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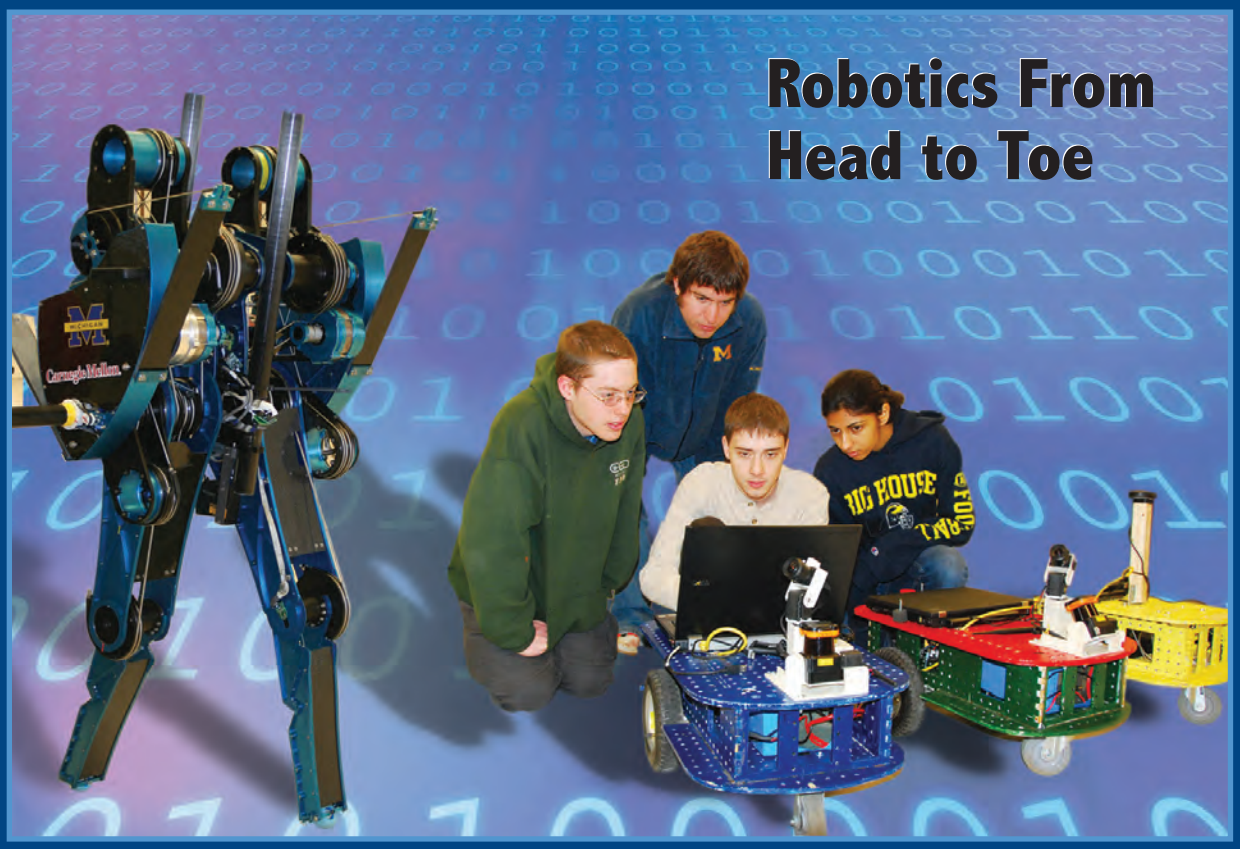

Robotics From Head to Toe

Energy and Power:
Engineering Sustainable Solutions From the Macro to the Micro Levels

UNIVERSITY OF MICHIGAN

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In This Issue

Electrical Engineering and Computer Science

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A Message

From the Chairs of EECS

Farnam Jahanian, Chair
Computer Science and Engineering Division

Khalil Najafi, Chair
Electrical and Computer Engineering Division

Greetings from EECS@Michigan! We are excited to mark the beginning of a new decade, and to see the many remarkable and important ways our discipline is impacting the world.

At the forefront of the nation's concerns is energy and power, a vast issue that must be addressed if we are to live in harmony with the world. Our faculty are involved in many facets of energy and power, from grid infrastructure, to electric vehicles, lighting, solar and wind power, and even scavenging energy from the surrounding environment to power extremely small devices – all with the goal of creating sustainable solutions; read more in the first research feature.

Michigan has a bright future in the areas of robotics. The State of Michigan is the home to the Dept. of Defense's Ground Vehicle Center of Excellence, the U.S. Army Tank Automotive Research, Development and Engineering Center (TARDEC); the College of Engineering boasts the multi-disciplinary Ground Robotics Reliability Center (GRRC); a strong core of EECS faculty are conducting important research in the area of robotics; and students can now earn a master's degree in robotics. Read about some of the cutting-edge robotics research happening in EECS in the second research article.

We are excited to announce a new Plasma Research Center, directed by Prof. Mark Kushner, and to see our faculty involved in new MURI's in the areas of computer security and quantum computing. As you'll see in the research briefs, we are continuing to make new breakthroughs in many areas. For example, just in the area of low-power computing, faculty are finding ways to dramatically reduce the energy requirements of data centers; the lowest power microcontroller in standby mode ever designed has evolved into a miniature commercial-grade microprocessor that can run on ambient light; cell phone users can decide which applications to use to extend battery life when needed; miniature sensors are being designed to run with extremely low power; and basic research is being pursued in the area of near-threshold computing. All of these activities, and many more, are highlighted in the Research Briefs section.

Research and the curriculum we teach go hand in hand. We are pleased to announce a new interdisciplinary program in Plasma Science and Engineering, and several new courses or existing courses that are making their own news. Importantly, our K-12 outreach has reached new heights with several programs initiated with area schools to improve their computer science curricula, while popular existing programs in nanotechnology continue to entertain and engage local children.

We are delighted to announce that several of our senior faculty have been honored with professorships, and our junior faculty are earning a variety of Young Investigator Awards, including a Presidential Early Career Award of Scientists and Engineers, given to Prof. Tony Grbic. A great number of additional honors and awards are highlighted on pp. 16-20.

We hope you can take some time to get to know our eight new faculty that have joined Michigan in 2009-2010 (pg. 21). With interests ranging from web-oriented research (Michael Cafarella), to wireless sensing systems (Prabal Dutta), performing arts technology (Georg Essl), power electronics (Heath Hofmann), signal processing (Raj Nadakuditi), MEMS (Mina Rais-Zadeh), computational physiology (Zeeshan Syed), and VLSI (Zhengya Zhang) – they are bringing exciting new areas of research to Michigan, and strengthening existing programs.

Michigan students once again are proving that they are the "Leaders and Best!" In addition to conducting important research, earning prestigious awards, and winning a wide variety of contests, they are venturing into the world of social entrepreneurship to serve others as part of their daily lives. Read how Raj Vable is bringing solar technology to India, how the iPhone application called DoGood grew from a new Mobile and Web App Programming class, and some examples of recent students, now alumni, providing assistance to others through charities and service (Globe Shares and Joe's Run for MS).

We hope that many of our alumni can join us for the 2010 Homecoming in October! Several alumni took advantage of Prof. Mohammed Islam's short course on Patent Fundamentals, and others participated in a special followup workshop about Patent Claim writing with EECS alumni and friends at Brooks Kushman. We were delighted to see many friends at the alumni reception at the *International Solid-State Circuits Conference in February*, and hope to offer more of such opportunities in the future.

We continue to be extremely grateful for the support of our alumni and industrial partners. We truly can't do it without you!

Featured Research

Energy and Power: Engineering Sustainable Solutions From the Macro to the Micro Levels

There is no shortage of energy being devoted to finding new and sustainable energy solutions. Even amidst the current economic challenges, the U.S. government is supporting these efforts with nearly a 50% increase in funding for energy-related research that includes energy efficiency and renewable energy, "smart" grid and efficient electrical transmission, green cars, and basic scientific research.

Energy research requires a multidisciplinary approach that involves basic science, technology, materials, systems, business, policy, and even politics. "If you're going to tackle problems as big as energy, it takes people from multiple disciplines to actually make any impact," stated Stephen Forrest, U-M's VP for Research, and William Gould Dow Collegiate Professor in the EECS Department. "The University of Michigan is one of the few places in the world where we have enough breadth to take on a sizeable chunk of this humanity-wide problem."

Faculty in the division of electrical and computer engineering are tackling the problem from many angles. On a systems-wide level, they are investigating ways to transfer wind- and solar-produced electricity into the nation's electrical power grid, and managing the burden on the grid that comes with the increased use of electric vehicles. They are also improving the technology of electric vehicles in partnership with the auto industry, improving the efficiency of the largest single user of electric power – white lighting, and they are exploring new materials to make solar energy a practical reality. Related efforts with far-reaching human and societal applications include turning naturally-occurring vibrations and movement into electricity.

Power Systems and the Smart Grid

Electric cars hitting the road in greater numbers, as well as new energy sources in the form of solar and wind power, will impact the nation's grid infrastructure in novel ways. It is a systems integration problem, and the specialty of Ian Hiskens, Vennema Professor of Engineering.

"The success of electric-powered vehicles will depend on solid, innovative science and technology that is tied to policy and market considerations," said Hiskens, who is working with the Michigan Public Service Commission to explore the widespread use of Plug-in HEV's in Michigan.

Hiskens is also working with the Department of Energy to develop new techniques for assessing the impact of wind generation on the grid system, specifically on power system voltage control and transient stability. He will initially focus on the power system in Michigan's "thumb" area, ideal because of its peninsula-like geography that is perfect for windy environments.

The current grid system doesn't allow for simple use of these new energy sources. New technologies need to be developed that will allow the grid to operate in a manner resembling the Internet. For example, with the Internet, if one link is congested with information, control loops redirect packets of information around the congested link. This is not possible with today's power grid.

"Right now the grid is either on or off," explains Hiskens. "We need to be able to add controllability through power-electronic devices – and better utilize existing assets to make the existing grid a truly 'smart' grid."

Hybrid electric vehicle testbed for enhancing fuel economy and drive quality.

Electric and Hybrid Electric Vehicle Technology

Hybrid electric vehicles, or HEV's (i.e., vehicles with an internal combustion engine, an electric motor, and a battery), plug-in HEV's, and all-electric vehicles are no longer cars of the future. They are making real inroads in the marketplace, and are among the alternative and advanced vehicles supported by the U.S. Government.

One of the all-electric cars on the road, the Tesla Roadster, contains a control algorithm designed by Prof. Heath Hofmann. The algorithm, which is part of the digital controller, impacts the propulsion drive for the vehicle, ensuring efficient and robust performance under a variety of driving conditions. Prof. Hofmann's research is in the area of power electronics and electromechanical systems, with an emphasis on energy-related applications. He has also worked with Pentadyne Power Corporation to develop an energy-efficient flywheel energy storage system, writing a control algorithm for an electric motor generator that converts kinetic energy in the flywheel into electrical energy.

Jessy Grizzle, Jerry W. and Carol L. Levin Professor of Engineering, has been working with Ford Motor Company more than two decades, most recently turning his "control" expertise to hybrid electric vehicles. Working with graduate student Dan Opila, he has recently found a way to significantly increase mileage while retaining a pleasant driving experience.

Training students to work in the new auto industry is one of the goals behind the formation of Grizzle's Hybrid Electric Vehicle Design and Test Team. These students are designing and testing a HEV with both Ford and General Motors that uses compressed air as its primary power source. Jeffrey Koncsol from General Motors Company said, "The energy, enthusiasm, and diversity of abilities that the team members bring to this project is remarkable. U-M is producing engineering teams that are capable of the innovation and implementation of sustainable technologies required in today's world."

Solid-State Lighting

White lighting is responsible for 20% of all the electricity used in homes and buildings, and therefore key to defining the nation's dependence on fossil fuel. Small improvements in lighting efficiency stand to significantly reduce our demand for electricity, and hence our dependence on fossil fuels.

Prof. Forrest has been working on this issue for decades. He is currently exploring technology using organic thin films based light-emitting diodes (or OLEDs) that is more efficient than the best fluorescent lighting solutions. "We have the efficiency and the color and the lifetime," explained Forrest, "but we can't yet do it cheaply enough to compete with regular light bulbs. But that may change in just a few years." Forrest has been involved in several energy- and lighting-related companies to further research in this area.

Similarly, Prof. P.C. Ku and his group are investigating inorganic light-emitting diodes (LEDs) for solid-state lighting. Ku is working to achieve high efficiency in both the component and the overall system. "There is as much as a 20-40% efficiency loss when a high-efficiency LED is placed into a light bulb," explained Ku. "We can improve on that."

Graduate student Celia Cunningham (left) discusses organic solar cell fabrication with undergraduate student Christine Austin. They are working on a new method of incorporating carbon nanotubes in organic solar cells in a project funded by the National Science Foundation and private industry.

New Materials and Solar Cells

Several ECE faculty are members of a new five-year, $19.6M, Energy Frontier Research Center, called Solar Energy Conversion in Complex Materials, led by Prof. Peter Green in the Department of Materials Science and Engineering. This center has the goal of developing a new generation of inexpensive materials that will convert solar energy and heat into electricity much more efficiently than is currently possible. Sponsored by the Department of Energy, the center includes 25 faculty from no fewer than 5 different departments at U-M, with faculty from ECE playing a prominent role.

"The challenge is to be competitive with fossil fuels, and to do that the process needs to be efficient, cheap, and lightweight so it can be deployed anywhere, even as a coating on windows," stated Prof. Forrest. Forrest has an active research program to create high-efficiency solar cells using alternative and potentially very low cost materials that are either organic or "conventional" III-V thin-film nanostructures. Currently, most solar cells on the market are silicon based, and while silicon is relatively inexpensive per unit volume, it takes a large quantity to generate the electricity needed.

Prof. Jamie Phillips and his students are investigating the use of inorganic materials, in particular II-VI compound semiconductors such as zinc telluride (ZnTe), to improve the efficiency of the energy conversion process through the use of intermediate electronic states within the bandgap. The intermediate states may be introduced via nanostructures or intentional impurities, providing multiple absorption bands and theoretical conversion efficiencies for a single-junction cell comparable to more costly and complex triple-junction devices. Promising results demonstrating the intermediate band concept have been achieved using oxygen-doped ZnTe.

Prof. Ku is also investigating the use of the inorganic materials to improve the efficiency of solar cells, beginning with indium gallium nitride. He hopes to explain the fundamental science behind the inefficiency of most quantum dot solar cells so that this weakness can be overcome.

Prof. Ted Norris, Director of the Center for Ultrafast Optical Science, is helping define the fundamental aspects of newly engineered materials using ultrafast laser technology. He measures the response of charge to excitation by photons at the femtosecond time frame, exploring the most basic properties of these interactions. This work has the potential to significantly improve the ability of materials to harvest solar energy, and convert it efficiently to usable electrical power.

Prof. Zhoahui Zhong is working with Norris to improve our fundamental knowledge of nanomaterials, such as carbon nanotubes, to improve solar cell efficiency.

Energy Scavenging and Power Generation

Researchers are shrinking the size of microsystems to such a degree that powering them by batteries has become impractical. Energy-harvesting systems offer an alternative source of power for many emerging applications of miniature instruments used in health care, environmental monitoring, security, energy conservation and exploration, and a myriad of consumer electronic devices. The energy may be harvested from vibration, light, RF signals, and heat sources available in the immediate surroundings through piezoelectric, electromagnetic, or thermoelectric techniques.

In one project, Khalil Najafi, Schlumberger Professor of Engineering and Chair of ECE, has designed an efficient energy scavenger for converting ambient low-frequency vibrations into electrical power. The goal is to allow networks of miniature environmental sensors distributed throughout an area to monitor the environment for long periods, powered only by naturally-occurring vibrations such as those on buildings, bridges, and other physical infrastructure.

Miniature power generator

Prof. Hofmann works on power electronic circuitry that interfaces with similar devices to extract the most power available from the system. He is investigating human-based energy harvesting by connecting an energy converter to a backpack equipped with springs, giving a Marine in the field, for example, virtually an endless supply of electricity.

Moving Forward in Energy and Power

Powering the way we live while sustaining a world that is clean and safe will require the ingenuity and expertise of countless engineers to create and refine new technology – as well as committed teamwork between researchers, industry, business, and political leaders. EECS faculty and students are making important and lasting contributions to this important goal.


Energy-producing backpacks have been marketed by Lightning Pack, LLC, based on technology developed by Heath Hofmann and Prof. Lawrence Rowe (U. Pennsylvania).

U-M Solar Car Team

No Michigan story about solar energy can be complete without mentioning the heroic efforts of the College of Engineering's primarily undergraduate student team, the Solar Car Team. Since this team has been building cars from scratch for the first American Solar Challenge in 1990, they have won 5 out of 9 races, and continue to incorporate new methods of solar technology in their cars. Recently, the team crossed the finish line to capture 3rd place for the fourth time in the World Solar Challenge, now part of the Global Green Challenge. EECS students always figure prominently in the makeup of the Solar Car team.

planet blue
UofM environmental & energy initiative

EECS has partnered with Planet Blue, whose mission is to reduce utility use and increase recycling within the U-M community. There is much at stake: the electricity used to power all of the PCs and monitors in the U.S. has a carbon equivalent of more than 41 million acres of pine forests, and most computers waste 50% of the power they consume. U-M is doing its part in stocking recyclable office supplies, making it easy to recycle, working with green-friendly vendors, and educating the community about how to conserve energy.

EECS Faculty Mentioned in the Article:

Stephen Forrest	Heath Hofmann	Ted Norris
Jessy Grizzle	P.C. Ku	Jamie Phillips
Ian Hiskens	Khalil Najafi	Zhaohui Zhong

Courses in Energy and Power Systems:

- Electric Machinery and Drives
- Grid Integration of Alternative Energy Sources
- Power System Analysis and Design
- Power Electronics
- Solid-State Lighting and Solar Cells
- Special Topics in Electric Power Systems Operation, Markets, Reliability, and Blackouts
- Electric Machinery and Drives

New courses in the area of transportation electrification being developed

Undergraduate concentration in energy being developed

Related Courses in Energy and Power Systems:

- Nanophotonics and Nanofabrication
- Semiconductor Optoelectronic Devices
- Semiconductor Lasers and LEDs
- Ultrafast Optics

Robotics From Head to Toe

Teams of robots are exploring and learning to recognize objects they encounter – intelligent, cooperative architectures have been conceived that will enable robotic systems to expand the reach of human endeavor – and MABEL is on the road to jumping, skipping, and running. This is robotics in EECS!

Robotics is an area that encompasses a broad array of theoretical and electronic components. EECS faculty are tackling wide-ranging issues related to robotics research, including artificial intelligence, control theory, and computer vision. The fruits of their research will impact fields from national security, to health, to transportation.

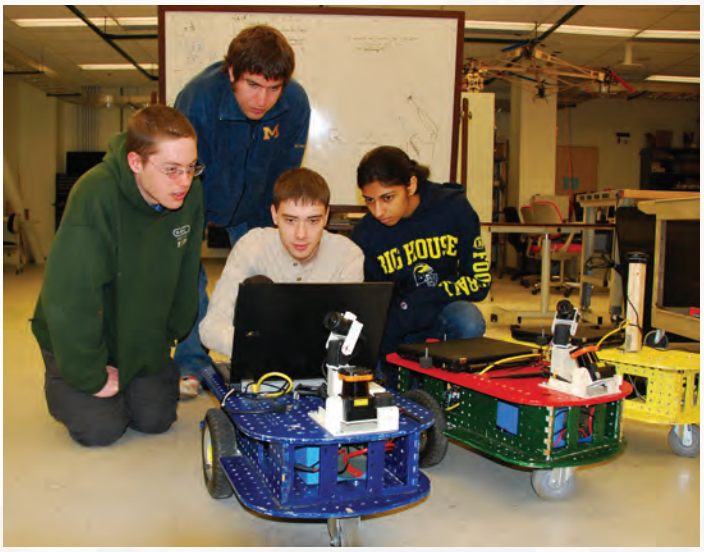
In the Beginning – How Can a Robot Learn?

Prof. Benjamin Kuipers wonders how foundational concepts, like knowledge of space, objects, and actions, can be learned and used by humans, animals, and yes, robots too. Kuipers notes, "It has been said that the newborn baby experiences its sensory world as 'one great blooming, buzzing confusion.' Robotics researchers working to build maps or recognize objects and actions from sensory input can definitely relate to this description."

Kuipers has demonstrated how a robot can be "born" with a sensorimotor system it knows nothing about, in an unknown environment, and then learn from the patterns of sensor input it gets during random behavior ("motor babbling"), how its sensors are structured, how its motor commands affect its sensor input, and how to build simple motion control laws. With this as a foundation, he and his students have shown how a robot with range sensors can learn about objects and actions. He and Prof. Silvio Savarese are now collaborating to investigate how a robot can learn about objects and actions using computer vision.

Graduate student Ilya Ganelin provides instruction to a robotic wheelchair as part of a research project into instruction and autonomy.

In previous work, Kuipers has shown how a robot, exploring a large-scale environment by following control laws, can autonomously identify "distinctive places" and use them as building blocks for a cognitive map. Like human cognitive maps, these robots build several different kinds of spatial representations, combining local metrical maps with global topological maps, connected by the structure of choices provided by each place.

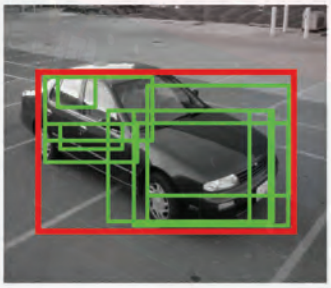


Undergraduate students in the Robotics Lab with some of the robots used for research into perception and planning.

Using these methods, Kuipers and his students have created a robotic wheelchair, which can build its own cognitive map of its environment and serve as a mobility assistant for a human driver. The robotic wheelchair allows the researchers to explore important questions about how the robot can be flexible enough in understanding the human's instruction, as well as how autonomy can be shared between the human driver, who remains ultimately in charge, and the robot, which must use its own knowledge to help the human reach his or her destination.

Vision and Perception – Learning From What is Seen

Prof. Silvio Savarese creates the "eyes" of a robot, so that the robot can interact with its environment and do specific tasks such as manipulate objects and open doors. Much of this is done through sensors. However, the real challenge lies in categorizing objects. For example, explains Savarese, if an automobile is operating as part of an intelligent transportation system, the behavior of the car will be different based on whether it "sees" a pedestrian, a dog, a tree, or another car. The car must be able to identify which of these it is – without having seen the specific object or individual before.



Savarese's algorithms enable the automatic detection of objects such as a car (indicated by a red bounding box) as well as the semantic interpretation of object parts (indicated by green boxes).

Savarese has developed a novel framework for learning and recognizing 3D object categories that requires minimal supervision and that has the ability to synthesize unseen views of an object category.

Much of Savarese's work in computer vision has been devoted to rigid objects, such as staplers or books. Once the robot has identified the object, it "learns" more about the object, such as whether it is viewing the front, side, or back of the object. More recently, Savarese has been developing algorithms for non-rigid objects, such as humans, and investigating action/activity recognition so that robots will understand what people are actually doing.

The techniques that Savarese is developing for robotic applications can be applied to a variety of additional problems, such as image indexing (finding pictures or videos on the Web that contain certain objects) and improved surveillance.

Decision and Action in Response to Perception

Professors Satinder Baveja, Edmund Durfee, and Edwin Olson are engaged in research that translates the use of perception and other input data into decision making, learning, and action.

Olson has an applied robotics focus, in which perception is tied to motor and decision planning, such as running motors and deciding when to follow or break the rules of the road.

State estimation, environment modeling, and motion planning are an important focus for Olson. This past fall, in his EECS 498 robotics course, students worked on a number of projects, including building robotic arms and exploring the challenges associated with perception, state estimation, and motion planning that are involved in having the arm pick up and manipulate an object.

Beyond the classroom, Olson and his students build their own robots for use in research (even designing their own custom circuit boards) – partly to reduce the cost of procuring multiple robots, but also to assist in exploring a number of laser and camera perception problems related to object avoidance, object classification, and predicting the behavior of other agents. These simple-looking wheeled robots, often seen roaming the halls of CSE, are really vehicles for conducting research into environment modeling, decision making, and motion-planning challenges.

Moving beyond the realm of perception and fundamental decision making, Olson is researching higher-level decision making and identification: not only should a robot be able to perceive and manipulate an object; it should also be able to make judgments regarding when it is safe to do so, and what the perceived object represents. This includes learning from experience, but also from others: Olson's robots will watch humans and incorporate perceived human activities and reactions into their decision making.

Finally, Olson's work includes methods for sharing information between robots, so that they can work more effectively as a team, especially in situations where one robot becomes disabled and others must "fill in" for its expected activities. This research will be applied in the robots that Olson and his student team hope to deploy in 2010's MAGIC Robot Challenge in Australia (see related story on page 24).

Prof. Satinder Baveja's main body of research is in reinforcement learning, a sub-field of artificial intelligence that is concerned with encouraging response from a system based on positive or negative reinforcement. His past work with the Sony Aibo dog robot illustrates how this works: the robot was trained to fetch a ball on command, and to return the ball to the sound of an encouraging voice. Successfully completing this task resulted in positive feedback, allowing the robot to add what it had learned from a particular variant of the task to its overall understanding, increasing future performance. "It was literally 'Good dog' and a pat on the robot's head," says Baveja.

Baveja has collaborated with Prof. Edmund Durfee in the area of human-robot interaction. Together, they are developing new protocols under which robots that are under nominal human supervision will be able to determine when to "ask" for human input or assistance, and when to make their own decisions based on past experiences and/or new sensory input.

Durfee's research is related to Baveja's and Olson's and is focused on the artificial intelligence behind decision making. His work potentially extends beyond traditional robotic applications, to "smart" (military) boats, vehicles, or homes. Much of this work is for contingency planning; for example, if an unexpected pattern occurs, how should the robot replan?

Durfee's research focuses on the use of agents – which are decision making modules that enable interaction. A multi-agent architecture provides protocols for communications to enable decision making. Much of this work is on safe operation of robots around humans (and other robots).

Looking ahead, Durfee is interested in robust robotics, under which a robot's performance can gracefully degrade as parts break, by enabling the robot to reason about its mission and how it can potentially work around failures and get help from people and other robots in its environment to do as well as it can, rather than just giving up.

A Unifying Architecture for Artificial Intelligence

Prof. John Laird's decades of research into artificial intelligence has a direct connection to robotics. His aim is to create an overarching architecture with cognitive decision making and reaction capabilities; essentially, a human-level AI that is general enough to be used in many different situations, especially novel situations where learning is necessary.

Laird's approach focuses on the underlying architecture, which provides the building blocks (fixed memories and processes) for developing cognitive systems. The current emphasis of this work is how to create robotic systems that can learn from interactive instructions with humans, making it easier to customize robot behaviors in the field.

Laird started this research as a graduate student at Carnegie Mellon, and has continued it during his entire tenure at Michigan. His architecture, known as Soar, is the result; Soar Technology is

a company co-founded by Laird that develops cognitive software for complex problems. Laird collaborates regularly with the other EECS faculty involved in machine perception and learning.

"Controlling" Bipedal Robots: Walking and Running With Grace

Jessy Grizzle, Jerry W. and Carol L. Levin Professor of Engineering, stepped into the world of walking robots with the bipedal robot RABBIT. He devised a novel walking algorithm that allowed RABBIT to walk with far more grace than seen previously. However, he was not able to get RABBIT to run, so he and his students set about devising new theory and algorithms with this goal in mind. To test them out he built the robot MABEL, in collaboration with the Robotics Institute at Carnegie Mellon.

A key difference in MABEL's makeup that distinguishes it not only from RABBIT, but from well-known industry robots such as ASIMO and QRIO, is the introduction of springs, which act like tendons in a human body. "These springs absorb shocks and store energy like the arch in your foot and the stretchiness of your muscles," explains Prof. Grizzle. "And this energy is all free – it doesn't come from a battery or auxiliary power source. Like energy harvesting, you get to store it and reuse it." His goal is energy-efficient walking and running, with motion that mimics the agility of a human.

MABEL, a novel robot that incorporates unilateral springs for shock absorption and energy storage. The robot is one meter tall at the hip and weighs 56 kg.

"The idea is, if you can get a robot to be agile enough, you can send them into rescue situations that would be extremely dangerous for a human. That's what really motivates me – it's also fun!" stated Grizzle. MABEL is currently walking at 1.5 m/s on a level surface. "We are the bipedal robot walking speed record holder!" adds Grizzle.

MABEL is also inspiring new developments in control theory. Prof. Grizzle sees this project as advancing the science of locomotion and forcing the discovery of more advanced feedback control notions for dynamic motion stabilization. At the same time, MABEL is used as a platform to interest students at all levels in science and engineering.

Applying Control Theory to Intelligent Transportation Systems and Biomolecular Circuits

Prof. Domitilla Del Vecchio is conducting research in intelligent transportation systems, specifically the control of large-scale networks of vehicles for safety. Miniature cars test new algorithms that are designed to ensure that the cars never crash into each other. In a real world situation, an automatic active assist system built into the car will take control of the vehicle if a crash is imminent. Her focus is on preventing or mitigating crashes at traffic intersections, which account for the largest number of accidents and fatalities.

Del Vecchio is working with the Toyota Technical Center of Ann Arbor to implement a prototype on their full-scale vehicles. To facilitate future use, the government has already allocated a band of frequencies that are dedicated for wireless communication between large-scale networks of vehicles.

In another area, Del Vecchio is trying to understand how to control cell behavior using control systems theory, specifically, how to design a bacterium that goes and tracks cancer cells and kills them.

"We are trying to understand how we can do biomolecular circuit design as has been done for decades in electronics, using a different kind of hardware – biomolecules," explains Del Vecchio. The idea is to create a biomolecular circuit, or tiny robot, that will attach itself to a molecule, which will in turn seek out cancerous cells and destroy them with targeted medicine. "We are doing the first milestones now for enabling that kind of activity," she added.

Robotics Research Moving Along

The study of robotics crosses many disciplines, and the applications that result from the research are far-reaching in scope. The robotic research being conducted in EECS may contribute to improved prosthetic devices; more agile robots capable of maneuvering in unfamiliar environments; searching and indexing of information on the Web; intelligent transportation systems; advanced medical applications; and assistive devices. It is also just plain fun!

EECS Faculty Mentioned in the Article:

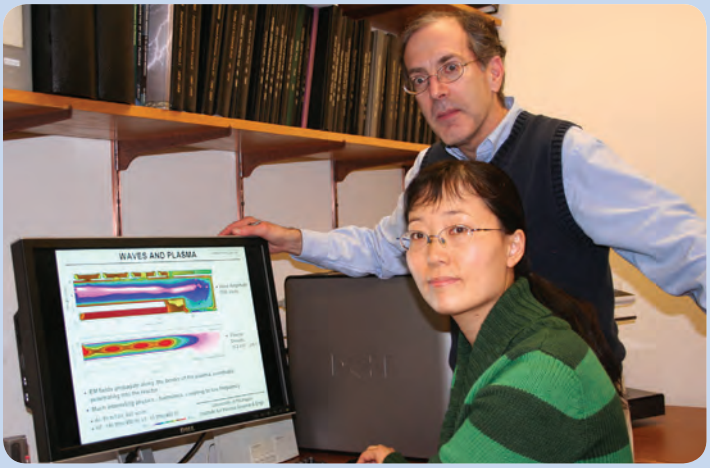
Satinder Singh Baveja
Domitilla Del Vecchio
Edmund Durfee
Jessy Grizzle
Benjamin Kuipers
John Laird
Edwin Olson
Silvio Savarese

Relevant Courses:

- Bio-Molecular Feedback Systems
- Computer Vision courses
- Image Processing courses
- Control Systems courses
- Machine Learning courses
- Advanced Topics in AI: Robot Learning
- Introduction to Robotics
- Autonomous Robotics Laboratory

Research Briefs

New $10M DoE Plasma Research Center



Graduate student Mingmei Wang and Prof. Mark Kushner

A new center headed by Mark Kushner, George I. Haddad Collegiate Professor and Director of the Michigan Institute for Plasma Science and Engineering, will enable fundamental research on low-temperature plasmas. The Center for Predictive Control of Plasma Kinetics: Multi-phase and Bounded Systems is funded by a $10-million, 5-year grant from the U.S. Department of Energy, and includes researchers from nine additional institutions: Ohio State University, the University of Minnesota, West Virginia University, the University of Houston, the University of California-Berkeley, Sandia National Laboratory, the University of Wisconsin, Princeton Plasma Physical Laboratory, and the University of Maryland.

Plasmas, or ionized gases, have vast potential for practical technological advancements in fields such as energy (through solar cells), lighting, microelectronics and medicine (i.e., medical tools that cut and heal tissues with plasma activated chemistry, rather than the heat from lasers).

A key focus of the center will be to develop the science that will enable future researchers to control the velocities of the charged particles that make up low-temperature plasmas. Controlling the velocities of the particles will allow researchers in turn to control and direct the plasma's energy—a vital step toward achieving these far-reaching technological advancements.

In addition to basic scientific research, the Center will develop open source computer models that will allow researchers to enter a particular plasma configuration they want to create and receive information about what electric and magnetic fields they must apply to achieve those attributes.

Researchers Battle Botnets

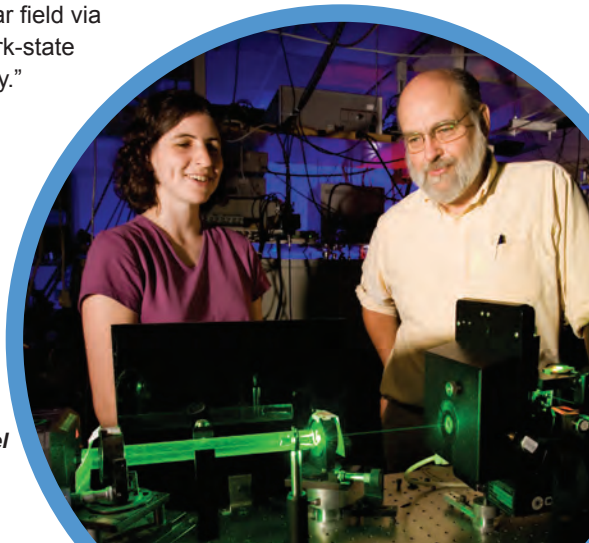
Professors Farnam Jahanian, Kang Shin, and researcher Michael Bailey are members of new Multidisciplinary University Research Initiative (MURI) funded by the Office of Naval Research entitled "Botnet Attribution and Removal: from Axioms to Theories to Practice." Botnets are groups of compromised computers that operate as a malicious network, increasingly carrying out fraudulent activities and attacks for organized criminal groups and nation-states.

The MURI includes ten researchers from four universities (Georgia Tech, University of Michigan, Stanford University, and the University of California, Santa Barbara), who were awarded a five-year, $7.5M grant. The investigators are collaborating to study the fundamental aspects of malicious botnet networks and to develop foundational and yet comprehensive and practical approaches to remove botnet threats.

Quantum Information Processes Advanced

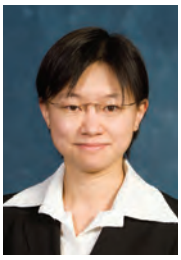
Duncan Steel, Robert J. Hiller Professor of Engineering, is a member of the newly instituted Multidisciplinary University Research Initiative (MURI) funded by the Army Research Office to study Quantum Optical Circuits of Hybrid Quantum Memories. Prof. Steel will concentrate his efforts on solid-state systems. His work will eventually lead to a reconfigurable quantum optical circuit that can connect different quantum platforms such as the atomic memory and the solid-state quantum processor. He will work with the condensed matter group at the Naval Research Laboratory and the quantum optics group at the University of Illinois.

In related work, Prof. Steel and colleagues have discovered a way to prolong the usable life of quantum bit memory by using lasers to elicit a previously undiscovered natural feedback reaction that stabilizes the quantum dot's magnetic field, lengthening the stable existence of the quantum bit by several orders of magnitude. The findings are described in the June 25, 2009 edition of *Nature*, in the article, "Optically-controlled locking of the nuclear field via coherent dark-state spectroscopy."

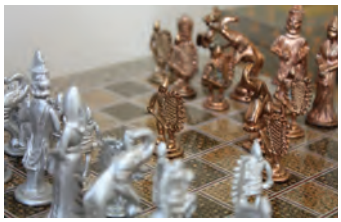


Katherine Smirl, Prof. Duncan Steel

Smartphone Application Illuminates Power Consumption



A new application for Android-based smartphones called PowerTutor shows users and software developers how much power their applications are consuming. PowerTutor was developed by Prof. Morley Mao and Robert Dick, with doctoral students Lide Zhang and Birjodh Tiwana. Its purpose is to extend the lifetime of hand-held computers, specifically cell phones, by enabling software developers to build more efficient products. PowerTutor will allow users to compare the power consumption of different applications and select the leanest version that performs the desired task. Users can also watch how their actions affect the phone's battery life.



Game Theory and Machine Learning for Better Bidding Strategies

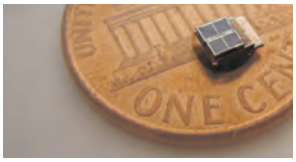
Prof. Michael Wellman and doctoral student Julian Schvartzman have conducted comprehensive research into continuous double auction bidding strategy, in which bidders exchange offers to both buy and sell, and transactions occur as soon as participants agree on a price. The researchers have applied game theory and reinforcement learning to develop bidding strategies for these dynamic environments. They presented their findings at the *International Joint Conference on Autonomous Agents and Multiagent Systems* in Budapest, Hungary.

Cross-Platform Study of 3G Networks

Prof. Morley Mao has led a research project to measure and quantify worldwide 3G wireless network performance measurement, looking at various aspects of network operation, such as performance, network policy, and user activity in order to assess network technology and deployment. Thousands of users of iPhone, Android, and Windows Mobile phones downloaded the study's 3G measurement tools and submitted data.

Improving Fuel Economy While Maintaining Drivability in HEVs

Jessy Grizzle, Jerry W. and Carol L. Levin Professor of Engineering, is applying his expertise in control theory to hybrid electric vehicles in a partnership with Ford Motor Company to improve fuel economy while allowing for optimal driving experiences. He and graduate student Dan Opila are developing a state-of-the-art controller design method that can incorporate many goals for vehicle behavior. This method allows for a much more complete exploration of design tradeoffs than previously possible, and facilitates next-generation cars to be brought to market more quickly.



The Phoenix Processor: 1 and 2

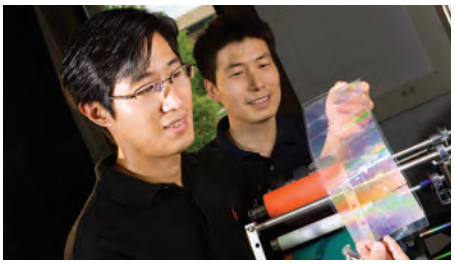
The ultra-low-power chip designed for sensor applications, known as the Phoenix Processor, was named a key innovation by *MIT Technology Review* for the Year 2008. Developed by Profs. David Blaauw and Dennis Sylvester, this chip consumes only 30 picowatts of power when idle. Now in its second evolution, the Phoenix Processor 2 is an 8.75m^3, solar-powered, commercial-grade microprocessor – and the smallest chip that can harvest energy from its surroundings. Expected uses include biomedical monitoring, building-monitoring devices, and environmental sensors. A new company, Ambiq Micro, co-founded by Profs. Blaauw and Sylvester, and alumnus Dr. Scott Hanson, is based on the Phoenix technology.

Assessing Impacts of Global Change With Spaceborne Radar

Prof. Mahta Moghaddam's group is developing an unprecedented continental scale decadal change map of the North American boreal wetlands through a differential analysis of spaceborne radar imagery. These ecosystems are believed to be among the most vulnerable to global change (warming and drying), and among the most highly influential in determining the future trends of carbon release to, or sequestration from, the atmosphere. The group's results so far indicate that the wooded vegetated wetlands are encroaching northward, a possible indication of the warming trend in the boreal zone. This research is supported by the NASA Science Mission Directorate and the NASA Carbon Cycle Science programs.

Vulnerability Demonstrated in Electronic Voting Machine

A team of computer scientists from UC, San Diego, U-M, and Princeton – including Prof. J. Alex Halderman at U-M – has demonstrated how criminals could employ a relatively new computing technique known as "return-oriented programming" to hack an electronic voting machine, steal votes, and potentially change the results of an election. This research shows that voting machines must be secure even against attacks that were not yet invented when the machines were designed and sold.



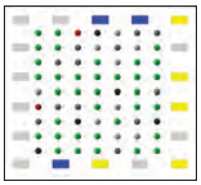
Se Hyun Ahn, Prof. Jay Guo

Continuous Nanoimprinting for Displays and Solar Cells

Prof. Jay Guo's rolling nanoimprint lithography technique, developed with graduate student Se Hyun Ahn, could ultimately be used to improve the quality and efficiency of displays and solar cells. The technique, described in the article, "Large-Area Roll-to-Roll and Roll-to-Plate Nanoimprint Lithography: A Step Toward High Throughput Application of Continuous Nanoimprinting" (*ACS Nano*, vol. 3 no. 8, July 2, 2009), was subsequently covered in *MIT Technology Review* (September 2, 2009), and the process was recently showcased at a trade show. Prof. Guo is currently working with companies interested in the process. Guo and Ahn also developed a high-speed dynamic nano-inscribing technique that is an elegant solution to some of the problems associated with other techniques for fabricating nanoscale structures. This work was highlighted in *Nature Nanophotonics* (vol. 239, 2009).

Research Briefs

FunSAT Game Helps IC Designers Use Intuition to Optimize Chip Layout



Prof. Valeria Bertacco and PhD student Andrew DeOrio have developed FunSAT, a game-based approach to integrated circuit layout that could help IC designers optimize chip layout. In addition to speeding up chip design, FunSAT can be used to solve other so-called satisfiability problems – classic and highly complicated mathematical questions that involve selecting the best arrangement of options. In such quandaries, the solver must assign a set of variables to the right true or false categories to fulfill all the constraints of the problem.

Sensing Sensors: News Ways to Monitor Infrastructure for Safety

New theory and techniques for processing information received from ultra-low-power wireless sensor networks are being investigated for the ultimate purpose of monitoring the nation's infrastructure, including bridges, buildings, and related construction. Named, "Sensing Sensors: Compressed Sampling with Co-design of Hardware and Algorithms across Multiple Layers in Wireless Sensor Networks," this new five-year, $3M multi-disciplinary research program funded by the National Science Foundation includes a diverse team of faculty in the areas of circuits (Prof. Michael Flynn, Principal Investigator, and Prof. David Wentzloff), systems (Profs. Mingyan Liu and Wayne Stark), mathematics (Prof. Anna Gilbert, Mathematics and EECS) and civil and environmental engineering (Prof. Jerry Lynch, Civil and Environmental Engineering (CEE) and EECS, PI for the project).

Security Vulnerabilities Exposed in Chinese Censorware

June 11, 2009, Prof. Alex Halderman, graduate student Scott Wolchok, and undergraduate student Randy Yao released a report on security vulnerabilities caused by Green Dam, the censorware program that the Chinese government had ordered installed on all new PCs in China beginning July 1. The report described serious security vulnerabilities in the software, as well as evidence that some of the program's code may have been copied from another security program. After this finding and under intense pressure from the media and computer makers, the Chinese government backed down from the plan.

Smart Bridges Under Development With New Grant

Faculty are working as part of an interdisciplinary team to develop smart bridges that can communicate their safety with bridge inspectors. The research, led by Prof. Jerry Lynch (CEE and EECS), involves developing a full range of interlocking technologies that will together sense and collect bridge status data and make it available to inspectors. EECS faculty working on the project include: Michael Flynn, Mingyan Liu, Amir Mortazawi, Khalil Najafi, Becky Peterson, Atul Prakash, and Dennis Sylvester.

Bridging the Gap Between Wireless Sensor Networks and the Scientists Who Use Them

Prof. Robert Dick and graduate student Lan Bai created a new, simpler programming language for wireless sensor networks designed for easy use by scientists in various areas of specialty. "Most existing programming languages for wireless sensor networks are a nightmare for everybody but expert embedded system programmers," said Prof. Dick. "We're working on ways to allow the scientists who actually use the devices to program them reliably without having to hire an embedded systems programming expert."

Noninvasive Cancer Treatment

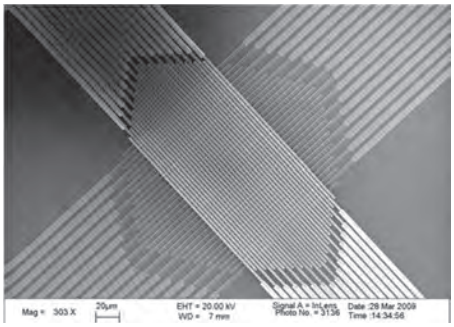
Through a new project supported by a DoD Breast Cancer Research Program IDEA Award, Prof. Mahta Moghaddam will lead an effort to develop a microwave-ultrasound synergistic treatment ("MUST") system in collaboration with the medical school Basic Radiological Sciences. The team will develop a 3D adaptively focused microwave array with sharp and accurate targeting capability, and will integrate it with a focused ultrasound treatment array. This new system is intended for tumor ablation, destroying the tumors by raising their temperature to 60C. It is nonsurgical and non-ionizing.

HP Labs Innovation Research Program Awards

Mark Kushner will investigate plasma physics phenomena for society-benefiting technologies. Stéphane Lafortune and Scott Mahlke are continuing work on Gadara, a tool that helps avoid the software freezes that occur when applications running concurrently begin to compete for resources. Trevor Mudge and Thomas Wenisch will research the use of disaggregated memory to enhance the energy efficiency of data centers. Kang Shin will investigate techniques for providing resource flexibility and system optimization within virtual data centers.

Trends Identified in Two-Year Internet Traffic Study

Researchers led by Prof. Farnam Jahanian and graduate student Jon Oberheide, along with Arbor Networks and Merit Network, released results from the Internet Observatory Report, a landmark two-year study of global Internet traffic that offers detailed trend data and analysis. This study is believed to be the largest study of global Internet traffic since the birth of the commercial Internet in the mid-1990s. Key findings from the report include data on the evolution of the Internet core, the rise of 30 large "hyper giants" that generate and consume a large share of traffic, the migration of applications to the Web, and the emergence of a new Internet ecosystem.

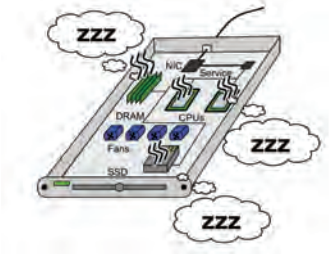


Memristor Chip Could Lead to Faster, Cheaper Computers

Prof. Wei Lu built a chip composed of nanoscale memristors that can store up to 1 kilobit of information without the use of transistors. A memristor is a computer component that offers both memory and logic functions in one simple package. It has the potential to transform the semiconductor industry, enabling smaller, faster, cheaper chips and computers. "We demonstrated CMOS-compatible, ultra-high-density memory arrays based on a silicon memristive system. This is an important first step," said Prof. Lu.

New Research in Near-Threshold Computing

Profs. David Blaauw, Trevor Mudge, and Dennis Sylvester have received a National Science Foundation research grant to study ultra-energy-efficient computing. With colleagues at Arizona State University and Harvey Mudd College, they are pursuing the universal application of aggressive low-voltage operation across all computational devices and platforms through the use of "near-threshold computing," under which operating voltage is lowered to near the threshold voltage of the devices where they pivot between being on and off. Any voltage excess over the turn-on point of the transistor is eliminated, thereby reducing power consumption. The researchers believe that their work will yield novel methods to overcome the barriers that have historically relegated ultra-low voltage operation to niche markets.

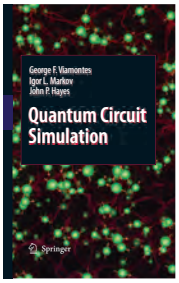


Roadmap Unveiled for Reducing Data Center Energy Requirements by 75%

Prof.Thomas Wenisch has been researching data center designs with an eye toward making them significantly more energy efficient. He and students David Meisner and Brian Gold presented a paper about improving the efficiency of data center computer systems on March 10, 2009, at the *International Conference on Architectural Support* for programming Languages and Operating Systems in Washington, D.C. Their approach for improving data center efficiency includes PowerNap, a plan to put servers to sleep for milliseconds between tasks, and RAILS (Redundant Array for Inexpensive Load Sharing), a more efficient power supplying technique.

Gadara: New Approach Eliminates Software Deadlocks Using Discrete Control Theory

Profs. Stéphane Lafortune and Scott Mahlke developed a new way around software deadlocks with a controller, called Gadara, that combines discrete control theory and compiler technology. "This is a totally different approach to what people had done before for deadlock. Previously, engineers would try to identify potential deadlocks through testing or program analysis and then go back and rewrite the program. The bug fixes were manual, and not automatic. Gadara automates the process," said Lafortune.



New Book

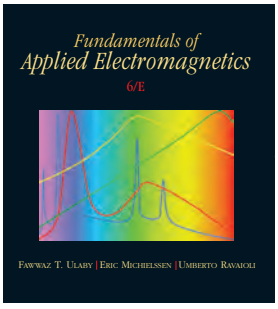
Profs. John Hayes and Igor Markov have co-authored a new book with their former graduate student Dr. George Viamontes, entitled *Quantum Circuit Simulation*, which has been published by Springer.

Soil Moisture Sensor Web

Profs. Mahta Moghaddam, Mingyan Liu, and Demos Teneketzis are developing a new concept for a smart sensor web to measure profiles of soil moisture through optimally placed and optimally scheduled *in situ* sensors in heterogeneous terrain. This measurement is intended to validate large-scale satellite measurements, and is applicable to NASA's research in climate, carbon cycle, weather, and water cycle focus areas. Field experiments are being conducted at the Matthaei Botanical Gardens to prototype the concept using the RIPPLE-1 sensor actuation and communication node recently developed by Prof. Liu.

Through-the-Wall Imaging

Research by Prof. Kamal Sarabandi appears on the cover of *IEEE Transactions on Geoscience and Remote Sensing*, vol. 47, no. 5, May 2009. The article, "Through-the-Wall Imaging Using Differential SAR" was co-authored by Mojtaba Dehmollaian, research fellow, and Michael Thiel, graduate student. In this research, Sarabandi proposes a new algorithm for the imaging of targets behind walls that is based on differential synthetic-aperture-radar image formation employing a continuous-wave radar system.



New Book

The sixth edition of the popular textbook, *Fundamentals of Applied Electromagnetics*, by Fawwaz Ulaby, Eric Michielssen, and Umberto Ravaioli has been published recently by Prentice Hall.

Department News

Curriculum News

New Program in Plasma Science and Engineering

Plasma science is essential to many areas of national interest, including healthcare, energy, homeland security, and the semiconductor industry. A new certificate program in plasma science and engineering brings together researchers from across campus to create a new interdisciplinary program. Michigan is one of just a few universities across the nation offering such a program.

Embedded Control Systems Goes International

Embedded Control Systems, a senior level undergraduate course, was designed in response to an industry need for electrical and computer engineers with embedded systems engineering expertise. In the course, students combine signal processing and control theory with microprocessor hardware and programming, using a microprocessor and specially designed haptic wheel. The success of the course has led to its being taught at the Swiss Federal Institute of Technology in Zurich, Germany. The MathWorks company recently offered a webinar about this course at international locations, and online at: http://www.mathworks.com/wbnr42281

Mobile Application Development Ignited in New Class

Mobile Application Programming, a senior-level undergraduate class, was designed in response to the profound shift in the consumer computing space toward mobile computing and downloadable "apps." The course, taught by Prof. Elliot Soloway, examines this trend, the markets that have grown up around apps, and the implications for software development, distribution, and consumption. Students are tasked with creating original functioning applications on the mobile platform of their choosing. Over a period of two terms, the course has sparked a remarkable array of class projects - over 40, eight of which are now available as commercial products.

An offshoot of these classes were two 48-hour programming blitzes, one each term, which challenged students to team up and create functional apps over a weekend. The events were sponsored by Apple Computer, CSE, the Center for Entrepreneurship, and the College of Engineering. For more information about the students and their projects, see http://www.eecs.umich.edu/eecs/events/mobile-blitz-F2009.html.

Mobile Phones Developed Into Platform for Music, Performance

Prof. Georg Essl, a musician as well as a computer scientist, is exploring the creative intersection of music, technology, and performance. From this research, he has developed urMus, a meta-environment for live and interactive application design and programming on and for multi-touch mobile devices such as the iPhone. In addition, Essl is engaged in envisioning new performances that take advantage of the computative and generative properties of this platform.

On December 9, 2009, Essl led the Michigan Mobile Phone Ensemble in its premier performance, showcasing all new works composed by the students in the ensemble and performed on virtual instruments that they programmed on their iPhones. The event sparked significant interest from the worldwide press.

The ensemble was formed in the context of Prof. Essl's new multi-disciplinary course, "Building a Mobile Phone Ensemble." This class, believed to be the first formal course of its type in the world, uses the urMus platform to merge engineering practices, mobile phone programming, and sound synthesis with new music performance, composition, and interactive media arts.

Tech News

A new startup company called Ambiq Micro, based on the Phoenix chip technology (see pg. 11), has been founded by Prof. David Blaauw, Prof. Dennis Sylvester, and EE alumnus Dr. Scott Hanson. Ambiq Micro is developing ultra-low-power microprocessors that are suitable for tiny wireless devices, including sensors, smart credit cards, computers, mobile electronics, and medical applications.

Ambiq Micro took first prize in the U-M Zell Lurie Institute for Entrepreneurial Studies business plan competition.

Integrated Sensing Systems (ISSYS) announced a new micro-miniature Coriolis mass flow sensor, for industrial applications.

Mobius Microsystems was acquired by Integrated Device Technology. Mobius co-founder Dr. Michael McCorquodale will become IDT's General Manager, Silicon Frequency Control Business Unit, Communications Division.

New Course Brings Cloud Computing to Cars

Profs. Brian Noble and Jason Flinn have collaborated with Engineers from Ford and Microsoft to offer a new project-based senior-level course entitled, "Cloud Computing in the Commute." The class is co-taught with engineers from Ford, and students are tasked with creating new applications for in-cabin computing environments that Ford and Microsoft are creating, which is a significant expansion of the existing Sync environment that will allow future Ford owners to download and run applications in their cars.

A challenging aspect of the course, according to Noble and Flinn, is that students can't just think in terms of applications found on smartphones or other platforms and port them to the Ford system. Instead, they are creating a new breed of applications that take advantage of vehicle performance data, networking services, voice recognition, cloud computing, and new social computing tools. Final projects will be incorporated into a cross-country promotional roadtrip that Ford will make in Spring 2010 with the new 2011 Ford Fiesta.

K-12 Outreach

K-12 Computer Science Outreach Website Launched

The department has launched CS Connections, a website that highlights the computer science outreach activities for K-12 students and educators. The site showcases teacher workshops and student camps that the division sponsors or participates in, provides information about the integration of mobile technology into the K-12 classroom for improved learning, and provides an extensive set of links for those who are seeking tools and information for teaching computer science at the K-12 level, as well as for those who want to learn more about adopting technology for use in teaching.

CS Connections is at: http://eecs.umich.edu/cse/cs_connections.

Workshop for High School CS Teachers, Administrators

CS4HS SUMMER WORKSHOP

In August, the department held CS4HS, a two-day workshop for regional high school teachers and administrators that explored the use of technology in learning and the direction of curricula in computer science education. According to Dr. Jeff Ringenberg, who organized and led CS4HS, "An important outcome of this workshop is that it started a genuine dialog between our department and local school districts about how to best serve students in preparation for a future the includes CS." The workshop was sponsored by Google and the College of Engineering and endorsed by the Computer Science Teacher's Association (CSTA).

Outreach Team Partners With Area School District

Drs. David Chesney and Jeff Ringenberg have partnered with the Dexter School District to advise on and help develop Dexter's CS curriculum. "Dexter is aggressively pushing for excellence in education in math and the sciences, and is very engaged in this partnership," says Dr. Chesney. "We look at it as a fabulous opportunity for us to put research into practice, as well as to help build more opportunity for local high school students." The relationship blossomed after Dexter administrators and teachers participated in the CS4HS Workshop.

NANOCAMP

Michigan is a member of The National Nanotechnology Infrastructure Network (NNIN), which is an integrated network of nanofabrication facilities that serve the needs of nanoscale science, engineering and technology researchers across the country. It is funded by the National Science Foundation, and directed at Michigan by Prof. Khalil Najafi.

Middle and high schools students in the area participate in Nanocamp and similar programs, which give them access to the world-class Lurie Nanofabrication Facility. This past year, about 150 students learned how their iPods, cell phones, and computers are made, what it's like to work in a cleanroom, and some of the special properties of nanomaterials.

The NNIN also sponsors special workshops on nanoscience topics, including a Nanoscience Workshop for Teachers and Educators, and sponsors research experiences for undergraduate students.

Honors/ Awards

William Gould Dow Distinguished Lecturership

This lectureship is the highest honor bestowed on a guest speaker by the Department. EECS welcomed two distinguished leaders from academia and industry for the most recent lectures.

Manuel Blum, Bruce Nelson Professor of Computer Science at Carnegie Mellon University, gave the talk "Hierarchical Understanding of Proofs." Prof. Blum is a leader in the world of theoretical computing. He is one of the founders of computational complexity theory, work that has also had applications to cryptography and program checking. He has received many honors and awards, including the A.M. Turing Award, the highest honor in computing, and he was elected to the National Academy of Sciences.

Dr. Irwin Jacobs, Co-Founder and Chairman of the Board of Qualcomm Incorporated, gave the talk, "Cellular Communications: A Dynamic Past and More Exciting Future – Even Now." Dr. Jacobs is the pioneer and world leader of Code Division Multiple Access (CDMA) digital wireless technology, the world's most-advanced voice and data wireless communications technology. He began his career as an academic, starting out at MIT, and moving to UC, San Diego as a Professor. He co-authored the textbook, *Principles of Communication Engineering* in 1965. Dr. Jacobs has received numerous industrial, academic, and business awards, including the IEEE Alexander Graham Bell Medal and the National Medal of Technology Award. In 2008, he was named Chair of the National Academy of Engineering.

NSF CAREER and Young Investigator Awards

VALERIA BERTACCO
AFOSR Young Investigator Award
"Defending Against Hardware-Based Security Attacks"

CLAY SCOTT
NSF CAREER Award
"Guided Sensing"

TAL CARMON
AFOSR Young Investigator Award
"Continuous On-Chip Extreme UV Emitter"

THOMAS WENISCH
NSF CAREER Award
"Programming Models and Hardware Mechanisms for a Polymorphic Multicore Cache Architecture"

WEI LU
NSF CAREER Award
"Understanding, Development and Applications of Nanoscale Memristor Devices"

DAVID WENTZLOFF
DARPA Young Faculty Award
"3D Wireless Interconnect for Crossbar Routing in Many-Core Processors"

PECASE Awarded to Anthony Grbic

Tony Grbic was awarded a Presidential Early Career Award for Scientists and Engineers (PECASE), the highest honor bestowed by the U.S. government on outstanding scientists and engineers beginning their independent careers.

Prof. Grbic conducts both experimental and theoretical research in electromagnetics and microwave circuits. His research program involves both basic science (e.g., multidisciplinary work on metamaterials and near-field plates) as well as advanced technology development (e.g., antenna research and design, wireless component development). In collaboration with physics professor Roberto Merlin, he is currently breaking ground in a new area that is of great interest among researchers, near-field superlenses, by pursuing an entirely new approach to manipulating and focusing the electromagnetic near field.

Prof. Grbic has previously received an AFOSR Young Investigator Award and an NSF Faculty Early Career Development Award. He teaches courses in introductory Electromagnetics, senior-level Radiowave Propagation and Link Design, and graduate courses in Electromagnetic Metamaterials.

Endowed Professorships

ALFRED HERO
R. Jamison and Betty Williams Professor of Engineering

Al Hero's current research interests include inference in sensor networks, adaptive sensing, bioinformatics, inverse problems, and statistical signal and image processing. He holds joint appointments in the Department of Biomedical Engineering and the Department of Statistics. He is also affiliated with the U-M Program in Biomedical Science (PIBS) and the U-M Graduate Program in Applied and Interdisciplinary Mathematics (AIM). Prof. Hero is Director of IEEE Division IX (2010-11), and has previously served as President of the IEEE Signal Processing Society (2006-07). He is the author of the book, *Foundations and Application of Sensor Management*.

IAN A. HISKENS
Vennema Professor of Engineering

Ian Hiskens has made fundamental contributions to the study of power system dynamics, such as establishing theoretical and practical techniques to predict voltage collapse, and creating trajectory sensitivity analysis techniques for hybrid dynamical systems. His primary research interests lie in the analysis of nonlinear (hybrid) systems, in particular system dynamics and control, and numerical techniques. Power systems form his primary applications focus. Current projects include large-scale integration of wind generation, grid controllability, system integration of plug-in hybrid electric vehicles (PHEVs), dynamics and control of microgrids, and the development of methods for analyzing the impact of uncertainty on system dynamic performance.

H.V. JAGADISH
Bernard A. Galler Professor of EECS

H.V. Jagadish is well known for his broad-ranging research on data management and data mining. He is affiliated with the bioinformatics program and the Center for Computation in Medicine and Biology. He is primarily concerned with building database systems and query models so they are usable in a variety of contexts. Currently, he is most concerned with databases in the context of the Internet, and data management for biological sciences. He designed Timber, an XML database that has an architecture similar to that of a relational database. Timber is able to store and efficiently manipulate probabilistic data that is known to be potentially erroneous. His work with the Michigan Molecular Interactions Database (MiMI) is being incorporated into the National Center for Integrative Biomedical Informatics.

MARK J. KUSHNER
George I. Haddad Professor of Engineering

Mark Kushner is the Director of the Michigan Institute for Plasma Science and Engineering (MIPSE), and Director of The Center for Predictive Control of Plasma Kinetics: Multi-phase and Bounded Systems. His research in low-temperature plasma science and engineering addresses fundamental transport and reaction chemistry of partially ionized gases and their application to technology. He is head of the Computational Plasma Science and Engineering Group (CPSEG), which develops computer simulations of low-temperature plasmas and technologically important devices which use low-temperature plasmas. Some of the recent areas of emphasis are lasers, microelectronics fabrication, multi-phase plasmas, polymer treatments, and biocompatible materials.

KAMAL SARABANDI
Rufus S. Teesdale Professor of Engineering

Kamal Sarabandi's research in the area of applied electromagnetics includes: microwave and millimeter-wave radar remote sensing; antenna miniaturization and reconfigurable antennas for wireless applications; performance assessment of wireless systems; and millimeter-wave and submillimeter-wave subsystems and components with applications to radar imaging (collision avoidance, autonomous vehicle control, security, etc.). His research impacts diverse areas such as global warming, security at airports, and trouble-free wireless communication. He has conducted important research in antenna miniaturization and metamaterials for antennas, and his work has led to nine patents, with several more in progress.

FAWWAZ T. ULABY
Chen-To Tai Professor of EECS

Since coming to U-M in 1984, Fawwaz Ulaby has directed numerous interdisciplinary, NASA-funded projects aimed at the development of high-resolution satellite radar sensors for mapping Earth's terrestrial environment. He has served as U-M's Vice President for Research, and recently was founding Provost and Executive VP for Academic Affairs of the King Abdullah University of Science and Technology. He is a member of the U.S. National Academy of Engineering, Fellow of the American Association for the Advancement of Science (AAAS), Fellow of the IEEE, and he serves on several international scientific boards and commissions.

Honors/ Awards

Faculty Honors and Awards

EECS Awards

Jason Flinn, Outstanding Achievement Award, for outstanding contributions to pervasive computing and storage systems.

Jay Guo, Outstanding Achievement Award, for outstanding contributions to nanoscience and nanotechnology, particularly the use of the nanoprint technique in displays and solar cells and high-throughput manufacturing.

Sandeep Pradhan, Outstanding Achievement Award, for outstanding contributions to the revamping of EECS 551, Mathematical Methods for Signal Processing, and the development of novel approaches to multiterminal communication systems.

Mark Brehob, lecturer in EECS, received the HKN Professor of the Year Award.

College of Engineering Awards

Peter Chen, Research Excellence Award

Brian Gilchrist, Service Excellence Award

Anatoly Maksimchuk, Outstanding Research Scientist Award

Kurt Metzger, Thomas M. Sawyer, Jr. Teaching Award for Non Tenure-Track Faculty

Mahta Moghaddam, Education Excellence Award

Todd Austin, **David Blaauw**, **Scott Mahlke**, **Trevor Mudge**, **Marios Papaefthymiou**, **Dennis Sylvester**, Ted Kennedy Family Team Excellence Award

University Awards

Semyon Meerkov, Distinguished Faculty Governance Award

National and Professional Honors and Awards

Mark Ackerman was elected into the CHI Academy by the Association for Computing Machinery's Special Interest Group on Computer-Human Interaction (SIGHCI).

Peter Chen is editor-in-chief of *ACM Transactions on Computer Systems*.

Lynn Conway (professor emerita) was awarded the 2009 Computer Pioneer Award by the IEEE Computer Society, "For contributions to superscalar architecture, including multiple-issue dynamic instruction scheduling, and for the innovation and widespread teaching of simplified VLSI design methods."

Domitilla Del Vecchio received the 2010 Donald P. Eckman Award from the American Automatic Control Council, "For contributions to the theory and practice of hybrid dynamical systems and systems biology."

Edmund Durfee was elected President of the International Foundation for Autonomous Agents and Multiagent Systems (IFAAMAS) in 2009.

Stephen Forrest, U-M's VP for Research and Professor of EECS, has been named Fellow of the American Physical Society for contributions leading to the demonstration of high-efficiency organic light emitting devices, organic photovoltaics, and organic lasers.

Yogesh Gianchandani has been named an IEEE Fellow, "for contributions to silicon-based microactuators and on-chip microplasmas."

Al Hero was elected to the IEEE Board of Directors as Director of Division IX (Signals and Applications). His official term of service is 2010-2011, and he served as Director-Elect in 2009. In addition, he is Chair of the IEEE Board of Directors Ad Hoc Committee on Excellence in Conference Papers on Xplore.

H.V. Jagadish has been elected to a three-year term on the Computing Research Association Board of Directors.

Farnam Jahanian has been named ACM Fellow by the Association for Computing Machinery for his significant contributions to the dependability and security of networks and systems. He was also named the 2009 U-M Distinguished University Innovator for his important and lasting contributions to the economy by moving new innovations into the private sector for public benefit, and by demonstrating entrepreneurial success.

Mark Kushner was awarded the 2010 APS Will Allis Prize, "For groundbreaking contributions to developing and applying hybrid plasma models that have advanced the fundamental understanding of the chemistry, surface kinetics, and energy transport in low-temperature plasmas." He was also honored with the 2009 Alumni Achievement in Academia Award from UCLA, and is currently Editor-in-Chief of *Plasma Sources Science and Technology*.

John Laird has been honored as a Cognitive Science Society Fellow in recognition of his sustained contributions to the field of Cognitive Science.

Morley Mao received a 2009 Alfred P. Sloan Foundation Research Fellowship. The two-year fellowship was awarded in recognition of distinguished performance and a unique potential to make substantial contributions to the field.

Igor Markov is the first recipient of the Early Career Award from the IEEE Council on Electronic Design Automation (CEDA) for his outstanding contributions to algorithms, methodologies, and software for the physical design of integrated circuits in the early stages of his career.

Mahta Moghaddam has been named IEEE Fellow, "for contributions to forward and inverse scattering techniques for radar remote sensing." She was also selected to the Science Definition Team (SDT) of the NASA Soil Moisture Active and Passive (SMAP) mission. SMAP is a $750M microwave satellite system planned for launch in 2015. The 12-member SDT has been selected by NASA to provide guidance on issues related to measurement and science objectives of the mission.

Stella Pang is Chair of the Technical Committee for the IEEE Nanotechnology Council.

Dragomir Radev was elected ACM Distinguished Scientist by the Association for Computing Machinery. He is the Secretary of the Association for Computational Linguistics (ACL). He also led two U.S. high school teams to several awards in the seventh International Linguistics Olympiad in Wroclaw, Poland. The U.S. Red team took home the gold cup in team competition. This was the third year in a row that the U.S. took the team gold cup.

Steve Rand has been named Chairman of the Board for the International Conference on Luminescence. The next meeting will be held June 2011 in Ann Arbor.

Karem Sakallah, his former graduate student Joao Marques-Silva (now at University College Dublin), and five other researchers received the 2009 Computer Aided Verification (CAV) Award at the *21st International CAV Conference* in Grenoble, France, in recognition of the researchers' series of fundamental contributions to the development of high-performance Boolean satisfiability solvers.

Silvio Savarese was Co-Chair and organizer of the *2009 IEEE Int. Workshop on 3D Representation for Recognition*.

Tom Senior (professor emeritus) was awarded the 2010 IEEE Electromagnetics Award, "For significant contributions to the advancement of electromagnetic diffraction and scattering theories."

Elliot Soloway has been elected to the board of directors for the International Society for Technology in Education (ISTE).

Duncan Steel was awarded the 2010 APS Frank Isakson Prize, "For seminal contributions to nonlinear optical spectroscopy and coherent control of semiconductor heterostructures."

David Wentzloff is guest editor for a special issue on Applications of Nanotechnologies in Communications for *IEEE Communications Magazine*, and guest editor for a special issue on Breakthrough Architectures for Image and Video Systems for *Elsevier Signal Processing: Image Communication*.

Zhengya Zhang received the David J. Sakrison Memorial Prize from UC-Berkeley and the Analog Devices Outstanding Student Designer Award in 2009.

Honors/ Awards

Faculty and Student Outstanding Paper Awards*

"Internet Routing Instability," by Craig Labovitz (MSE PhD CSE '94 '99), G. Robert Malan (MSE, PhD CSE '96 '00), and Prof. **Farnam Jahanian**, received the ACM SIGCOMM Test of Time Award.

"Analysis of clinical flow cytometric immunophenotyping data by clustering on statistical manifolds: Treating flow cytometry data as high-dimensional objects," by William G. Finn, **Kevin M. Carter**, **Raviv Raich** (research fellow), Lloyd M. Stoolman, and Prof. **Alfred O. Hero**, was selected as Best Original Paper published in *Clinical Cytometry* for 2008-2009.

"Adaptive Online Testing for Efficient Hard Fault Detection," by graduate students **Shantanu Gupta**, **Amin Ansari**, **Shuguang Feng**, and Prof. **Scott Mahlke**, received the Best Paper Award at the *27th IEEE International Conference on Computer Design*.

"Enhancing Cognitive Radio Dynamic Spectrum Sensing Through Adaptive Learning," by **Cem Tekin**, **Steven Hong** (undergraduate student), and Prof. **Wayne Stark** received the 2009 Fred W. Ellersick Award for Best Unclassified Paper at the *2009 Military Communications (MILCOM) Conference*.

"SPINTO: High-performance Energy Minimization of Spin-glasses with Applications to Adiabatic Quantum Computing," by graduate student **Hector Garcia** and Prof. **Igor Markov** won first place in the technical paper competition at the 2009 Society of Hispanic Professional Engineers (SHPE) national conference.

"Photofield-Effect in Amorphous In-Ga-Zn-O (a-IGZO) Thin-Film Transistors," by T-C Fung, C-S Chuang, Kenji Nomura, H-P Shieh, Hideo Hosono, and Prof. **Jerzy Kanicki**, received an Excellence Award for Basic and Original Technology at the *8th Int. Meeting on Information Display (IMID)*.

"Low Power Circuit Design Based on Heterojunction Tunneling Transistors (HETTs)," by **Daeyeon Kim**, **Yoonmyung Lee**, Jin Cai, Isaac Lauer, Leland Chang, Steven J. Koester, Prof. **Dennis Sylvester**, Prof. **David Blaauw**, received the Best Paper Award at the *2009 Int. Symp. on Low Power Electronics and Design (ISLPED)*.

"Micro Energy Scavengers," by Edward Romero, **Tzeno Galchev**, **Ethem Aktakka**, **Niloufar Ghafouri**, **Hanseup Kim**, Michael Neuman, Prof. **Khalil Najafi**, and Robert Warrington, won the Best Paper/ Presentation Award at the *2008 Int. Conference on Commercialization of Micro and Nano Systems (COMS)*.

"Locating the nodes: cooperative localization in wireless sensor networks," by **Neal Patwari** (PhD EE:Systems '05), Joshua Ash, Spyros Kyperountas, Prof. **Alfred O. Hero**, Randolph Moses, and Neiyer Correal, published July 2005, received the 2009 IEEE Signal Processing Magazine Best Paper Award by the *IEEE Signal Processing Magazine*.

"A 3D Forward and Back-Projection Method for X-Ray CT Using Separable Footprint," by **Yong Long**, Prof. **Jeffrey A. Fessler** and Prof. James M. Balter (Professor of Radiation Oncology) received a Best Poster Award at the *10th International Meeting on Fully Three-Dimensional Image Reconstruction in Radiology and Nuclear Medicine*.

"New Bounds on the Maximal Error Exponent for Multiple-Access Channels," by **Ali Nazari,** Prof. **S. Sandeep Pradhan** and Prof. **Achilleas Anastasopoulos** received a Best Student Paper Award at the *IEEE Int. Symposium on Information Theory*.

"Mapping of Sand Layer Thickness in Deserts Using SAR Interferometry," by **Adel Elsherbini** and Prof. **Kamal Sarabandi**, received the second prize award in the Student Paper Competition at the *2010 IEEE USNC/URSI National Radio Science Meeting*.

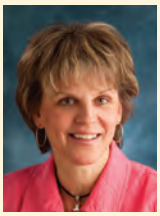
"Closed Loop Determinism for Non-Deterministic Environments: Verification for IEC 61499 Logic Controllers," by **Lindsay V. Allen** Kiah Mok Goh (Singapore Inst. of Manuf. Tech.) and Prof. **Dawn Tilbury** (Mechanical Engineering and EECS), received the Best Conference Paper Award at the *2009 IEEE Conference on Automation Science and Engineering*.

"A Printed Leaky-Wave Antenna with a Sinusoidally Modulated Surface Reactance," by **Amit M. Patel** and Prof. **Anthony Grbic** received first place in the Student Paper Competition at the *2009 IEEE International Symposium on Antennas & Propagation and USNC/URSI National Radio Science Meeting*.

**Names in bold are U-M faculty or graduate students, unless otherwise identified.*

Staff Awards

Karen Liska, EECS Human Resources Coordinator, received the 2009 College of Engineering's Judith A. Pitney Staff Service Career Award, which recognizes the significant contributions of a single CoE staff member with at least 10 years of service.



Barbara Rice, Senior Research Administrator for the Solid-State Electronics Laboratory (SSEL), the NSF Center for Wireless Integrated MicroSystems (WIMS), the National Nanofabrication Infrastructure Network (NNIN), and the Lurie Nanofabrication Facility (LNF), has received a 2009 Distinguished Research Administrator Award from the Office of the Vice President for Research for her superlative service to the research community in a manner exemplifying the highest goals of research administration.

Dennis Schweiger, Facilities Supervisor for the Lurie Nanofabrication Facility, has received a 2009 College of Engineering Staff Excellence Award for sustained excellence during his time at the College of Engineering.

New Faculty

MICHAEL CAFARELLA
Assistant Professor
PhD, CS, U. Washington, 2009

Research Interests: Web-oriented research, using techniques drawn from databases and artificial intelligence

Michael Cafarella is widely recognized for his research on techniques for extracting and managing informally structured data on the Web. Prof. Cafarella is one of the co-creators of the Hadoop system, which is the first public implementation of the Map-Reduce programming paradigm and is in wide use today for data intensive computation in both industry and academia.

PRABAL DUTTA
Assistant Professor
PhD, CS, U-C Berkeley, 2009

Research Interests: Designing architectures, platforms, protocols, software, and tools for wireless, embedded, and internetworked sensor/actuator systems

Prabal Dutta envisions a future in which wireless communications is pervasive, sensors can monitor anything and actuators can control many things, and he explores how we should build devices and software that survive and thrive in this environment. His graduate research has been commercialized by Aginova, Arch Rock, Crossbow, Moteiv and Moteware, and is in use by hundreds of researchers and practitioners worldwide.

GEORG ESSL
Assistant Professor
PhD, CS, Princeton, 2002

Research Interests: Performing arts technology, human-computer interaction, tactile and tangible computing

Georg Essl joins the faculty from Deutsche Telekom Labs, TU-Berlin. Prof. Essl will have a joint appointment with the Department of Performing Arts Technology in the School of Music. He is best known for his research in interactive music performance using mobile devices, efficient real-time sound synthesis, and the human-instrument interface.

HEATH HOFMANN
Associate Professor
PhD, U-C, Berkeley, 1998

Research Interests: Power electronics and systems

Heath Hofmann joins the faculty from Pennsylvania State U. He specializes in the design and control of electromechanical systems, with an emphasis on energy conversion and storage. Prof. Hofmann has undertaken fundamental work in understanding the properties of piezoelectric and electrostrictive materials for energy harvesting applications. His collaboration with industry includes Tesla Motors, Pentadyne Power Corporation, and LightningPacks LLC.

RAJESH R. NADAKUDITI
Assistant Professor
PhD, Electrical and Oceanographic Engineering, MIT and Woods Hole Oceanographic Institution, 2007

Research Interests: Signal processing and random matrix theory with applications to sonar, radar, wireless communications, and machine learning

Raj Nadakuditi joins the faculty from MIT, where he was a post-doctoral research associate developing "smart" undersea signal processing technologies and characterizing their fundamental limits. Working at the interface of statistical signal processing and random matrix theory, he uses random matrix theory to address problems that arise in statistical signal processing and identifying opportunities for creative applications of the theory to other core areas of electrical engineering.

MINA RAIS-ZADEH
Assistant Professor
PhD, Georgia Tech, 2008

Research Interests: Integrated RF MEMS, MEMS-enabled ICs, wafer-level packaging and micro/nano-fabrication techniques

Mina Rais-Zadeh joins the faculty from Georgia Tech, where she was a Postdoctoral Research Fellow with the Integrated MEMS group. Her research interests include passive micro-machined devices for communication applications, interface IC design for MEMS and CMOS-MEMS integration, micro-resonators and micromechanical structures for complete system-on-a-chip, and micro- and nano-fabrication processes. She is co-founder of the startup company RadioMEMS.

ZEESHAN SYED
Assistant Professor
PhD, CS and Biomedical Engineering, MIT, 2009

Research Interests: Computational physiology and computational epidemiology

Zeeshan Syed joins the faculty from the Harvard-MIT Division of Health Sciences and Technology, which integrates engineering at MIT with medicine at Harvard Medical School to solve problems of human health. Professor Syed's research has involved the analysis of cardiac electrical signals to predict heart attacks and sudden cardiac death. He brings together skills from multiple disciplines in new ways in conducting his research.

ZHENGYA ZHANG
Assistant Professor
PhD, EE, U-C Berkeley, 2009

Research Interests: VLSI architecture, digital systems, communication and signal processing systems

Zhengya Zhang is investigating energy-efficient communications and signal processing system design that spans algorithm design and analysis, architectural optimization, and efficient hardware implementation. His current research projects involve designing error-resilient processors, high-performance communication baseband processors, and accelerators for imaging applications.

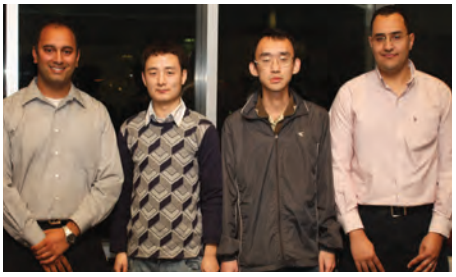
Student News

Solar Powered Computer Lab in India

Raj Vable, who recently graduated with his undergraduate degree in electrical engineering, initiated a project that aims to power a computer lab at Jnana Bodhini School in India, using only solar power. Last summer, the school installed a 750 watt prototype system to drive three computers for five hours. Now, he and his team are working to power all 20 of the school's computers for the full school day. Vable will continue his engineering studies in a graduate program in sustainability. [You can view a video about the project on the EECS YouTube Channel]

Students Develop iPhone App to Promote Good Deeds

Mobil33t, a company formed by a team of three recent U-M graduates, has created DoGood, the popular iPhone App that leverages mobile networks and social media to encourage and promote altruism on a global scale. The developers were inspired to create DoGood after completing Prof. Elliot Soloway's new "Mobile and Web App Programming" class, and are the first of a wave of student companies to get an iPhone app into commercial circulation. Mobil33t is Jason Bornhorst, Mayank Garg, and Kunal Jham.



Ganesh Dasika, Xin Hu, Ran Duan, and Ahmed Hassen

2009 CSE Graduate Student Honors Competition

CSE held its Sixth Annual Graduate Student Honors Competition on November 17. CSE faculty and a guest judge from Mentor Graphics ranked the finalist's presentations. The finalists in each area and their final standings were: Ganesh Dasika, Hardware (First place); Xin Hu, Software (Second place); Ran Duan, Theory (Honorable mention); and Ahmed Hassan, Artificial Intelligence (Honorable mention).

Line van Nieuwstadt in front of the Microwave Observatory of Subcanopy and Surface (MOSS) antenna she helped engineer.

Line van Nieuwstadt: An Unconventional Path

With a patent, several research awards, three children and a husband, work on her PhD in electrical engineering, and various side activities such as teaching female students how to be financially stable and traveling to local schools to show students the value of math, science, and engineering – Line van Nieuwstadt says, "You wonder why I'm tired. I don't think I'm the typical grad student."

Line van Nieuwstadt received her master's degree in electrical engineering at Cornell University, spent seven years at the Jet Propulsion Laboratory (JPL), and worked for two years in the Netherlands before coming to Michigan. At JPL, she worked on the communications system of the Mars Pathfinder Sojourner Microrover, which landed on Mars in 1997; this system enabled pictures to be transmitted back to Earth. She travels to schools and gives talks to elementary and middle school children about her time as an engineer at JPL, using a video that shows her and others building the rover.

That experience was invaluable in her next job at Michigan with the Space Physics Research Lab (SPRL). At SPRL, she was senior engineer, adjunct lecturer, project manager for a student satellite project for NASA Marshall Space Flight Center, and lead engineer for the implementation of a MOSS antenna for Prof. Mahta Moghaddam.

Six years after arriving at SPRL, she took an educational leave to pursue a doctoral degree that would allow her to investigate better methods of breast imaging for cancer detection. She secured a three-year NASA Jenkins fellowship, and now works with Prof. Mahta Moghaddam. Prof. Paul Carson in the Department of Radiology, also collaborates on the research.

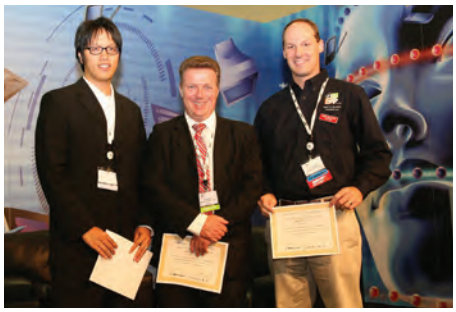
Line's vision is to help devise a technique for imaging breast tissue that is safe—much safer than a mammogram for example, and inexpensive. Women need access to affordable health care because they are typically less likely to have insurance than men, believes Line, mainly due to employment status. This motivates Line to provide financial counseling to women students and friends several times a year.

She's not a financial counselor by profession, though she'll do that to help women – and she's not a school teacher – but she'll spend her time and energy spreading the message to elementary and middle school children that engineering is fun, and important. "I am an engineer to the core," said Line.

Jacob Oberlin, standing

Electronics Savvy Helps Drive MRacing Team to a Strong Finish

Michigan's MRacing team competed in the largest student competition of its kind, the Formula Student Germany (FSG) competition, held August 5-9, 2009, in Germany. They finished an impressive fifth among 78 international contenders, the best showing at FSG by a North American team. Jacob Oberlin, the electronics group leader and senior undergraduate student in computer engineering, was responsible for all of the electrical systems on the vehicle.



Mingoo Seok, Ian Burgess (Mentor Graphics), and Prof. Dennis Sylvester

DAC/ISSCC 2009 Student Design Contest

The winning project and paper, *Phoenix: An Ultra-Low Power Processor for Cubic Millimeter Sensor Systems*, by Mingoo Seok, Scott Hanson, Yu-Shiang Lin, Zhiyoong Foo, Daeyeon Kim, Yoonmyung Lee, and Nurrachman Liu, and their advisors, Profs. Dennis Sylvester and David Blaauw, was one of nine winning teams in the *2009 Design Automation Conference/ Int. Solid-State Circuits Conference Student Design Contest*. Their project was in the operational chip design category.

EECS Students Take Top Two Clean Energy Prizes

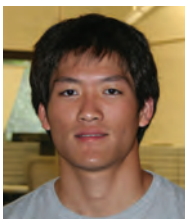
First prize in the Clean Energy Prize business plan competition, established by DTE Energy and U-M, went to the team Enertia, comprised of Tzeno Galchev and Ethem Aktakka, PhD fellows in electrical engineering, and Adam Carver, U-M MBA student. They earned $50,000 for their plan to harness vibrations to generate power for small electronics.

Second prize went to Advanced Battery Control (ABC), a team that included Fangjian Jin, graduate student in CSE, Dr. Hahnsang Kim, post-doctoral fellow in CSE, as well as MBA students Paul Gruber and Drew Demuth.

Yahoo! Hack U 2009 at CSE

On March 17-21, 2009, Yahoo! held Hack-U at the University of Michigan. Hack U, designed to get students to think about Web technologies and to encourage interaction, learning, and creativity, was a week-long event that took place in the Computer Science and Engineering building. The week culminated with a Friday/Saturday 24-hour "hackathon," from which nine student teams emerged to present their hacks to a judging panel. The winning hack was written by Brandon Kwaselow. A summary of the hacks can be seen at http://developer.yahoo.com/hacku/show/2009/mar/umich.

Kevin Huang



Michael Shin

Students Create Portable Device to Detect Suicide Bombers

EECS undergraduate students Kevin Huang and Michael Shin were members of the winning team that designed a portable, palm-sized metal detector for a competition sponsored by the U.S. Air Force Research Laboratory at Wright Patterson Air Force Base. The detectors are designed to be part of a wireless sensor network that conveys to a base station where suspicious objects are located and who might be carrying them. Compared with existing technology, the sensors are cheaper, lower-power, and longer-range.

Student Entrepreneurship at TechArb

EECS student entrepreneurs have a way of getting things done. Prior to graduating in Winter '09, CSE student Jason Bornhorst teamed up with Ann Arbor-based venture capital firm RPM Ventures and McKinley Properties to create TechArb, an incubator for companies run by students and recent graduates. TechArb came into existence as a three-month test in the summer of 2009, and was featured in the press, including PBS NewsHour. TechArb quickly became home to a number of fledgling companies, many of them software and iPhone development companies. This success prompted the Center for Entrepreneurship to sponsor TechArb on a long-term basis in a new home on the fourth floor of the Google building in downtown Ann Arbor.

Student News

U-M Team Moves to Semi-Finals for MAGIC 2010 Robot Challenge

A team of over 20 students, led by Prof. Edwin Olson, is busy designing, building, and programming robots for use in the Multi-Autonomous Ground-Robotic International Challenge (MAGIC) 2010 competition. Prof. Olson's technical proposal for the competition was recently accepted, placing U-M on a short list of 12 teams worldwide that will compete if they pass site visit requirements in June 2010.

The MAGIC Challenge requires competitors to develop multi-vehicle robotic teams that can execute an intelligence, surveillance, and reconnaissance mission in an unknown indoor/outdoor environment with little or no human supervision. The robots will need to dynamically coordinate to carry out tasks based on changing priorities. For these reasons, the challenge provides an excellent focus for new research into machine perception, autonomy, and learning – key areas of inquiry that Prof. Olson's APRIL Laboratory is centered on. The U-M team will also leverage support from Soar Technology, the cognitive science company founded by Professor John Laird.

MAGIC is jointly sponsored by the Australian and U.S. Departments of Defense to attract innovative proposals from worldwide research organizations to develop next-generation fully autonomous ground vehicle systems that can be deployed effectively in military operations and civilian emergency situations. The final stage of competition will take place in November 2010, at an undisclosed location in South Australia. ●

Keegan Reilly, Ray Smith, and Dan Lagreca
Credit: Ray Smith

Medical Data Logger Enables National Clinical Drug Trial

A team of six engineering students spent a summer inventing an electronic data logger kit for medical researchers to conduct clinical drug trials in ambulances, and then competed with an engineering firm to have their prototype selected for use in a National Institutes of Health's Neurological Emergencies Treatment Trials network. The students' kit was selected, and will be used in a four-year national study comparing how ambulance patients respond to two different anti-seizure drugs. Overseeing the project was master's student Patrick Quinn. He worked with the EECS undergraduate students Andrew Jones, Dan Lagreca, Keegan Reilly, and Ray Smith, as well as mechanical engineering student Craig Spencer.

Students Help the Deaf Feel the Music

A competition called Feel the Music, sponsored by the Deaf Performing Arts Network (D-PAN) and the College of Engineering Center for Entrepreneurship, sought solutions for a better way for the deaf and hearing-impaired population to appreciate music. First place went to a team of five students, which included EE and performing arts technology double major Rishi Daftuar, who called themselves Team Thumping Threads. Their project consisted of a specially designed vest that causes one's spine to tingle in response to sound waves. Second place went to a team of sophomore EE students, Ryan Garrone, Mike Huang, and Steven Joseph, for their project Muted Music, which consisted of an electronic glove that provided vibrations in specific patterns based on the rhythmic pulse and musical pitch.

Robert Alexander, Stewart Randolph, Rishi Daftuar, and Matthew Rose

Ryan Garrone, Steven Joseph, and Mike Huang

Student Programming Team Ranks High in ACM World Finals

A U-M team tied for 14th place in the World Finals of the ACM International Collegiate Programming Contest in Harbin, China, on February 5, 2010. Students Mark Gordon, Yu-Shuang (Frost) Li, Zhongxia Zhou, coach Prof. Kevin Compton, and assistant coach Dennis Matveyev, comprised one of 103 teams, from 7000 around the world, advancing to the finals from regional competitions held in the fall.

Individual Honors and Awards

Mona Attariyan received the Margaret Ayers Host Award from the U-M Rackham Graduate School.

Michael Benson received a NASA fellowship from the Earth System Science Fellowship Program to study synthetic aperture radar and related imaging techniques.

Anne Itsuno (graduate EE student), and **Jason Bornhurst** (undergraduate CSE student) won in the categories of Local Business and Global Business, respectively, for their entrepreneurial ideas in the 2009 U-M 1,000 Pitches Contest.

Matthew Fojtik was awarded an Intel Foundation/ Semiconductor Research Corporation Education Alliance (SRCEA) Fellowship for his work in ultra-low-power integrated circuits.

Amanda Funai received the Margaret Ayers Host Award from the U-M Rackham Graduate School.

Tzeno Galchev was awarded a special certificate by the president of Bulgaria for his achievements in the field of computer engineering and information technology.

Luis Gomez received an NSF Graduate Research Fellowship to investigate a new treatment for neurological disorders.

Amir Hormati was awarded a 2009 Rackham Predoctoral Fellowship.

Sung Hyun Jo took first place in the Raith Micrograph Award for his nanostructure, 1kb crosspoint RRAM (Resistive Random Access Memory).

Pelumi Osoba received an NSF Graduate Research Fellowship to investigate the design of platform-mounted antennas.

Andrea Pellegrini was awarded a 2009 Rackham International Fellowship.

Carl Pfeiffer, undergraduate student in EE, received a 2009 IEEE Microwave Theory and Techniques Society Undergraduate/Pre-Graduate Scholarship.

Scott Rudolph was awarded an IEEE Microwave Theory and Techniques Society Graduate Fellowship Award to support his work in metamaterials.

Michael Thiel took first place in the SEMCAD X Student Research Award for his research, Analysis of Human Backscattering in Buildings for Through-wall Radar Applications.

EECS and CoE Undergraduate Student Awards

EECS Senior Outstanding Achievement Award
John Dydo (CE)
David Ramos (CSE)
Khuram Shahid (EE)

EECS Outstanding Research Award
Carl Pfeiffer (EE)
David Ramos (CSE)

EECS Entrepreneurship Award
Leore Avidar (CSE)
Chen-Yue Zhang (EE)

EECS Outstanding Service Award
Alexandra Holbel (EE)

William L. Everitt Student Award of Excellence
Paul Hou (CSE/EE)
Ben Kempke (CE)
Shuang Zhao (CSE)

Richard K. Brown Scholarship
Andrea Bohl (EE)
Rishi Daftuar (EE)

William Harvey Seeley Prize
Katherine Bouman (EE)

Charles F. Barth, Jr. Prize
Arun Ganesan (CSE)

Arlen R. Hellwarth Award
Jason Bornhorst (CSE)

CoE Distinguished Achievement Award
Akram Helou (CSE)
Shao Ning Pei (EE)
Edwin Tay (CE)

Student Instructor Awards
Alex Matchneer, undergraduate student
Patrick Quinn, graduate student
Jeff Roder, graduate student
John Schmotzer, graduate student

Graduate Student Awards

CoE Distinguished Achievement Award
Emine Cagin (EE)
Yin Wang (EE:Systems)
Britton Wolfe (CSE)

Fred R. and Margaret R. Trucks Fellowship
Srujankumar Puchakayala (EE:Systems)

W. R. Yates Fellowship
Sinan Farmaka (EE:Systems)

Arjun Chandran Scholarship
Bharan Giridhar (EE)

A Message From the Alumni Society President

Welcome to 2010 and the start of the new decade! When I was growing up in the 1980s, not long after we signed up for this new service called "cable television," one of the first movies I remember watching multiple times was *2010: The Year We Make Contact* (sequel to *2001: A Space Odyssey*). I marveled at the idea of space travel to Jupiter, supercomputers with artificial intelligence, and had no doubt that such advances would be a reality by 2010. While we are not yet sending humans to Jupiter, we are sending probes to the far reaches of the solar system and perfecting the technology to get the images back to Earth, and we do have supercomputers with artificial intelligence. Some technology advances that are a reality today were beyond my wildest dreams as a youth, such as the Internet and my trusty mobile smartphone. Many of today's astounding advances may be directly attributed to the contributions of Michigan EECS Engineers. With the tremendous size and talents of our EECS alumni, there is clearly a great benefit to networking.

The primary goal of our EECS Alumni Society is to facilitate this network to the benefit of both alumni and students. In 2009, we hosted events including a social event in Ann Arbor to watch U-M Basketball, mixers at technical conferences such as the *International Solid State Circuits Conference*, Homecoming events, and a local and online short course on patent fundamentals. We have also improved our efforts to connect alumni and announce departmental events through the EECS website and professional and social networking sites including LinkedIn and Facebook. In 2010, we plan to introduce more activities, and improve methods for student and alumni networking. We also introduced a new EECS Alumni Society undergraduate scholarship as a means to recognize excellent students. Keep a watch out for future activities, and as always, we welcome your participation by contributing your time (you can volunteer by contacting me at jphilli@umich.edu) or financial support (http://www.eecs.umich.edu/eecs/about/giving/giving.html).

Go Blue!

Jamie Phillips
President, EECS Alumni Society

Course on Patent Fundamentals

A short course covering patent fundamentals was presented November 5, 2009, for EECS alumni and students, by Prof. Mohammed Islam, Professor of EECS and registered patent attorney, and his colleagues at Brooks Kushman. If you missed it, you can view the video and slides online – access to the video and slides can be obtained by emailing EECS-Alumni-Society@umich.edu. A follow-up course allowed small groups of alumni to work individually with patent lawyers from Brooks Kushman to write a patent claim.

Jamie Phillips and daughter Brooke after the Big House Big Heart run at Michigan Stadium in 2009.

Stay in touch with LinkedIn, Facebook, and YouTube.

We now have a Jobs page on LinkedIn – check it out!!! Feel free to post positions, or apply for your next career.

Returning alumni mingled with each other, and with faculty and students during Homecoming Weekend.

Nino Masnari, the 2009 CoE Alumni Merit Award Winner, reconnected with former student, Neal Vance. Read about how his Michigan degree changed Vance's life in the Alumni Notes.

Bob Beuhler, class of 1938, charmed us all!

Ernest S. Kuh, Bettine Kuh

John Seely Brown, David C. Munson, Jr. (Dean, College of Engineering)

Ruba Borno, Michael S. McCorquodale

2009 Alumni Society Medal

Prof. Ernest S. Kuh *(BSE EE '49)*

Ernest Kuh, William S. Floyd, Jr. Professor Emeritus in Engineering at the University of California, Berkeley, returned to campus 60 years after he graduated! Kuh's pioneering work in circuit theory and Electronic Design Automation (EDA) has had a major impact in the field. He co-authored four textbooks and more than 200 articles in the areas of circuit theory, electronics, networks, and computer-aided design. His theoretical work in EDA resulted in software programs relevant to industrial and academic researchers in the earliest days of integrated circuit design. He has received numerous honors and awards, including the IEEE Circuits and Systems Society Award, the ASEE Lamme Medal, and the Benjamin Gustav Kirchhoff Award. He is a member of the National Academy of Engineering, and a fellow of both IEEE and the American Association for the Advancement of Science.

2008 Alumni Society Medal

John Seely Brown *(MS Math '64; PhD CCS '72)*

John Seely Brown revolutionized the vision and application of technology's role in society, recognizing early on that computers offered new means of human expression and interaction. His research has spanned organizational learning, complex adaptive systems, ubiquitous computing, and digital culture. During the 1980's, he was an influential director of the Xerox Palo Alto Research Center, and later chief scientist at Xerox Corp. He was one of the first to hire research anthropologists and sociologists to explore how technology transforms the workplace and social life more broadly. Among numerous other publications, he co-authored the classic work, *The Social Life of Information*. He is currently co-chairman of the Center for Edge Innovatino at Deloitte. Dr. Brown is a fellow of the American Association for Artificial Intelligence, and a member of the National Academy of Education.

2009 Recent Engineering Graduate Award

Michael S. McCorquodale *(MSE PhD EE '00 '04)*

Dr. Michael S. McCorquodale was recently named General Manager, Silicon Frequency Control Business Unit, Communications Division, for Integrated Device Technology, Inc. (ITD). Formerly he was CTO and founder of Mobius Microsystems. McCorquodale founded Mobius based on his doctoral research in precision analog integrated circuits for frequency generation and quartz replacement at Michigan. He holds inventorship on more than 30 issued and pending U.S. patents. Governor Granholm awarded Mobius for the Largest High-Tech Job Creation in Michigan in 2005, and the Small Business Administration recognized Mobius for developing the Innovation of the Year in Michigan in 2006. EDN recognized Mobius' all-silicon spread-spectrum clock generator as one of the "Hot 100 Products" of 2008.

Join us for the next Homecoming Weekend: October 15-16, 2010.

Alumni Awards

David C. Munson, Jr. (Dean, College of Engineering), Usama Fayyad, Farnam Jahanian (Chair, CSE)

2009 CoE Merit Award Winner (CSE)

Dr. Usama Fayyad *(BSE CE & EE '84; MS, CSE & Math '86 '89; PhD CSE '91)*

Dr. Fayyad is founder and chief executive officer of Open Insights, a data strategy and consulting firm. Prior to this, he was Yahoo!'s Chief Data Officer and Executive VP of research and strategic data solutions. He founded and managed the Yahoo! Research organization with offices around the world. He is a fellow of the Association for the Advancement of Artificial Intelligence, and of the Association of Computing Machinery.

David C. Munson, Jr. (Dean, College of Engineering), Randel E. Bryant, Farnam Jahanian (Chair, CSE)

2008 CoE Merit Award Winner (CSE)

Dr. Randel E. Bryant *(BS Applied Math '73)*

Dr. Bryant is Dean of the School of Computer Science at Carnegie Mellon University. He has conducted pioneering research on methods for verifying digital hardware, and more recently, software as well. He authored a groundbreaking paper on symbolic Boolean manipulation, and the popular textbook *Computer Systems: A Programmer's Perspective*, used in more than 130 universities worldwide. Dr. Bryant is a fellow of IEEE, the Association for Computing Machinery, and a member of the National Academy of Engineering.

David C. Munson, Jr. (Dean, College of Engineering), Nino Masnari, David Neuhoff (Assoc. Chair, ECE)

2009 CoE Merit Award Winner (ECE)

Prof. Nino Masnari *(BSE MSE PhD EE '58, '59, '64)*

Prof. Nino Masnari is a Distinguished Professor of ECE at North Carolina State University. He was a faculty member and Director of the Electron Physics Laboratory at U-M before moving to NC State in 1979 as Head of the Electrical Engineering Department. He subsequently was appointed Dean of Engineering at NC State in 1996, where he was responsible for initiating and leading efforts to relocate the CoE from the main campus to the centennial campus, while adding several new buildings to the campus.

David C. Munson, Jr. (Dean, College of Engineering), Mehdi Hatamian, Khalil Najafi (Chair, ECE)

2008 CoE Merit Award Winner (ECE)

Dr. Mehdi Hatamian *(MSE PhD EE '78 '82)*

Dr. Mehdi Hatamian, VP of Engineering for DSP Microelectronics, Broadcom Corporation, is a recognized expert in high-speed VLSI signal processing, image processing and compression, full-custom and low-power circuit and architecture design, Gigabit Ethernet transceiver design, high-density deep sub-micron CMOS design, and biomedical electronics. He has nearly 50 published articles, and holds 54 patents. He is an IEEE Fellow, and co-founder of Smart Medical Technologies Inc. and Metrics Corp.

Jerry Levin, Kevin O'Connor, David C. Munson, Jr. (Dean, College of Engineering)

2009 Alumni Service Award

Jerry Levin (BSE EE & Eng. Math '66 '67) and Kevin O'Connor (BSE EE '83)

Jerry W. Levin and **Kevin O'Connor** have helped transform North Campus through nine years of unparalleled leadership as co-chairs of the College of Engineering's fundraising campaign called, Progress & Promise: 150th Anniversary Campaign. This was the largest fundraising effort in the history of Michigan Engineering, generating more than $300 million that went to numerous scholarships and fellowships, 17 endowed professorships, and four new facilities, including the Computer Science and Engineering Building.

Mr. Levin is Chairman and CEO of JW Levin Partners LLC, which specializes in rebuilding branded consumer products and service companies. Previously, he served as CEO of several other premier U.S. corporations.

Mr. O'Connor has been an entrepreneur for more than 28 years, notably co-founding the successful company DoubleClick, which was acquired by Google in 2008. He authored the book, *Map of Innovation: Creating Something Out of Nothing*.

Michael McCorquodale

Engineering a U-M Startup to Commercialized Technology in 5 Years

Michael McCorquodale
MSE PhD EE '00 '04
Former CTO and Co-Founder of Mobius Microsystems
General Manager, Silicon Frequency Control Business Unit,
Communications Division, Integrated Device Technology, Inc.

"On January 14, 2010, IDT acquired Mobius Microsystems, a leading innovator in patented all-silicon oscillator technology, and welcomed the Mobius team and technology to the IDT family."[1]

Integrated Device Technology, Inc., IDT, is the new home for Dr. Michael McCorquodale, who founded Mobius Microsystems just as he finished his doctoral degree in 2004.

"It's so weird to be talking about my life like this," said Michael in response to questions about his story that led to this key professional milestone. "There's still so much I want to do."

Michael came to Michigan from Hughes Space and Communications Company interested in developing silicon frequency references as a potential technology for space applications. At Michigan and on the advice of his advisor, Prof. Richard B. Brown (now Dean at the University of Utah), he investigated the use of solid-state circuits to replace quartz as a frequency reference.

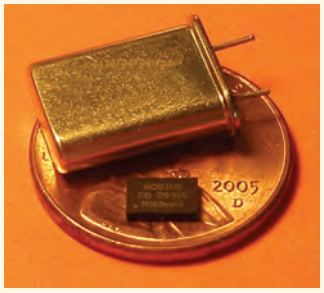
"A lot of people wanted to accomplish this," stated Dr. McCorquodale. "Quartz-based frequency references are essentially vibrating rocks, and they're fairly large. If you can achieve the same function in silicon, it gives the added benefits of integration with other electronics, the ability to stack in packages, much smaller form-factor, and the lowest possible cost structure."

"This technology goes into everything," added McCorquodale. "The iPhone for example has 7 frequency references that are quartz. These can be replaced with our tiny pieces of silicon."

When it appeared that he found a successful solution, Michael turned his attention to commercializing the technology. "Rich really encouraged me to pursue my entrepreneurial interests – and that's when I connected with the Zell Lurie Institute and participated in business plan competitions to see if we could develop a business around the technology. People became interested in it, and after starting the company, we began raising money and building products based on the core technology."

Michael entered the market with a venture capitalist's dream, a disruptive technology. "This is a new business for semiconductors because quartz is its own technology and product, and now silicon can replace it. It's an entirely new market that was not served by silicon until now," explained McCorquodale. With IDT, the world leader in frequency generation products, Mobius' patented all-silicon timing technology is expected to find wide use in products around the globe.

Moving with Michael to IDT are Eric Marsman (BSE MSE, EE '00 '01), Scott Pernia (BSE MSE, EE '02 '03), and Gordy Carichner (BSE MSE, EE '89 '91), all U-M colleagues hired by Michael.



Mobius solid-state component next to much larger quartz crystal component.

Gordy was just the fifth employee at Mobius, and he left a secure job at Michigan to join the team. Though commercial success was just a dream at that point, Gordy stated, "I believed in Michael and the team he was building. The fact that he was trying to make this happen in Michigan was also a big attraction." Marsman was also delighted to work on cutting-edge technology here in Ann Arbor, and added, "it's rewarding to see our achievements getting noticed, our devices getting traction in the industry, and other people trying to do what we're doing."

Always a high achiever professionally, Dr. McCorquodale has also participated in a wide array of community service activities. He's demolished abandoned houses in Detroit, volunteered at soup kitchens, planted trees, and served as an elected district Councilman. "The most enjoyable has been tutoring homeless children in math and science," stated McCorquodale. "These were children that were between homes, or having custody issues."

Michael will tell you that Michigan has been good to him. He even met the love of his life, his wife Ruba Borno (MSE PhD, EE '03 '08) at Michigan! A fellow electrical engineer with a novel research, a patent, and several national and international business plan competition wins to her credit, Ruba works as a management consultant with the Boston Consulting Group, a leading global business strategy firm.

We're delighted to hear that after Michael's taste of success, he wants more. "I'd like to keep doing what I'm doing in different roles and capacities: developing new technologies, building new businesses, starting new companies, and getting them to the point that other big companies can use them. It was really tough, but I'd like to do it again."

Dr. McCorquodale offers this advice to students who dream of following a similar path: "Don't listen to anyone who tells you that you can't do something. And when you choose to do something, make sure you're determined to finish it."

[1] *[www.idt.com: also announced in EE Times and elsewhere]*

Listen to Michael's talk, "Straight Down the Crooked Path: The Dynamic Process of Commercializing Research," given to students during the 2009 Michigan Engineering Alumni Weekend. See www.eecs.umich.edu/eecs/about/media.html, under Entrepreneurship.

Alumni Notes

1950's

Left to right: Donnajean Bloss (U-M alumnus), Richard Bloss, Mark Bloss (son) at the Go Blue Tailgate. First time back in the Big House for 52 years!

Richard Bloss *(BSE MSE EE '56 '57)* is an independent industrial marketing consultant and writer on factory automation. After he graduated from U-M, he went to work for National Cash Register in Dayton, OH, in computer design, then worked in the area of controls for factory automation at TRW (later known as Bunker-Ramo). He moved to Cleveland, OH, in the mid 60's, and continued a connection with factory automation first through an industrial ad agency, selling electrical equipment, and then working for Booz Allen & Hamilton as a senior associate for automation. The last several decades Boss has worked as an independent industrial marketing consultant and writer on factory automation. He has remained in contact with his fellow alumn and friend Chuck Hutchins since the mid 60's.

1960's

Eustace L. Dereniak (*MSE EE '65*) is a professor of Optical Sciences, as well as Electrical and Computer Engineering, at the University of Arizona. He and Teresa D. Dereniak have authored the textbook, *Geometrical and Trigonometric Optics (2008)*, which covers the modern geometrical aspects of optics. Prof. Dereniak has published two additional books, *Infrared Detectors and Systems (1996)* and *Optical Radiation Detectors (1984).*

Galal Khadr *(MSE, PhD EE '68 '69)* is Director of Madina Regional Center at Arab Open University in Saudi Arabia. He says, "I am proud to be a U-M graduate, and am grateful for the excellent PhD program. I still remember Ann Arbor, even after more than 36 years."

1970's

Neal B. Vance *(BSE EE '71)* came to Michigan Engineering after serving in the Navy, and working at General Motors as a draftsman and research technician.

While there, said Vance, "I came to realize that industry places its future with young engineers, and they recruit these future business leaders from engineering colleges, and if I wanted to realize any leadership contribution in my life, I would need to get my degree. From that moment on, I could not have been more focused or determined. It was spring, and my goal was to be enrolled by fall in the best engineering school that would have me." Accepted by every school to which he applied, he chose Michigan!

Vance decided to major in electrical engineering after he was told he had a keen insight in the realm of the invisible. Upon graduating, he returned to GM and discovered "that his Michigan degree forever changed my life; doors opened, challenges were offered, leadership was given, and a satisfying and enduring career has been the result." Neal says:

"I am a Renaissance man; curiosity and wonderment at nature and exploring the unknown. I've owned three companies, and have a half-dozen inventions living inside automobiles, computer cabinets, and manufacturing machines, I'm an ex-pilot and ex-speed junky. I designed a super-precision manufacturing grinder in 1981 (10 years out of Michigan Engineering) still being built and sold worldwide today. The grinder company who gave me that job did so on faith; neither they nor I had ever designed or built anything like that before. And part of that faith was based on that I was a Michigan Electrical Engineering grad!

My goals today are to pick projects that have a direct human benefit. One thing I know; any project - any enterprise, will hit

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The Phoenix Chip: From Concept to Commercialization

Links are on our homepage: www.eecs.umich.edu

snags and delays and unexpected interruptions. If the goal is indeed important to another human being, that fact seems to get me through the delays and interruptions; it takes me out of the equation. Somebody is depending on this thing getting done, and that is a very powerful incentive.

I am the father of a future Michigan man, I hope, and married to a wonderful woman. I read 4-6 hours a day, am building an Intel Core2 Quad Q9550 Yorkfield 2.83GHz workstation to run solid modeling CAD, restoring an old house, and making sure everyone uses the recycle bins. Life is good. Go Blue!"

neal.vance@labcappers.com;
Saginaw, Michigan

Note: To read Neal's complete remembrance, please see the Alumni Notes on the EECS Web pages (eecs.umich.edu/alumni). His photo with former professor Nino Masnari shown on pg. 27.

1980's

Kathryn Ullrich *(BSE EE '86)* is the new Associate Director of Alumni Career Services at UCLA Anderson School of Management. She provides programs and resources to help alumni with job transition and career success. She leads a Getting to the Top career development program at UCLA Anderson and Stanford Graduate School of Business. In addition, Ullrich is President of a Silicon Valley based executive recruiting firm doing Marketing, Product Management, Sales and Consulting searches for high-technology companies.

Walter L. Whipple (*MSE PhD CICE '74 '88*) is a self-employed consultant, currently testing GN&C and COMM software for the SBIRS GEO-1 satellite for Lockheed Martin in Sunnyvale, CA.

1990's

Thomas J. Treutler (*BSE CE '90*) was named a Leading Lawyer in Intellectual Property Law in Vietnam by the legal industry publication *Chambers Asia* for the second consecutive year. Treutler is a Senior Associate in the Hanoi Office of the law firm Tilleke & Gibbins. In 2009, Treutler and his wife Ngoc Thuy founded the Hanoi Little League, and led the first ever Vietnamese Little League team to the Asia-Pacific Little League Championship Tournament in Jakarta, Indonesia. It was the first time a Vietnamese baseball team had participated in an international level tournament at any level (see pictures at http://www.hanoibaseball.com). Treutler has been appointed District Administrator for Vietnam by Little League International.

2000's

Kai-hui Chang *(PhD CSE '07)* received the 2009 ACM SIGDA Outstanding PhD Dissertation Award in Electronic Design Automation for his dissertation, "Functional Design Error Diagnosis, Correction and Layout Repair of Digital Circuits." Kai-Hui previously received the Outstanding Dissertation Award from the European Design and Automation Association.

Smita Krishnaswamy *(BSE CE '04; MSE, PhD CSE '04 '08)* received the 2009 Outstanding Dissertation Award in the area of "New directions in circuit and system test" from the European Design and Automation Association (EDAA) for her dissertation, "Design, Analysis and Test of Logic Circuits under Uncertainty."

Jay Sivagnaname *(PhD EE '05)* and his wife Bhavani are happy to announce the birth of their second child "Akshara" (means either 'a syllable' or 'eterna' in Sanskrit). She was born November 30, 2008 at 9:43 am. The baby weighed 5 lb 13 oz at birth. Bhavani and the baby are doing fine.

Alumni Notes/ In Memoriam

2000's
EECS Alumni Reaching Out to Help Others

Allan Evans, Scott Wright

Globe Shares: A New Global Charity

A chance to explore different parts of the world for an extended period of time is a dream for many students. Allan Evans (*PhD EE '10, exp*) and Scott Wright (*PhD EE '09*) are making this dream a reality in 2010, with trips planned for Taiwan, China, Thailand, Israel, Egypt, India, Nepal, and South America.

They won't simply be travelling as a way to take in the sites, however. Along the way, they'll be connecting with a variety of public service organizations to help children and adults in need at the locations they visit. This includes teaching English in rural Thailand; teaching math and science in English to Sudanese refugees in Cairo; and helping to rebuild Pisco, Peru, which is still hurting from an earthquake a few years ago.

Believing that others share a similar passion for travel combined with a social consciousness, they formed the non-profit company Globe Shares; their mission is to facilitate global generosity. Globe Shares will connect travelers with places that could use their help, and they will help raise funds for the communities in need of building supplies and other basic needs. Allan and Scott will sit on the board of Globe Shares and continue the work even after they return and continue their careers as professional engineers. [For more information, visit www.globeshares.org.]

Joe's Run Across America for MS

Joe Fairchild *(BSE CE '06)* is running across the United States, an estimated 3,400 miles, to raise money and awareness for Multiple Sclerosis, an autoimmune disease that attacks the central nervous system. He covers 25-30 miles per day, pushing all of his essentials—a tent, sleeping bag, clothes, food, water—in a stroller. "To me the run is a spiritual journey. I hope to discover more about myself while taking in the beauty of this great country."

Joe started his run in Boston on August 8, and he will finish in Los Angeles. According to his blog, he reached Prescott Valley, AZ, after 174 days on the road, and 3,001 miles. His original goal was to raise $25,000 for the MS Society by the end of the journey. Fans can view pictures, read journal entries, and monitor his progress on his website, www.runsomemore.com.

In Memoriam

A True Blue Michigan Engineer: Memories From Don's Wife, Mrs. Jeanne Morelli

Donald R. Morelli, P.E. *(BSE EE '68)*

Don became a registered Professional Engineer after graduation and owned his own consulting engineering company in Columbus, Ohio, for many years. Most recently, he was the Senior Electrical Engineer for the Health Care Division of TLC Engineering in Orlando, specializing in hospital design. He was respected nationally for his knowledge in that area.

His Michigan education was the cornerstone of his success. He always said that Michigan not only provided a solid education in engineering principles but also taught students how to think creatively and solve problems, a trait he often found lacking in his employees who graduated from other schools.

Don was a lifelong member of the Michigan Alumni Association, participating in local alumni clubs and student recruitment in both Columbus and Orlando. We sponsored the New Student Reception at our home each year since we moved to Orlando, and he often spent time talking to prospective students about engineering. I am also a Michigan graduate as are our two daughters. We never missed a homecoming game in 40 years of marriage and still have one daughter and many friends in the Ann Arbor and Detroit areas.

Michigan was an important part of his life, and our life together, and so it was fitting that his funeral flowers were maize and blue, and he was cremated with a Michigan flag. He treasured his years at Michigan in the College of Engineering and in the marching band and wore the maize and blue proudly.

In Memoriam

The Department offers its sincere condolences to the family and friends of the EECS alumni named below, as well as those about whom we have not been informed.

CLASS OF 1930–39

Louis D. Smullin ('36; 6/4/09)
Robert M. Wopat ('36; 7/12/08
Lt. Col. Robert F. Bowker ('36; 3/22/08)
Dr. Jack F. Cline ('38, '41, '50; 8/17/08)
Merle W. Heidman ('39; 12/20/09)
Anand M. Kelkar ('39; 3/13/08)
John F. McLean, Jr. ('39, '39; 12/26/09)
Rodney C. Owen ('39; 2/21/09)

CLASS OF 1940–49

Henry B. Heyl ('40; 11/27/09)
Charles F. Kraut ('40; 8/17/08)
Fred Laviolette ('40; 11/27/08)
Robert L. Ohlsson ('39, '40; 6/8/09)
Hans John Prager ('40; 6/28/09)
Robert B. Shulters ('40; 1/12/10)
Oliver H. Bell ('41; 12/9/09)
Gordon Ryther ('42, MBA '47; 8/18/08)
Herbert W. McCord ('43; 8/27/2009)
Norman B. Carson ('45; 5/30/09)
William R. Hamilton ('46; 9/27/08)
Rex Elmer Smith Jr. ('46; 12/25/08)
The Rev. William Muha ('47; 3/18/09)
Stanley G. Neumann ('47; 8/22/09)
William L. Sherwood ('47; 8/18/08)
Hung Chang Lin ('48; 3/05/09)
Leland A. Pickett ('48; 8/22/08)
Donald G. Raymer ('48; 11/7/09)
Warren J. Rutter ('48; 5/30/09)
Charles W. Schoendube ('48; 10/9/09)
William S. Squire ('48; 8/15/09)
Jackson R. Templin ('48; 4/24/09)
Gorge Vandesande ('48; 11/27/08)
Charles F. North ('49; 10/3/08)
Randall R. Rockwood ('49; 9/7/08)
Abraham I. Tersoff ('48, '49; 2/12/09)
John Daniel Vicich ('49; 6/23/08)
Robert G. Weber ('49; 6/30/05)

CLASS OF 1950–59

Jack J. Bialik ('50; 1/4/10)
Wilbur A. Carrington ('50;12/24/09)
Dr. Leonhard Holmboe ('50; 12/18/08)
John R. Kruse Jr. ('50; 10/6/08)
Alan J. Robertson ('50; 11/18/09)
Allen Henry Tumer ('50; 9/8/09)
Richard M. Welty ('50; 7/23/09)
Glenn H. Anderson ('51; 9/19/09)
Lawrence F. Calahan ('51; 9/23/08)
John Cochran Graham ('51; 3/4/09)
George N. Jorgensen ('52; 9/8/09)
Kenneth L. Wilson ('52; 1/8/09)
Wayne L. Holmes ('53; 5/22/09)
Sai Liong Ow-Yong ('52, '54; 2/20/09)
Roger G. Mercier ('57; 4/22/08)
Lawrence J. Walsh ('58; 5/10/09)
Donald J. Way ('58; 12/5/09)
David M. Collier ('59; 10/14/08)
Amiya Ranjan Pal ('59; 5/27/09)

CLASS OF 1960–69

Kendall J. Beerthuis ('60; 11/28/08)
John Briggs ('60, MBA '61; 10/14/08)
Charles Hammerslag ('60, MBA '61; 8/18/08)
George R. Hope Jr. ('60, '61; 3/3/07)
Richard G. Voigt ('60; 12/20/08)
Charles E. Bodmer ('61; 1/23/08)
Lt. Col. Theodore DeMuro ('61; 1/8/10)
James G. Schonbok ('61; 7/13/09)
Wesley A. VanSpronsen ('61; 9/1/03)
John E. Dulfer ('62; 12/24/06)
Kenneth H. Moses ('62; 8/21/06)
Vincent Dambrauskas ('55, '63; 9/11/09)
Dr. Jim Pennington ('58, '63; 4/16/09)
Irving W. Rozian ('63; 10/28/08)
Wilbur J. Lindsay ('66; 5/10/09)
Herbert Federhen, PhD ('67; 10/6/09)
Donald R. Morelli, P.E. ('68; 8/3/09)

CLASS OF 1970–79

Sulhi S. Altug ('74; 6/12/09)
James S. Lutz ('74; 11/28/07)
James C/ Anderson ('77; 5/3/09)
Carol A. Prochnow ('78; 8/31/09)
Gerald A. Kotarski ('79; 2/25/09)

CLASS OF 1980–89

Janet E. Peterson ('80; 8/16/09)
John P. Giardina ('81, '84; 6/11/09)
John R. Plude ('82; 4/27/09)
Ronald C. Witham ('88; 1/22/09)
Charles E. Lewis ('89; 10/04/07)

CLASS OF 1990–99

Dr. Timothy Himmelspach ('93; 10/5/08)
Matthew A. Lekson ('95; 3/3/09)
Patricia A. Battey ('85, AM EDUC '99; 10/1/08)

CLASS OF 2000–2009

Jin Chen ('08; 1/27/09)
Patrick Denantes ('06; 7/12/09)

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The Department offers its profound gratitude to all of the donors named below, and to those who gave anonymously during the past year. Your support is essential to keeping the Department strong and ensuring that the best students attend Michigan to receive the education they deserve.

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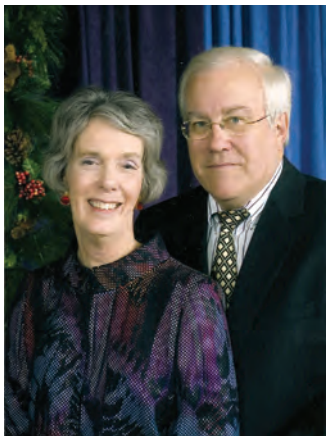
George I. Haddad Conference Room

The Department offers its sincere thanks to George Haddad, Robert J. Hiller Professor Emeritus of Electrical Engineering and Computer Science, for providing the EECS Building with a beautiful new conference room! As part of the EECS renovations, several rooms were transformed into this wonderful space suitable for large meetings and welcoming visitors. Many of you know that Prof. Haddad is an EECS alumnus and former Chair of the Department – a position he held for an unprecedented 19 years! He knows better than most the need for a quality conference room, and we have been making excellent use of it! ●

David G. and Dorothy S. Messerschmitt Scholarship Fund



Dr. David G. Messerschmitt (MS '68; PhD CICE '72) and Dr. Dorothy S. Messerschmitt (AB, AM LSA '68 '69; PhD Linguistics '72) recently established the David G. and Dorothy S. Messerschmitt Scholarship Fund, for the benefit of undergraduate students pursuing a degree in either Electrical Engineering or Computer Engineering.

Dr. David Messerschmitt is an Emeritus Professor of the Department of Electrical Engineering and Computer Sciences at U-C, Berkeley, where he also served as Department Chair. He is a renowned researcher in the field of telecommunications, and author of several textbooks in the areas of networking, digital communications, and software. He is an IEEE Fellow and member of the National Academy of Engineering. Dr. Messerschmitt received the College of Engineering Alumni Society Merit Award for EECS in 1994, and has served on the EECS National Advisory Committee. Dr. Dorothy Messerschmitt is an Emeritus Professor in the School of Education at the University of San Francisco. She is a published author and a specialist in training teachers of English as a second language. ●

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Upcoming Events:

May 1, 2010	Spring Commencement
May 18, 2010	WIMS ERC 10 Year Celebration Site Visit and LNF Grand Opening
May 26, 2010	AVS Michigan: 37th Spring Symposium of the American Vacuum Society
June 21-21, 2010	WISE-GISE Camp for Middle School Girls
June 21-25, 2010	ENGAGE Camp for High School Girls
July 10-29, 2010	LEAD Camp for High School Students
July 26-30, 2010	Grace Hopper Camp for High School Girls
August 18-19, 2010	CS4HS Summer Workshop for K-12 Educators and Administrators
October 2, 2010	Michigan Engineering Tech Day for Prospective Undergraduate Students
October 15-16, 2010	Homecoming! Friday: Alumni Society Board Meeting, all are welcome. Lunch. Talks by our award winners. Saturday: U-M vs. Iowa Football
November 12, 2010	Engineering Graduate Symposium – this past year more than 90 posters of graduate student research were on display just from EECS.

NOTE: See all of our upcoming events on the EECS website. Contact eecscomm@eecs.umich.edu if you would like to get weekly announcements of news and upcoming events.

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