refined during the 2010-2011 academic year by the Undergraduate Affairs Committee. Finally,

the new PEOs were discussed by the Department Council and ECE Advisory Board before being approved by the ECE faculty on May 20, 2011.

## **New Program Educational Objectives (for both EE and CP)**

**Technical Accomplishments:** Have our graduates establish a reputation for technical expertise and excellence among colleagues and achieve professional recognition for their work, in graduate or professional school and/or the technical workforce.

**Invention, Innovation, and Creativity:** Have our graduates utilize their skills and resourcefulness to invent, design and realize novel technology; to find creative and innovative solutions to engineering problems; and to identify, research and solve new technical challenges in electrical engineering and related fields.

**Professional Development:** Have our graduates stay abreast of emerging technologies, continually learn new skills, and actively participate in professional communities to nourish ever-developing careers.

**Professionalism & Citizenship:** Have our graduates embrace cultural, societal, environmental, and ethical issues in their work to help fulfill their professional responsibilities to themselves, employers, employees, co-workers, and the local and global communities.

**Communication & Teamwork:** Have our graduates excel on multi-disciplinary and multi-cultural teams, demonstrate leadership, and effectively employ their oral and written communication skills to resolve problems and inform, educate and persuade diverse audiences.


## **Constituencies**

The primary constituencies with an interest in or needs satisfied by the EE undergraduate program are:

Undergraduate EE students  
ECE Faculty  
EE Alumni  
Local, state, and national employers of electrical engineers  
Relevant Graduate and Professional Programs for EE  
The Public  
(NOTE: Only the EE constituencies are listed here. CP has a similar set.)

Input is regularly solicited from each constituency with representatives from each group being integrated in different ways into the decision making processes that impacts the EE undergraduate program. The first five constituencies are essentially the same as previously defined by the Department, though there has been a refinement in the understanding of the needs of each of these groups. The sixth constituency is new.

As a formally recognized group, "the Public" was added to the ECE constituency list with the May 20, 2011 PEOs vote. Understood in its many different senses, the Public encompasses local, state, regional, national, and international communities. However, for purposes of generating PEO feedback, this constituency is primarily focused at the local, state, and regional level.

The interests and needs of the Public as they pertain to the EE program include: advancing the public health, safety, and well-being through technological developments; innovative advocacy of the public interest through effective communication and active engagement with relevant communities and cultures; engineers who are technically competent and prepared to fulfill their professional responsibilities and obligations to society; and enhanced economic development. 

## ACCOMPLISHMENTS, AWARDS & HONORS FOR ALUMNI

### CARIN NAMED ECE DEPARTMENT CHAIR AT DUKE UNIVERSITY

ECE alumnus **Lawrence Carin** (B.S. '85, M.S., '86 and Ph.D. '89), was recently named Chair of Electrical and Computer Engineering at Duke University's Pratt School of Engineering. He joined Duke in 1995 as an associate professor, was promoted to the rank of full professor in 2001, and named the William H. Younger Professor of Engineering in 2003. Prior to Duke, he was on the faculty of Polytechnic University in Brooklyn, NY. His research focuses on adaptive physics-based signal processing.

### ALUMNUS WHEATLEY EARNS IEEE PIONEER AWARD

Alumnus **C. Frank Wheatley** (B.S. '51) was elected an IEEE Pioneer, at the 23rd International Symposium on Power Semiconductor Devices & ICs, to recognize his significant and transformative impact on the field of power electronics. He has been issued 58 United States patents, published over 150 professional papers, presented 44 papers at IEEE conventions, domestically and abroad, and has received many awards. He is known for his seminal patent in 1982 of the Insulated Gate Bipolar Transistor (IGBT), an electronic device that led to worldwide sales of the IGBT that are currently estimated to be worth over \$2 billion per year. Wheatley was elected into the Electronics Design Magazine Hall of Fame in 2010.

### ALUMNUS HEMMADY RECEIVES IEEE OUTSTANDING YOUNG ENGINEER AWARD

ECE Ph.D. alumnus **Sameer Hemmady** ('06) received the 2011 IEEE Outstanding Young Engineer Award from the IEEE Albuquerque, NM Chapter for his work on reconfigurable stealth-antennas, counter-IED technologies and electromagnetic weapons design, as well as high power microwave (HPM) effects and active denial technologies. An applied physicist with over 7 years experience in advanced directed energy weaponized

systems, he has served as a program manager and PI on several US DoD programs. He is also a research professor in the Applied Electromagnetics group of the ECE department at the University of New Mexico. He currently serves as Senior Technical Lead Scientist for TechFlow Inc. At UMD, he was advised by Profs. **Steven Anlage**, **Thomas Antonsen**, and **Edward Ott**.

### ALUMNUS SMITH PROMOTED TO FULL PROFESSOR AT CMU

Now a Full Professor of Information Technology and Marketing at the Heinz School of Business, **Michael D. Smith** has served as a faculty member at Carnegie Mellon University since 2000. He graduated summa cum laude (B.S. EE '91) and studied Telecommunications (M.S. '96) at the University of Maryland. He received his Ph.D. in Management Science and Information Technology from the Sloan School of Management at MIT in 2000. Smith's teaching focuses on the application of information technology to adapting business practices and industry structure and competition. Smith's father, **David K. Smith** (B.S., EE, '64), and sister, **Virginia (Smith) O'Connell** (B.S. in Engineering and an MBA from the Smith School), are also University of Maryland alumni.

### ECE GRADUATES TURAGA, VEERARAGHAVAN APPOINTED TO FACULTY POSITIONS

**Pavan Turaga** (Ph.D., 2009) and **Ashok Veeraraghavan** (Ph.D., 2008), both former students of Minta Martin Professor of Engineering and Interim Chair Dr. **Rama Chellappa**, were appointed to university faculty positions. Turaga joins Arizona State University as assistant professor in Interactive Media and Electrical and Computer Engineering. His research interests include automatic interpretation of multimedia signals, computer vision, and image processing.

Dr. Ashok Veeraraghavan, joined the Electrical and Computer Engineering Department at Rice University where he plans to set up a computer vision and computational imaging laboratory at Rice.

### ALUMNA RESNIK REMEMBERED ON 25th ANNIVERSARY OF CHALLENGER TRAGEDY

Dr. Judith Resnik ('77), an Electrical Engineering Ph.D. graduate, Space Shuttle astronaut, and the second American woman in space will forever be remembered as a trailblazer and a hero. January 28, 2011, marked the 25th anniversary of the Challenger Space Shuttle tragedy, which resulted in the deaths of Dr. Resnik and six other



JUDITH RESNIK

astronauts on board. The Judith Resnik Memorial Fellowship Fund, established in 1986, honors her memory and supports fellowship awards to outstanding graduate students at the University of Maryland.

### ALUMNUS HAMID JAFARKHANI ELECTED AAAS FELLOW

Alumnus **Hamid Jafarkhani** (EE, Ph.D. '97) was recently elected as a fellow of the American Association for the Advancement of Science in the Section on Information, Computing, and Communication. He also was named the Conexant-Broadcom Endowed Chair at UC Irvine and director of the Center for Pervasive Communications and Computing. His research is in communication theory with emphases on coding, wireless communications, and wireless networks. He invented "space-time block coding," a MIMO technology, that has become an active area of research and is widely used in practice. At Maryland, he was advised by former Provost **Nariman Farvardin**. ☐





## ECE Student Laura Freyman Earns NSF Graduate Fellowship

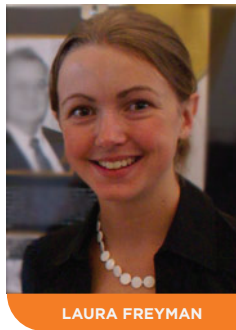
**Laura Freyman** was one of 11 students in the A. James Clark School of Engineering to be awarded a National Science Foundation (NSF) Graduate Research Fellowship.

Laura previously participated in the Electrical and Computer Engineering Department's Maryland Engineering Research Internship Teams (MERIT) summer research internship program in 2008, and was among the students included on the Fall 2010 Dean's List.

The Graduate Research Fellowship Program recognizes and supports

outstanding graduate students in NSF-supported science, technology, engineering, and mathematics disciplines who are pursuing research-based master's and doctoral degrees at accredited U.S. institutions.

Fellows benefit from a three-year annual stipend of \$30,000 along with a \$10,500 cost of education allowance for tuition and fees, opportunities for international research and professional development, and the freedom to conduct their own research at any accredited U.S. institution of graduate education they choose. ☐



LAURA FREYMAN

## Chen Honored as Outstanding Student Abroad By Chinese Govt.

ECE Ph.D. student **Yan Chen** received the 2010 Chinese Government Award for Outstanding Students Abroad. He was one of approximately 500 students to receive the award. Each recipient was awarded \$5,000.

The purpose of the award program is to encourage students to study abroad and engage in new educational experiences across the globe. Since its inception in 2003, a total of more than 2,400 academic awards have been awarded to outstanding doctoral students.

Yan Chen is advised by Christine Yurie Kim Eminent Professor of Information Technology and Associate

Chair for Graduate Studies and Research **K. J. Ray Liu.**



YAN CHEN

Yan Chen received his B.S. degree from the University of Science and Technology of China (USTC) in 2004 and M.S. degree from Hong Kong University of Science and Technology (HKUST) in 2007 before coming to the University of Maryland. His research interests include multimedia social networks, game theory, multimedia signal processing, and cooperative multimedia communication and networking. ☐

## Baron Featured in *IEEE Institute* for Chapter, Society Work

**Sergio Baron**, a first-year graduate student in the ECE Department advised by Herbert Rabin Distinguished Professor and Director of the Institute for Systems Research **Reza Ghodssi**, was recognized for his work as an Institute of Electrical and Electronics Engineers (IEEE) member in a recent article in the *IEEE Institute*. Baron is a chapter organizer for the Argentina Section and just recently formed a joint chapter of the IEEE Electron Devices and Solid-State Circuits societies.

Sergio received an Electronics Engineering degree from the National University of La Plata, Argentina in 1999. Since then, he has been active in the field of microelectronics through a teacher/researcher position he held at the same university. Recently, Sergio has participated in several MEMS and nanotechnology science schools and did an internship at MINATEC in Grenoble, France. In 2009, he was awarded with a Fulbright Scholarship that allowed him to start his Ph.D. studies at the University of Maryland in Electrical and Computer Engineering and conduct research at the MEMS Sensors and Actuators Laboratory (MSAL) since August 2010.

"All the skills I acquired during my IEEE volunteer experience have been paramount in fulfilling my day-to-day duties," said Sergio. "My organizational skills improved a lot, and speaking in front of audiences of different nationalities became normal for me." ☐

# University of Maryland Wins CyberWatch Mid-Atlantic Collegiate Cyber Defense Competition


The University of Maryland won the 6th annual CyberWatch Mid-Atlantic Collegiate Cyber Defense Competition (MA CCDC) in March, earning top honors and the opportunity to compete against the seven other university finalist teams in the National CCDC competition in San Antonio, TX.

The MA CCDC event, held at the Johns Hopkins University Applied Physics Laboratory (JHU APL), in Laurel, Md., drew over 500 competitors, spectators and industry and government officials from the region. The event was supported by the National Science Foundation, the Department of Homeland Security and several industry sponsors, including Deloitte, Booz Allen Hamilton, Northrop Grumman, Boeing, CSC, NetApp, Neustar, SAIC, Tenable Network Security,

and CTI. Cybersecurity presentations were provided by experts in the field, including Dr. Ernest McDuffie of the National Institute for Standards and Technology (NIST), Alan Paller of the SANS (SysAdmin, Audit, Network, Security) Institute, and Wendé Peters of JHU APL.

Throughout the MA CCDC competition, a “Red Team” of over 25 hackers launched relentless attacks against the eight university teams who attempted to defend their networks. In the end, the University of Maryland team was the most successful in defending against the attacks.

The University of Maryland team that competed in the MA CCDC competition included seven undergraduate students: **Drew Bailey, Justin Chen, Travis Finkenauer,**

**Stephen McCarthy, Aaron Sanders, Nick Sinlock,** and **David Wasser**; and one graduate student, **Rose Kirby**. The four additional members of the team that did not compete were **Scott Tomaszewski, Josh Berenhaus, Josh Kamdjou,** and **Jesse Spears**. All of the students are members of the University of Maryland Cybersecurity Club, a student organization with over 200 members, mostly from the Computer Science and Electrical and Computer Engineering Departments. The team was coached by **Robert Maxwell** of the University of Maryland’s Office of Information Technology Security team. The Maryland Cybersecurity Club is supported by the Maryland Cybersecurity Center, and sponsored by SAIC, Northrop Grumman, Lockheed Martin, Harris Corporation, and CSC. 

## Google Sponsors Cybersecurity Seminar Series

The University of Maryland announced the creation of a new cybersecurity seminar series made possible by a sponsorship from Google. The Google and University of Maryland Cybersecurity Seminar Series will feature a diverse group of speakers from industry, academia, and government, addressing a broad range of topics related to cybersecurity, including technology, policy, and economics. Invited speakers will also examine the impact that cybersecurity threats and protective measures are having on privacy, identity, social networks, business and national security.

The new series is organized by the Maryland Cybersecurity Center, a multidisciplinary initiative at the University of Maryland launched in Fall 2010 aimed at research, education, and technology development in cybersecurity. The center brings together faculty experts from engineering and computer science with colleagues from across campus in fields such as information sciences, business, public policy, social sciences



VINT CERF SPOKE AT THE KICK-OFF EVENT

and economics, mirroring the comprehensive perspective of the new seminar series that places special emphasis on “the human factor” of cybersecurity. Google committed to a three-year sponsorship of the new series, which will feature six seminars per year.

The series kicked off with a special talk titled “Can We Make the Internet Safer?” by Dr. **Vint Cerf**, Chief Internet Evangelist at Google, on April 7, 2011. Widely known as one of the “Fathers of the Internet,” Vint Cerf is the co-designer of the TCP/IP protocols and the architecture of the Internet and recipient

of the U.S. National Medal of Technology and the Presidential Medal of Freedom.

Additional Google seminars have featured **Martin Roesch**, Chief Technology Officer of Sourcefire®, **Ari Schwartz**, Senior Internet Policy Advisor at the National Institute of Standards and Technology (NIST), and Dr. **Stefan Savage**, Professor of Computer Science at the University of California, San Diego.

The University of Maryland offers an ideal location for seminars about the nation’s growing needs in cybersecurity. The State of Maryland leads the nation in information technology jobs and more than half of the nation’s Internet traffic passes through the Washington, D.C. metropolitan area. The region is also home to U.S. Cyber Command and key federal agencies that focus on national cybersecurity, along with many area companies specializing in information assurance. The University of Maryland is also the alma mater of Google Co-Founder and President **Sergey Brin**.

To learn more, visit [cyber.umd.edu](http://cyber.umd.edu). 

## ETA KAPPA NU WINS OUTSTANDING STUDENT CHAPTER AWARD

The Gamma Xi Chapter of Eta Kappa Nu, the Electrical and Computer Engineering Honor Society at the University of Maryland, has received the Outstanding Chapter Award for 2009-2010. The purpose of the Outstanding Chapter Award is to recognize excellence in college chapters. The award is based on the quality of activities as outlined in the Annual Chapter Report, submitted by each chapter. This coveted award is a sign of great distinction for a college chapter. Eta Kappa Nu is a unique membership organization dedicated to encouraging and recognizing excellence in the electrical and computer engineering field. Members consist of students, alumni, and other professionals.

## FORTE AND SRIVASTAVA WIN AHS 2011 BEST STUDENT PAPER AWARD

**Domenic Forte**, an ECE graduate student attending the NASA/ESA Conference on Adaptive Hardware and Systems (AHS) on June 6-9 in San Diego, won the AHS 2011 Best Student Paper Award. Domenic and his advisor, Prof. **Ankur Srivastava**, collaborated and presented the paper, titled "Adaptable Video Compression and Transmission Using Lossy and Workload Balancing Techniques." Domenic is in his fourth year of Ph.D. work studying Computer Engineering. His research focus is in the VLSI Design Automation and Embedded Systems area. The purpose of the AHS Conference is to bring together leading researchers from the adaptive hardware and systems community to exchange experiences and share new ideas in the field.

## FIVE ECE STUDENTS SELECTED FOR L-3 SCHOLARSHIPS

Five ECE students have been selected to receive scholarships from L-3 Communications through the A. James Clark

School of Engineering. **Rebecca Baier**, **John Garvey**, and **Pedro Peña** each received an L-3 Communications Corporation Scholarship for \$4150, and **Saara Khan** and **Prateek Kukreja** each received an L-3 Communications Corporate Partner Scholarship for \$1000.

## STEVE TJOA AWARDED NSF POSTDOCTORAL RESEARCH FELLOWSHIP

**Steve Tjoa** (Ph.D., May 2011) received a National Science Foundation (NSF) Postdoctoral Research Fellowship in collaboration with Imagine Research, Inc., in San Francisco, CA. He will develop machine learning algorithms that annotate and search for sound objects from large-scale multimedia collections. Tjoa's

postdoctoral fellowship is funded through the NSF/ASEE Small Business Postdoctoral Research Diversity Fellowship Program,

which aims to encourage creative and highly-trained recipients of doctoral degrees in NSF-supported science, technology, engineering and mathematical disciplines to engage in hands-on research projects in their areas of expertise at the kind of small innovative businesses that historically have fueled the nation's economic regime. At Maryland, Steve has been advised by Christine Yurie Kim Eminent Professor of Information Technology **K. J. Ray Liu** and served as a member of the Signals and Information Group. He recently defended his dissertation, "Sparse and Nonnegative Factorizations for Music Understanding." His research involved problems in music information retrieval such as music transcription, factorization, and classification. information theoretic and networking concepts and points to new possibilities towards a stronger coupling between the two fields.

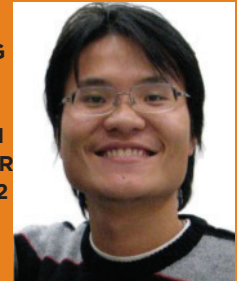


STEVE TJOA

## TA SELECTED AS ECEGSA PRESIDENT

**TUAN (JOHNNY) TA**, A THIRD YEAR ECE PH.D. STUDENT, WAS NAMED THE NEW PRESIDENT OF THE ELECTRICAL AND

COMPUTER ENGINEERING GRADUATE STUDENT ASSOCIATION (ECEGSA) FOR THE 2011-2012 ACADEMIC YEAR. TUAN IS ADVISED



BY PROF. JOHN BARAS IN THE FIELD OF SIGNAL PROCESSING & COMMUNICATIONS. HE RECEIVED HIS UNDERGRADUATE DEGREE WITH HIGH HONORS FROM THE UNIVERSITY OF TEXAS AT AUSTIN IN ELECTRICAL ENGINEERING. HE PREVIOUSLY HELD AN ECEGSA OFFICE AND WAS A TEACHING ASSISTANT FOR ECE DURING SPRING AND FALL OF 2011. HE RECEIVED A SCHOLARSHIP TO ATTEND THE 5TH EUROPEAN TRUSTED INFRASTRUCTURE SUMMER SCHOOL, HOSTED BY THE INFORMATION SECURITY GROUP (ISG) IN 2010. HE IS LOOKING FORWARD TO FUTURE RESEARCH OPPORTUNITIES IN WIRELESS NETWORKS

## JEONGHO JEON EARNS NIST-ARRA FELLOWSHIP

**Jeongho Jeon**, a graduate student in the ECE Department, was awarded the National Institute for Standards and Technology's American Recovery and Reinvestment Act Measurement Science and Engineering Fellowship (NIST-ARRA). The fellowship award has a three-year term with stipends to be funded by the grant at \$30,000 annually. Jeongho will work with Dr. Kamran Sayrafian-Pour of the NIST Information Technology Laboratory. This Fellowship entails an appointment as a Graduate Research Assistant with the Institute for Research in Electronics and Applied Physics. Jeongho is advised by Cynthia Kim Eminent Professor of Information Technology Dr. **Anthony Ephremides**.