EECS News

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EECS at Michigan: Charting the Future

EECS
CSE ECE

In This Issue

Computer Science and Engineering Building

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A Message from the Chairs of EECS

EECS at Michigan: Charting the Future

A new world-class Nanofabrication Facility (dedicated in 2008); a newly renovated Electrical and Computer Engineering Building (completed in 2008); a recently-completed Computer Science and Engineering building (dedicated in 2006); a new departmental organization with two separate Chairs for the divisions of Computer Science and Engineering (CSE) and Electrical and Computer Engineering (ECE); a large group of brilliant new faculty; and a new look for the EECS web site are among the many changes that will chart an exciting course for the Department of Electrical Engineering and Computer Science.

Our new departmental organization, centered around two very strong divisions (CSE and ECE) that are chaired by two individuals who together co-chair the entire EECS department, will allow us to amplify our strengths by increasing the tremendous educational and research opportunities that we offer our students, while at the same allowing us to pool our resources where needed and beneficial to pursue major opportunities. The new organization also brings greater resources to reach out to our alumni and industrial partners. Finally, it provides greater flexibility to react more quickly to educational opportunities, such as new educational programs (see pg. 14 for information about new programs in Biophysics and Informatics), and new research areas, described below.

We are delighted to be introducing 15 new faculty in this issue! In addition to strengthening existing areas, the new group of faculty will help us expand into important new research areas, such as Power and Energy Systems, Robotics and Autonomous Agents, Computer Vision, Computer Security and Information Privacy, Nanotechnologies and Nanodevices, Low-Power Systems, and Terahertz Devices and Technologies. Please read about them on pp. 19-21. In addition to brilliant young faculty, we are welcoming seasoned veterans in Mark Kushner (formerly Dean of Engineering at Iowa State University), who heads the new Plasma Science and Engineering Institute, Ian Hiskens (formerly at the University of Wisconsin), who will lead new activities in power and energy, and Ben Kuipers (formerly at the University of Texas at Austin), whose expertise in artificial intelligence reaches into the area of robotics.

Robotics and computer vision are among the areas greatly strengthened by our incoming faculty. Two of our new faculty, Ed Olson and Silvio Savarese, were present August 11 with more than 50 robotics researchers from several Michigan universities to showcase their research at the Michigan Robotics and Autonomous Technologies Conference. U.S. Senator Carl Levin was on hand to applaud the movement of the U.S. Army's ground robotics activities from Alabama to Michigan, and the announcement of a new multidisciplinary Ground Robotics Research Center in the College of Engineering.

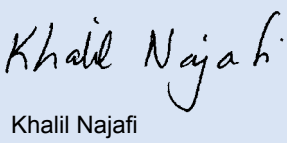
The same day, Rep. John Dingell congratulated the Solar Car team on their unprecedented 5th win in the North American Solar Challenge (see pg. 22 for the story)! EECS students continue to lead the way in all areas with their energy and ingenuity. The student honor society Eta Kappa Nu partnered with Yahoo! to create an internal seminar series featuring CSE faculty. They also organized the Ann Arbor Tech Fair, bringing representatives from twelve local companies to answer questions regarding internship and employment opportunities. Our graduate students continue to bring home top honors in a variety of national competitions, while playing a critical role in the advancement of research.

We are indebted to our industrial partners and to our alumni, who through their generosity and foresight enabled the remarkable facilities we now have to continue the pursuit of new ways to make life better for all of us. Within these facilities are the heart of what makes Michigan great, our students and our remarkable faculty. Your generosity in support of graduate and undergraduate education is vital, and greatly appreciated.

Finally, we offer our sincere gratitude to Prof. Brian Gilchrist for his excellent and devoted service to the department these past two years, first as Interim Chair of the EECS department, and most recently as Interim Chair of ECE. He accepted the interim chair position during a very challenging and eventful period, and performed with remarkable grace and dedication.

We feel privileged to be leading the EECS Department at this exciting time, and look forward to working with our faculty, students, staff, industrial friends, and our alumni as we all chart an exciting future!

Farnam Jahanian
Chair
Computer Science and
Engineering Division



Khalil Najafi
Chair
Electrical and Computer
Engineering Division

Featured Research

Ted Norris and CUOS: Reaching New Frontiers in Ultrafast Optical Science

Ted Norris
Professor and Director, Center for Ultrafast Optical Science (CUOS)

The province of ultrafast optical science, explored in the Center for Ultrafast Optical Science (CUOS), is the generation and application of extremely short pulses of light. How fast is ultrafast? Scientists at CUOS work in femtoseconds (10^{-15} seconds), and even attoseconds (10^{-18} seconds). Lasers that can produce such ultrashort pulses of light make it is possible to investigate and even control phenomena in materials with low intensity, as well as drive novel processes using extremely high peak power. Indeed, ultrafast lasers produce the shortest controlled bursts of energy and the highest peak intensity ever produced by mankind. Researchers at CUOS build these highly remarkable lasers, and are discovering important applications for them.

Comprised of electrical engineers, astrophysicists, physicists, materials scientists, biomedical engineers, and doctors, CUOS researchers explore ultrafast laser applications across the entire range of pulse energy. This includes low-energy laser applications such as biomedical optics and spectroscopy, medium-energy applications such as terahertz generation and micromachining, and studies of light-matter interactions at the highest achievable intensity that promise new treatments for cancer, breakthroughs in lithography, and new insights into fundamental science.

Leading this highly diverse group of interdisciplinary researchers affiliated with CUOS is Professor Ted Norris. Prof. Norris, formerly the Associate Director, took over as Director where his long-time mentor and internationally renowned researcher, Gérard Mourou, left off. Mourou is best known for inventing chirped pulse amplification (CPA), which enabled extremely high power ultrafast lasers. Prof. Norris worked with Prof. Mourou as a graduate student at the University of Rochester, and after completing a post-doc in France in 1990, was persuaded to join the new ultrafast laser laboratory being established at Michigan.

Norris recalled the early days of CUOS as an experiment in how to do interdisciplinary research at a University. “It was a tremendous success,” said Norris, “with the highly successful spinoffs, Picometrix, Clark MXR, Translume, and Intralase. These companies have created an incipient optics industry right here in Ann Arbor.”

As director, Prof. Norris is ideally suited to bringing together the disparate groups of researchers that are affiliated with CUOS. For many years, he has straddled the fields of electrical engineering, physics, applied physics, chemistry, and medicine in his research. He has been Associate Director of the Applied Physics program since 2002, and is a member of the NSF FOCUS Physics Frontier Center. Norris was a recipient of the Ted Kennedy College of Engineering Team Award for his team’s contributions to pioneering work in quantum dot semiconductor optoelectronics. He is a Fellow of both the Optical Society of America and the American Physical Society, and maintains close ties with faculty of several different research fields, including the Medical School.

Lasers lasers lasers

Driving the early days of CUOS in the 1990’s was the development of ultrafast titanium-sapphire amplifiers, a new class of ultrafast laser combining high peak power with short pulses. Prof. Norris invented the ultrafast high-repetition-rate Ti:sapphire amplifier in the early 90s, and is amazed that the same basic technology is still state-of-the-art today. These lasers are found in over a thousand laboratories throughout the world in universities, national laboratories, and industry. “We’re waiting for Almantas to make all of that obsolete,” smiles Norris. “He will get there with his fiber lasers.”

While most high-power ultrafast lasers rely on “open-cavity” design, Prof. Almantas Galvanauskas has been defying conventional wisdom by pursuing high-power ultrafast laser pulse generation in optical fibers. After proving the viability of ultrashort-pulse lasers using optical fibers, he received a $7M grant from the Army Research Office through the Joint Technology Office for High Energy Laser development to explore, among other things, high power operation of innovative fibers. He invented a new class of fiber called chirally coupled core

Almantas Galvanauskas
Professor, Ultrafast and High Power Fiberlasers, CUOS

(CCC) fiber. "The idea was so new that people were skeptical it could work," said Galvanauskas. "It worked on the first shot."

Prof. Galvanauskas has also been working to achieve high peak power pulses with fiber lasers, and over the past two years has been able to generate extreme ultraviolet (UV) light with this technique. UV light is considered to be key to next-generation lithography for chip manufacturing, and if experiments with these new lasers continue to prove fruitful, they could have a significant impact on the world's chip industry.

Finally, Prof. Galvanauskas is collaborating with Prof. Norris' group and with Picometrix on a project that uses fiber lasers to generate high power teraherz radiation. Teraherz radiation can be used to scan contents of packages and luggage at airports, and even individuals, at a distance.

Prof. Galvanauskas enjoys pursuing completely new areas. "I want to try what is pioneering, which is very risky, but very rewarding if you succeed," he says. "That's why I'm at a university."

HERCULES

CPA enabled the miniaturization of high power, high intensity lasers, so that a laser fitting on a table-top could achieve peak power of a petawatt (10^{15} W, or a million billion watts!). One such laser, called HERCULES (High-Energy Repetitive CUos LasEr System), was built at CUOS by a team led by research scientist Victor Yanovsky. HERCULES is a table-top size laser that set the world record for high intensity in a laser back in 2003, and has recently broken its own record. No other known laser system can achieve the focused laser intensity of HERCULES!

Excited about the possibilities of this laser technology is Prof. Karl Krushelnick, professor of Nuclear Engineering and Radiological Sciences (NERS), EECS, and Associate Director for High Field Science at CUOS. Krushelnick emphasizes that HERCULES presents remarkable opportunities for deepening our understanding of fundamental science, as well as for expanding practical applications in materials science, biology, and medicine.

HERCULES has a pulse length of approximately 30 femtoseconds, which enables its very high power. Focusing the resulting laser beam yields extraordinarily high intensities - seen nowhere else in the universe except perhaps during a supernova. "It's a very unique condition," explains Prof. Krushelnick, "so there is very interesting and important fundamental science that can be done in such experiments."

When focused on a material, such a high power laser will create a plasma with unique properties. Plasmas are ionized gases - meaning that they are so hot that the electrons actually separate from the rest of the atom. At present, scientists study the properties of fundamental particles by accelerating them in large accelerators, or they can use

Laser technology invented at CUOS is omnipresent in the marketplace today. CUOS remains at the frontier of laser development and application.

CUOS Spin-offs

IntraLase
Femtosecond surgery enables precision surgery with very little damage to surrounding tissue. Developed for eye surgery, with recent applications in micromachining.

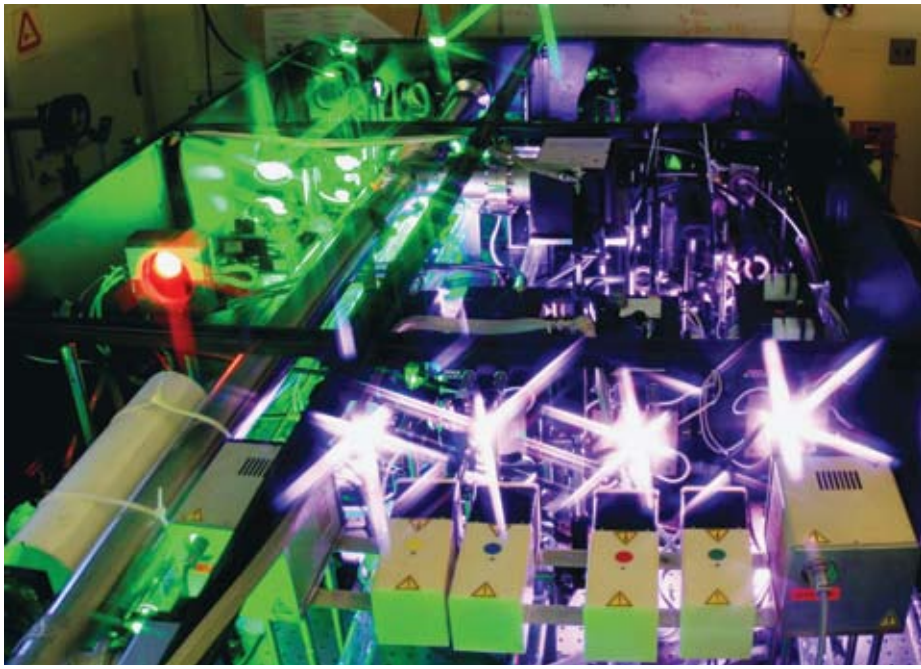
Picometrix
Teraherz ray imaging for non-destructive evaluation. This technology was responsible for probing the defects in the foam that covered the space shuttle rocket engines.

Translume
Micromachining, optical communications, microfluidics

Clark-MXR
Scientific instruments and micromachining

Opteos, Inc.
Electro-optic and magneto-optic sensing technologies

Arbor Photonics, LLC
Optical fiber technology



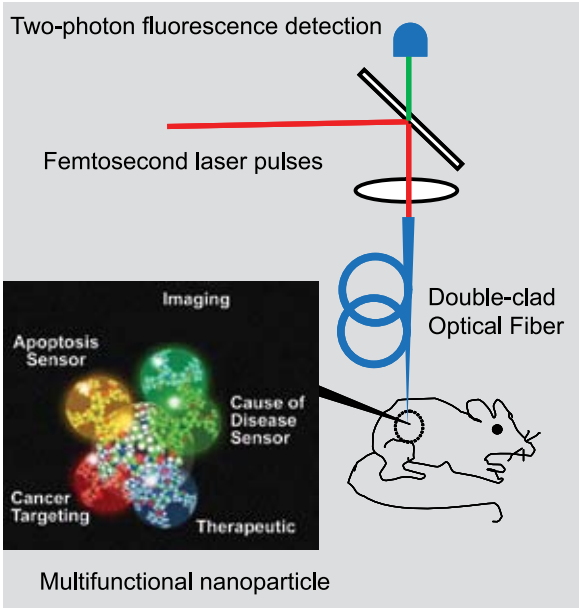
HERCULES Laser
Photo by Anatoly Maksimchuk

Karl Krushelnick Professor and Associate Director for High Field Science, CUOS

the radiation produced from the electron beams in synchrotron facilities, which are about the size of a football stadium and cost up to $1B. Prof. Krushelnick's goal is to conduct the same type of research in a university setting. With HERCULES, he is already reporting good quality electron beams which can be accelerated using relativistic plasmas to energies approaching a GeV, which is comparable to the beams generated by a synchrotron - with an acceleration distance of only a few millimeters!

Cancer Research with Lasers and Optics

Krushelnick believes HERCULES' capabilities can be used to treat cancer. By using the laser to generate high-energy protons, and directing a proton beam into the middle of a tumor, it may be possible to destroy the cancerous cells with little collateral damage to the surrounding tissue. A handful of facilities using conventional accelerators are currently available for this type of treatment, but they are large and extremely expensive. By reducing the size of the laser to that of a tabletop, or the size of HERCULES, this treatment will be more readily available to all who need it.



Schematic diagram of setup for two-photon optical fiber fluorescence (TPOFF) probe for *in vivo* and real-time biosensing.

At the same time, Prof. Norris has been working on a unique method of cancer treatment with researchers affiliated with the Michigan Nanotechnology Institute for Medicine and Biological Sciences (M-NIMBS). In this research, special molecules are attached to nanoparticles in order to guide them to a tumor in the body. Chemotherapeutic molecules that will then kill the cancer cells are attached to the nanoparticles. One of the challenges of this technology has been to measure how well the nanoparticles target the actual tumor. To accomplish this, a fluorescent molecule may be attached to the nanoparticles, and an ultrafast laser used to measure the fluorescence.

Norris' group at CUOS developed a novel optical fiber, called a dual-clad fiber, which can be inserted deep into tissue to measure very accurately the concentration of nanoparticles in real time. "We're able to do *in vivo* measurements of flourescence in live mice, and follow the dynamics of these nanoparticles in real time as they circulate. This has been key to proving that the nanoparticles indeed home in to tumors, and has been one of our big successes," said Norris. This technology has been patented and licensed, and may prove to have major applications in endoscopy as well; high-resolution microscopy can be performed in an endoscope using this fiber technology.

In another project having important applications to cancer research, Norris' group has developed an ultrafast laser fluorescence system called two-photon excitation to observe circulating cells in real time in the body. When a tumor metastasizes, the primary tumor sheds cells that travel to other parts of the body. Among those that are shed, the cells responsible for metastasis are suspected to be stem cells, and the concentration of these stem cells in the blood can be correlated to a patient's prognosis. Real-time monitoring of cancer cells in the blood stream will be critical to advancing studies of metastasis as well as targeted therapies.

Student connection

This type of research requires a close cooperation between the fields of engineering and medicine, which is easily facilitated at U-M through the close proximity of the College of Engineering and the Medical School. One of the students working on flow cytometry was Eric Tkacyk, who, as part of the Medical Scientist Training Program (MSTP), is combining a PhD in electrical engineering with an MD in medicine. Through this program, Eric said he hopes to "bring a unique clinical perspective to the development of advanced diagnostics and treatments for the betterment of human health."

Tkacyk described Prof. Norris as "a truly outstanding advisor," and added, "Ted gives the academic freedom to deepen all aspects of the graduate education. He also has a unique talent to convey a deep understanding of the physics driving our novel technologies. Ted really cares about his students, that's a priority for him."

CUOS and Ultrafast Optoelectronics

In the field of ultrafast optoelectronics, major breakthroughs have come from Prof. Norris' collaboration with Prof. Pallab Bhattacharya and others over the past decade. One of their major accomplishments was to develop a comprehensive picture of the dynamics of electrons in quantum dot structures, leading to the development of high-speed quantum dot lasers and quantum dot infrared photodetectors.

Most recently, Prof. Norris and his students have been collaborating with Prof. Federico Capasso at Harvard University, He and Capasso have had significant success this past year using ultrafast lasers to understand the unique way electrons move through Quantum Cascade Laser (QCL) devices. These experiments, the first mid-infrared ultrafast measurements of operating cascade lasers, have illuminated the key electronic transport processes responsible for QCL operation.

CUOS and Micromachining

Building on the discovery of ultraprecise femtosecond laser micromachining by Prof. Mourou in the 1990's, there is a large and vital activity at CUOS pursuing real-world applications for femtosecond lasers in the area of materials processing and micromachining. Prof. Tresa Pollack, Department of Materials Science and Engineering (MSE), is using short pulse lasers both at Michigan and at national laboratories to attempt to detect the microscopic origins of cracks in materials that can lead to failures, without damaging the material in the process. This could have tremendous ramifications for the nondestructive testing of airplane turbine blades.

Prof. Steven Yalisove, also in MSE, is collaborating with Pollack, Galvanauskas, and research scientist John Nees on a project known as Non-destructive Laser Induced Breakdown Spectroscopy, which uses lasers to break down extremely small amounts of material (nanograms) which can then be studied optically.

In yet another of many related projects, femtosecond pulse lasers are used by Biomedical Engineering professor Alan Hunt and his group at CUOS to address a variety of biological questions and to develop tools to further biomedical research. A significant recent breakthrough has been in the area of nanoscale machined holes, capable of being produced without debris. His group has been able to break the diffraction limit, and machine to tenths of nanometers in scale. This work is leading to the development of sub-cellular surgery! Recently his group has also been concentrating on using ultrafast micromachining to fabricate three-dimensional micro-fluidic devices, with planned applications in medical diagnostics and environmental testing.

The Future of CUOS is Bright

Prof. Norris is excited at the tremendous opportunities on the horizon for research at CUOS. Two of the most important frontiers in ultrafast laser development are in the areas of high laser intensity, and high laser average power with femtosecond pulses. CUOS is the leading U.S. laboratory in both of these areas.

HERCULES owns the world record for focused intensity, and is being upgraded by Dr. Yanofsky's team to the petawatt power level. Prof. Krushelnick is utilizing the unique properties of HERCULES to perform plasma physics experiments at unprecedented laser intensity, and to develop powerful new laser accelerators. A new assistant professor in NERS, Alec Thomas, is joining CUOS this Fall semester to further build the laser-plasma and accelerator programs. New experiments are coming on line to demonstrate ultrafast coherent x-ray generation. This has been a long-standing goal of the field, and will enable such new fields as dynamical structure studies of biologically important proteins.

Eric Tkaczyk's (above) research led to a Best Paper award at the 2006 Biomedical Optics Symposium (BiOS) of the Photonics West Conference for the paper, "Increasing two-photon fluorescence signals by coherent control," by E. R. Tkaczyk, A. Mignot, J. Y. Ye, I. Majoros, J. R. Baker, and T. B. Norris.

Prof. Galvanauskas and his group are inventing new optical fibers which will enable unprecedented high average power from compact ultrafast fiber lasers. "The field of very high average power lasers is not just an engineering frontier," states Prof. Norris. "It's the real key toward bringing to fruition many of the real-world applications that we foresee for ultrafast pulses."

"At CUOS, there is engineering to do science, and engineering for the marketplace," explained Norris. "Much ultrafast research advances science, particularly in optoelectronics, chemistry, and biomedical science."

CUOS research has led to a number of successful spin-offs and commercialized technology. Prof. Galvanauskas recently founded Arbor Photonics to commercialize new fiber technology. Also, the development of ultrafast-laser-based biomedical instrumentation is resulting in numerous patents and licensing arrangements; for example the dual-clad fiber probe has attracted the attention of companies doing endoscopic microscopy.

Michigan provides the ideal environment for Prof. Norris and his colleagues in CUOS to continue to pursue new directions in science. "The best thing about Michigan," states Norris, "is that whatever you want to do, you can do here. You can explore crazy new ideas, and be relatively fearless about going into new fields. If you need to find someone outside your area of expertise - and we always do - you can find someone here to work with."

"The best thing about Michigan is that whatever you want to do, you can do here."

A Different Way to Think About Artificial Intelligence

Satinder Singh Baveja Professor and Director, Artificial Intelligence Laboratory

Deep Blue learned how to outmaneuver a chess grandmaster, Polaris won the second man-machine showdown against one of the best heads-up limit poker players in the world, and several vehicles without a driver behind the wheel drove many miles across the desert in DARPA's recent grand challenge. But even these very impressive manifestations of artificial intelligence (AI) fall short of the goal of Professor Satinder Singh, which is to create an artificially intelligent agent that is both flexible and adaptable and thus competent across a wide range of tasks, instead of being competent in one task only.

"Narrow competence is unlikely to lead to a solution for AI. Any one narrow thing, no matter how well done, is not going to lead to the answer. It's instead going to be simply an engineering solution," says Satinder Singh, professor of Computer Science and Engineering and director of the Artificial Intelligence Laboratory. An alternative solution being explored by Singh uses an innovative approach to the challenge of designing an autonomous agent that is broadly competent in a number of complex, dynamic, and uncertain environments.

Machine Learning to Predictive State Representations

Singh's research resides in the broader field of machine learning, or how machines can "learn" and "think" for themselves. Within machine learning, his primary contributions have been in the field of reinforcement learning (RL), which is a method for building robots and software agents that can learn how to act in the world. These agents learn as they attempt to maximize reward in the world.

But how do they learn to do that? Singh's approach has been to rethink the foundational components of RL: State, Action, and Reward. To contextualize these elements, Singh gives the example of an elevator. The elevator's state includes its floor, how many passengers it's carrying, or how many passengers are waiting on each floor, and what time of day it is. The elevator may act by selecting a destination, determining how long to pause at each floor, and prioritizing passenger needs. Its reward function is motivated by the attempt to minimize passenger wait times.

To act intelligently agents need to be able to predict outcomes of specific actions so that they can find ways to maximize their reward within a varying, uncertain environment. While at AT&T Research Labs, Singh and his colleagues Michael Littman and Richard Sutton developed a field of inquiry named Predictive State Representations (PSRs) to address this problem. What's most important about PSRs is its emphasis on representing the world in terms of predictions of what would be observed if the agent behaves in certain ways, rather than in terms of unobservable quantities like objects and their relationships.

A Robot on PSR

David Wingate (PhD CSE '07), Singh's former student who is currently a post-doc at the Department of Brain and Cognitive Sciences at MIT, employed PSRs to program a robot to navigate a maze while representing its current state, or location, with predictions about the future. A more typical method of

navigation would have been through GPS readings, or other map-based methods. Training the robot to make predictions based on past sensory observations mimics a more "human" way of comprehending one's environment.

With PSRs, an agent need no longer rely on more traditional "linguistic" interpretations of state – instead the agent starts with a few known (pre-programmed) facts and skills, and works from there to make predictions, constantly learning as its expectations are validated or "surprised," until the agent has a working knowledge of its environment, and how to operate within it.

This sort of agent, Wingate says, "may not be able to predict in a pixel perfect way what he's going to see every time. But he should be able to predict a few broad things, such as a door, a classroom a hallway, or even pink elephants."

Through PSRs, Singh anticipates being able to design agents flexible enough to handle abstraction in their environments, at a level similar to higher-level animals. He has already discovered that PSR appears to be just as competent in handling AI challenges as the more established methods, Markov Decision Processes (MDP) and Partially-Observable MDPs (POMDPs), and surpasses them in some areas.

Additional answers may lie in synthesizing old and new approaches, though building an agent to think in the incredibly complex way a human does, with a human's ability to prioritize tasks and reason flexibly, will still take a long time to develop. "That's such a beautiful challenge for AI," said Singh, who believes his work with PSR will contribute to the entire area of AI.

The Path Ahead

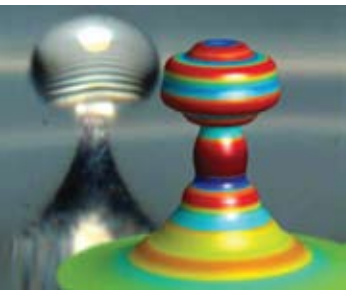
Prof. Singh hopes to demonstrate the success of his theories on multiple robots within five years. He is already starting to examine the differences between his and traditional methods with a project for Toyota, in which he is using PSR to predict road traffic patterns; the data he obtains from his experiments will be compared to results the POMDP method would predict.

At the same time, his ongoing work in game theory, and inverse game theory, relates to the notion of actions and rewards seen in RL. "Game theory," explains Singh, "is another rich mathematical formalism or theory that tells us how to think about multiple agents." Singh collaborates with Prof. Michael Wellman in creating algorithms for solving large, multi-agent game theory problems, such as

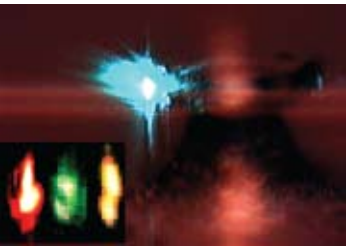
four-player chess. Inverse game theory, or mechanism design, presumes the outcome, and asks the designer to create a game that will lead to the desired result. He is collaborating with Prof. David C. Parkes at Harvard on this issue.

Reinforcement learning was a nascent field when Singh first began studying it during his graduate school days. There are now thousands of researchers who have joined him in the field. Still, Prof. Singh is determined to keep his research germane to all of AI and its larger questions as he attempts to answer his motivating question: "How do we build machines and software that are as interesting and intelligent as higher animals, even humans?"

"That's such a beautiful challenge for AI"



Micrograph of an on-chip optomechanical resonator with one of its calculated mechanical eigenmodes in the foreground. The mechanical mode and the optical mode are coupled via the centrifugal radiation pressure applied by the light circulating inside this photonic device.



Visible emission from an on-chip microdevice by third harmonic generation.

RESEARCH BRIEFS

Prof. Tal Carmon's Research Ushers in Deeper Understanding of Photonic MEMS

Prof. Tal Carmon, a recent addition to the faculty, is already making a name for himself in the area of photonics with recent articles on effects such as visible-micro-emitters, opto-mechanics and most recently a geometrical effect that involves the crossing between different optical modes.

Prof. Carmon came to Michigan from CalTech, where he focused his post-doctoral research on what happens when the intensity of light is enhanced in an on-chip device by multiple recirculations.

Describing his investigation, he stated: "A laser of continuous power would enter a photonic resonator, but exit with oscillations. What caused this oscillation?" Prof. Carmon hypothesized that the centrifugal radiation pressure of the light which is circulating in this device excites mechanical vibration that induces the oscillations in the optical power. Such devices that combine optics and mechanics are called photonic-MEMS (Micro Electro Mechanical System). Quite simply, centrifugal radiation pressure is actually identical to the force that we feel when our car takes a sharp curve since both, moving cars and light, are carrying linear momentum.

He next discovered that the intensity of the telecom-compatible light in the on-chip device was high enough to convert infrared light to visible light by exciting the third harmonic of the light that comes from the input fiber. Such a visible emission from the micron-scaled device was observed with pump powers of less than 300 microWatts, which is lower than the power of a conventional laser pointer.

On-chip resonators are very robust and operate at room temperature and pressure. "Sometimes," said Carmon, "we pick up devices that have fallen face-down on the floor, and simply put them back in the system. And they work! But it's not recommended."

One crucial component for the research is an on-chip device developed by Prof. Vahala's group at Caltech. Its smooth surface, which has been smoothed to a nano-meter scale, is crucial for reducing light scattering out of the device thus enhancing the intensity to regimes that allow phenomena such as the visible emission and the mechanical vibration.

Prof. Carmon is enthusiastic about the potential of photonic-MEMS. In the future, higher rates of vibration will be needed for oscillators in communication systems. Additionally, shorter ultra-violet light will be needed for lithography as well as for imaging and detection applications. In the race for higher vibration rates and shorter emission wavelength, being different by having a low-loss on-chip optical platform that exploits the ever improving lithography techniques is an important advantage, says Prof. Carmon.

Breakthrough in Quantum Computing

Prof. Duncan Steel, Robert J. Hiller Professor of Engineering, described a breakthrough on the road to achieving quantum computing in *Science* magazine (August 17, 2007, v. 317, pp. 929-932). He and collaborators at the Naval Research Lab and at U-C, San Diego, are using pulses of light to dramatically accelerate quantum computers. The use of optically driven quantum bits, or Q-bits, will enable fast low-power quantum computers.

"We're particularly excited about our findings because they show that we can achieve these results by using quantum dots and readily available, relatively inexpensive optical telecommunications technology to drive quantum computers," Steel said. "Quantum dots replace transistors in these computers, and our results show it only takes a few billionths of 1 billionth of a watt to drive it."

The use of quantum dot systems is expected to pave the way for numerous quantum level applications, such as quantum dot dressed state lasers, optical modulators and quantum logic devices.

New Software, FogClear, Improves Chip Development

Prof. Valeria Bertacco, Prof. Igor Markov and recent Ph.D. graduate Kai-Hui Chang have devised software, called FogClear, that employs puzzle-solving search algorithms to troubleshoot prototype microchips. Unveiled at the *2007 International Conference on Computer-Aided Design*, and described in *EE Times*, FogClear "aims to make obsolete the "first silicon" moniker by repairing errors in prototypes in hours rather than days."[1]

"With thousands of people tasked with debugging new chip prototypes, Intel and several other companies have already expressed interest in the work," stated Prof. Markov. "The challenges are becoming harder every year, and companies are looking forward to our next crop of Ph.D. graduates who are specialists in this field."

[1] EE Times, 11/9/07, posted at: http://www.eetimes.com showArticle.jhtml?articleID=202804270

Next Generation Anti-Virus System

Prof. Farnam Jahanian, PhD candidate Jon Oberheide and postdoctoral fellow Evan Cooke developed a new approach to antivirus software, called CloudAV, that moves antivirus software off individual computers while greatly improving its effectiveness against malicious software.

CloudAV refers to "cloud computing," meaning the applications and services that are provided seamlessly on the Internet. It moves antivirus functionality into the "network cloud" and off personal computers. The result is that each time a computer or device receives a new document or program, rather than relying on one antivirus package, that item is automatically detected and sent to the antivirus cloud for analysis. The CloudAV system uses not one, but twelve different detectors that work together to tell the inquiring computer whether the item is safe to open.

There are promising opportunities in applying CloudAV to cell phones and other mobile devices that aren't robust enough to carry powerful antivirus software.

Microchip sets low-power record with extreme sleep mode

A low-power microchip called the Phoenix Processor, developed by Profs. David Blaauw and Dennis Sylvester, along with doctoral students Scott Hanson and Mingoo Seok, uses 30,000 times less power in sleep mode and 10 times less in active mode than comparable chips now on the market.

The Phoenix Processor, which sets a low-power record, is intended for use in cutting-edge sensor-based devices such as medical implants, environment monitors or surveillance equipment.

The chip consumes just 30 picowatts of power during sleep mode. A picowatt is one-trillionth of a watt. Theoretically, the energy stored in a watch battery would be enough to run the Phoenix for 263 years.

"Low power consumption allows us to reduce battery size and thereby overall system size. Our system, including the battery, is projected to be 1,000 times smaller than the smallest known sensing system today," Blaauw said. "It could allow for a host of new sensor applications."

Security Flaws in Online Banking Sites Found to be Widespread

Prof. Atul Prakash and doctoral students Laura Falk and Kevin Borders examined the Web sites of 214 financial institutions, and found that more than 75 percent of them had at least one design flaw that could make customers vulnerable to cyber thieves who are after their money or even their identity.

"To our surprise, design flaws that could compromise security were widespread and included some of the largest banks in the country," Prakash said. "Our focus was on users who try to be careful, but unfortunately some bank sites make it hard for customers to make the right security decisions when doing online banking."

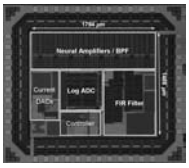
The study was cited by Slashdot, Barron's, Businessweek, NPR, BBC digital planet and many news agencies. The study already has had impact. Several financial institutions have made changes to their web sites to address some of the major security concerns highlighted in the study.

Open-source Software Developed that Finds Symmetries Dramatically Faster

Profs. Igor Markov, Karem Sakallah, and graduate student Paul Darga developed open-source software that cuts the time to find symmetries in complicated equations from days to seconds in some cases. The algorithm is an update to software called "saucy" that the researchers developed in 2004.

Finding symmetries is a way to highlight shortcuts to answers that, for example, verify the safety of train schedules, identify bugs in software and hardware designs, or speed up common search tasks. "If you ask a computer to put 20 trains on 19 tracks, this computation may take forever," Markov said. "But if you use an approach with symmetry breaking, these cases can be solved in seconds." In searching for symmetries in the road networks between cities and towns in Illinois, the new algorithm captured the 10 to the power of 4,843 symmetries in less than a half-second, whereas the most robust previous algorithm took 16 minutes.

A Chip to Better Control Brain Stimulators for Parkinson's



IEEE Spectrum (June 2008) reported the research of Profs. Michael Flynn and Daryl Kipke into deep-brain stimulation to control the tremors associated with Parkinson's disease. Current technology in the marketplace stimulates the brain in a hit-or-miss fashion, relying on visual clues to see if the stimulation helped the patient.

The new technology being developed includes a programmable device that will allow for simultaneous stimulation and recording of the brain. Flynn and Kipke are also working to make the devices smaller and more energy efficient.

Jerrold Vitek, a neurologist at the Cleveland Clinic, in Ohio, was quoted in the article as saying, "It's what a lot of people have talked about for a really long time, but nobody's done it."

Users of Yahoo! Answers Seek Advice, Opinion, Expertise

Profs. Lada Adamic and Mark Ackerman initiated one of the first large-scale analyses of how people share knowledge on Yahoo! Answers, and found that participants use the site to exchange advice and opinions, in addition to technical expertise. Their research team found that, "rather than search through a book, millions of individuals are flocking to online question/answer forums to seek answers directly from others. Part of the reason is the social aspect of online question/answer forums."

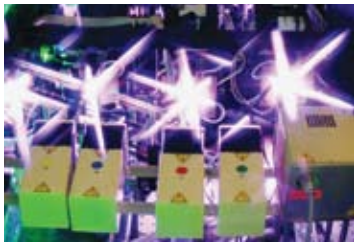
Sensors for bat-inspired spy plane under development

Prof. Kamal Sarabandi will direct research on the microelectronics component of a six-inch robotic spy plane modeled after a bat that is expected to gather data from sights, sounds and smells in urban combat zones and transmit information in real time.

A $10M grant from the Army will establish the U-M Center for Objective Microelectronics and Biomimetic Advanced Technology (COM-BAT), which includes two other institutions, UC-Berkeley and U of New Mexico.

"Throughout this research, we expect to make technological breakthroughs and have a much wider range of applications for other types of engineering problems, from medical to industrial," Sarabandi said. For example, they expect to develop quantum dot solar cells that double the efficiency of current cells. They expect their autonomous navigation system to be 1,000 times smaller and more energy efficient than systems being used now, and they believe they can deliver a communication system that's 10 times smaller, lighter and more energy efficient than today's technologies.

CUOS laser beam believed to set record for intensity



HERCULES, a titanium-sapphire laser that takes up several rooms at the Center for Ultrafast Optical Science (CUOS), reached a new record-setting beam intensity measuring 20 billion trillion watts per square centimeter.

Research scientist Victor Yanovsky, who built HERCULES, stated that its intensity is about an order of magnitude higher than any other laser in the world can produce.

If you could hold a giant magnifying glass in space and focus all the sunlight shining toward Earth onto one grain of sand, that concentrated ray would approach the intensity achieved by HERCULES. Such intense beams could help scientists develop better proton and electron beams for radiation treatment of cancer, and explore new frontiers in space.

For additional information about most of these research briefs, please find the full articles at related links online at www.eecs.umich.edu; click on News.

High-tech device uses rays to unveil hidden artwork

Scientists at the Center for Ultrafast Optical Science (CUOS), the Louvre Museum, and Picometrix, LLC (a CUOS spinoff), used terahertz imaging to detect colored paints and a graphite drawing of a butterfly through 4 mm of plaster. They believe their technique is capable of seeing even deeper.

Just as X-rays let doctors see the bones beneath our skin, "T-rays" could allow art historians to see murals hidden beneath coats of plaster or paint in centuries-old buildings. T-rays, pulses of terahertz radiation, also could illuminate penciled sketches under paintings on canvas without harming the artwork. Current methods of imaging underdrawings can't detect certain art materials such as graphite or sanguine, a red chalk that some of the masters are believed to have used.

Pinpoint microwave resolution could lead to wireless power transfer

Profs. Tony Grbic and Roberto Merlin have focused microwaves to specks 20 times smaller than their wavelength and five times smaller than other devices have achieved.

This development could allow advances such as laptop computers that recharge without plugging in, higher-resolution microscopes for observing molecules, and CDs that can store vastly more data.

"This is the highest resolution to date achieved at microwave frequencies," Grbic said. "It opens up a whole range of applications, including wireless power transfer, microscopy and beam-shaping devices to focus the electromagnetic radiation. If we can push this to light frequencies, and there are no reasons why this couldn't be done, it will have applications in lithography and data storage."

For the first time in its history, the EECS Department will be led by two Chairs, one for each division.

Farnam Jahanian Named Chair of Computer Science and Engineering

Farnam Jahanian received his B.S. degree in mathematics from University of Texas at San Antonio, and his M.S. and Ph.D. degrees in computer science from the University of Texas at Austin. He joined the faculty at U-M in 1993, after four years as a member of the research team at the IBM T.J. Watson Research Center.

Professor Jahanian brings to the position extensive administrative and organizational experience, a strong entrepreneurial approach to research, an innovative spirit and in-depth knowledge of present computing practices. His groundbreaking work on Internet infrastructure and security became the basis for the highly successful international company, Arbor Networks, Inc., which he co-founded in 2001, has served as President, and for which he currently serves as Chairman. Professor Jahanian's research has revolutionized how cyber threats are addressed by today's Internet Service Providers and has been transformational by significantly closing costly delay between onset of security attacks and their resolution.

Prof. Jahanian's research team during the 1990s demonstrated fundamental limitations in the core routing architecture of the Internet by uncovering the fragility of the underlying routing infrastructure. The group's seminal work on Internet routing stability and convergence has been highly influential within both the network research community and the Internet operational community and was recently recognized with the ACM SIGCOMM Test of Time Award.

Prof. Jahanian is an enthusiastic supporter of students and their academic and non-academic activities. He has received several teaching excellence awards, including the Eta Kappa Nu (HKN) Professor of the Year Award, the Amoco Teaching Award, and the U-M College of Engineering Teaching Excellence Award. He is enthusiastic about encouraging students in their entrepreneurial endeavors.

The author of over 80 published research papers, Prof. Jahanian has served on dozens of advisory boards and government panels in recent years, including Internet2's External Relations Advisory Council, the National Advisory Board for U-M Office of Technology Transfer, and the ITZone Advisory Board. He is the recipient of an NSF CAREER Award, an IBM Outstanding Technical Innovation Award, and the 2005 Governor's University Award for Commercialization Excellence.

Khalil Najafi Named Chair of Electrical and Computer Engineering

Khalil Najafi, Schlumberger Professor of Engineering and Arthur F. Thurnau Professor, received his B.S., M.S., and Ph.D. degrees in electrical engineering from The University of Michigan, and served as a research fellow and assistant research scientist before being hired as an assistant professor in 1990. He is currently Director of the NSF National Nanotechnology Infrastructure Network (NNIN), and Deputy Director of the NSF Center for Wireless Integrated Microsystems (WIMS).

In addition to his considerable administrative experience, Prof. Najafi is an internationally recognized leader and expert in the field of integrated sensors, MEMS (microelectromechanical systems), and microsystems. Efforts in these fields are improving health care, helping us monitor the environment, ensuring homeland security, and influencing instrumentation for the emerging revolution in systems biology. He demonstrated the first integrated ring gyroscope in 1994, and remains a world leader in inertial instruments. His more recent research advances include the development of high-performance wireless interfaces for implantable devices, and techniques for sensor packaging.

Bringing technology to the marketplace has been an ongoing effort of Najafi, and he has been highly successful. In addition to earning 19 patents, he co-founded Integrated Sensing Systems, Inc., (ISSYS) in 1995, a company specializing in MEMS for medical and scientific sensing applications, and most recently co-founded ePack, Inc., a company specializing in MEMS packaging.

His dedication to teaching has been recognized by several honors, most notably by his recognition as Arthur F. Thurnau Professor, a title given for his outstanding contributions to undergraduate teaching. He introduced the undergraduate course "Introduction to MEMS," which serves students at Michigan as well as seven other national and international institutions via the web. He has graduated 31 Ph.D. students, and served on another 65 committees.

Prof. Najafi's professional service to the most prestigious conferences and journals in MEMS and microelectronics is extensive, and includes his upcoming role as General Chair of the 2009 *International Solid-State Sensors and Actuators (Transducers '09) Conference*. Prof. Najafi is a Fellow of IEEE and the American Institute for Medical and Biological Engineering.

Two New Interdisciplinary Programs with Strong Ties to EECS Established

Biophysics

On April 1, 2008, Prof. Steel became chair of the new program in Biophysics, a highly interdisciplinary, tenure-granting unit that involves faculty from the departments of EECS, Biomedical Engineering, and Mechanical Engineering. The new program offers an undergraduate component to the widely-recognized Biophysics Research Division.

Research in the program will continue to focus on some of the most exciting problems in biology today including molecular structure of complex biological systems, biological dynamics, brain function and the origin of cellular toxicity in amyloidogenic diseases like Alzheimer's, Huntington's, and Parkinson's.

Informatics

iNFORMATiCS

A new undergraduate program in Informatics, approved this past spring, will be jointly administered by the College of Literature, Science, & the Arts, the College of Engineering, and the School of Information.

Key to the new concentration is its bringing together of both technological and social perspectives to study information. U-M's cross-disciplinary approach gives students a solid grounding in computer science, mathematics, and statistics, combined with study of the ethical and social science dimensions of complex information systems.

New Courses Created to Introduce Students to the World of Electrical Engineering and Computer Science

Students learn to program a socially relevant computer game, design and build a music synthesizer, and learn about the variety of energy options available in the new green world in three new courses designed for first year students.

Gaming for the Greater Good
An Introduction to Computer Science

Dr. Chesney, a dedicated proponent of engineering for social change, created this course for students to understand how programming can meet a socially relevant need or educational purpose. He organizes his students into small teams to design, build and test games with an educational objective. "They're absolutely, 100% enthused about what they're doing, and they have a strong sense of ownership," reports Chesney. Prof. Chesney feels he has been successful when his students begin to learn independently.

EECS WELCOME DAY

EECS students and faculty "Show their Stuff" at this annual event created to introduce students to some of the things we do as Electrical Engineers, Computer Engineers, and Computer Scientists.

L: Anna Cihak, Shannon Spencer: Undergraduate Advisors, ECE grad student Scott Hanson , CSE Professor Jignesh Patel

Microprocessors and Music
An Introduction to Computer Engineering

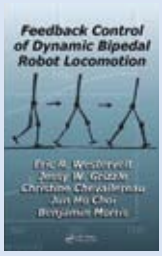
Students in this course design, build, and demonstrate their own microprocessor-based music synthesizer. As students take a substantial engineering project from creation to completion, they experience the excitement and challenge of real-world engineering. The course uses hands-on labs and group work to help students build the core components of their system, including a hardware microprocessor, operating system drivers, and application software.

Disorder and Coherence: From Light Bulbs to Lasers
An Introduction to Electrical Engineering

In this course about energy designed by Prof. Jasprit Singh, students work with a variety of concepts in electrical engineering, including the functions of solar panels, quantum mechanics, microwaves, light emitting diodes and energy storage devices. In the culminating project, small teams of students develop and submit proposals to the United Nations, proposals that underscore the capability for engineering to address humanitarian needs. Prof. Singh also intends the course to train his students to "lose the fear" of complex problems.

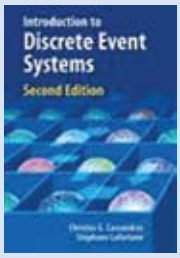
RECENT FACULTY BOOKS

Prof. Yogesh Gianchandani edited the 3-volume set, *Comprehensive Microsystems,* with O. Tabata and H. Zappe.



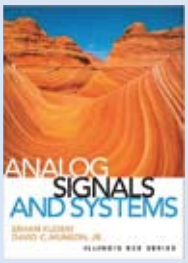
Prof. Grizzle co-authored *Feedback Control of Dynamic Bipedal Robot Locomotion,* with E. Westervelt, C. Chevallereau, J.H. Choi, and B. Morris.

Prof. Al Hero co-authored *Foundations and Applications of Sensor Management* along with D. Castañón, D. Cochran and K. Kastella.



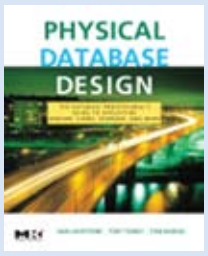
Prof. Stéphane Lafortune's *Introduction to Discrete Event Systems*, co-authored by C. Cassandras, is in its second edition.

Prof. Semyon Meerkov's *Production Systems Engineering,* co-authored by J. Li, is in its second printing.



Prof. Dave Munson co-authored *Analog Signals and Systems* with Erhan Kudeki.

Amir Sodagar, assistant research scientist, published *Analysis of Bipolar and CMOS Amplifiers*.



Toby Teorey, professor emeritus, co-authored *Physical Database Design*, with T. Nadeau and S. Lightstone.

Prof. Michael Wellman co-authored *Autonomous Bidding Agents: Strategies and Lessons from the Trading Agent Competition* with A. Greenwald and P. Stone.

Prof. Susan Graham Delivers the 9th William Gould Dow Distinguished Lecture: "Programming: Past and Future"

Prof. Susan Graham, Pehong Chen Distinguished Professor of EECS at UC-Berkeley, charted the historical ebbing of programming and made the case for its resurgence in the near future.

Prof. Graham was the founding editor-in-chief of the *ACM Transactions on Programming Languages and Systems*. She received the ACM SIGPLAN Career Programming Language Achievement Award and recently co-chaired a National Research Council study on the Future of Supercomputing. She is a fellow of ACM, and member of the National Academy of Engineering.

Yahoo! Seminar Series

GEECS president Amy Hartwig, HKN president Paul Cooper, Yahoo! Campus Relations Manager Donald McGillen

Instituted Fall term 2007 and sponsored by Yahoo!, the Yahoo! Seminar Series features presentations by professors and graduate students in the EECS Department and School of Information at the University of Michigan. These seminars, organized by HKN and Girls in EECS (GEECS), focus on high-level topics in computer science and information technology,

FACULTY HONORS AND AWARDS

EECS and College of Engineering

EECS Outstanding Achievement Award

Valeria Bertacco
Igor Markov
Jasprit Singh

HKN Professor of the Year

Don Winsor, DCO Coordinator, adjunct faculty

College of Engineering Awards

David Blaauw, Research Excellence Award
John Hayes, Service Excellence Award
H.V. Jagadish, Research Excellence Award
Jignesh Patel, Teaching Excellence Award

Z. MORLEY MAO Named Morris Wellman Faculty Development Professor

University of Michigan

PROF. JESSY GRIZZLE
Jerry W. and Carol L. Levin Professor of Engineering
2007 Distinguished Faculty Achievement Award

Prof. Grizzle, innovator in the field of bipedal robotic locomotion and automotive powertrain systems, was named the Jerry W. and Carol L. Levin Professor of Engineering. He also received a 2007 Distinguished Faculty Achievement Award from U-M. Grizzle combines a deep knowledge of nonlinear control theory with an ability to develop practical applications in several areas, in particular, semiconductor manufacturing, powertrain systems and bipedal locomotion. His current work on the robot MABEL seeks to replicate a natural gait on uneven terrain through advanced feedback control and machine design. His research promises to lead to important innovations in prosthetic design. Grizzle was named one of the *Scientific American* Top 50 Technologists of 2006.

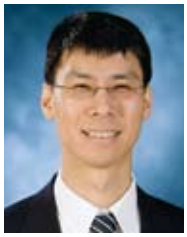
JOHN LAIRD
John L. Tishman Professor of Engineering

Prof. Laird, internationally renowned leader in Artificial Intelligence, was named the John L. Tishman Professor of Engineering. His primary research contributions have been in the development, application, and analysis of a general cognitive architecture called Soar, with the goal of enabling machines to mimic the range of human-level intelligent behavior. He developed his ideas to the point where they could be used for practical applications, and founded the company Soar Technology, Inc. in 1998. His current research expands the Soar architecture to include more human-inspired methods of learning, such as Reinforcement Learning, semantic learning and memory, episodic learning and memory, visual imagery, and emotion-inspired processing.


PROF. JEFFREY FESSLER (L) AND PROF. MARIOS PAPAEFTHYMIOU (R) received the U-M **Faculty Recognition Awar**

National and Professional

PROF. TODD AUSTIN received the **Maurice Wilkes Award** for innovative contributions in computer architecture, including the SimpleScalar Toolkit and the DIVA and Razor architectures.



PETER CHEN was named **IEEE Fellow** for his contributions to fault-tolerant storage systems. He also received the **ACM/Mark Weiser Award** for his outstanding research into operating systems development.


ED DURFEE AND MARTHA POLLACK received **Influential Paper Awards from IFAAMAS** (International Foundation of Autonomous Agents and Multi-Agent Systems) in recognition of the impact their individual work has had on the field of agents and multiagent systems.

MICHAEL FLYNN received a **Guggenheim Fellowship** for his research into the fundamental limits of analog-to-digital conversion.

AL HERO received the **Digiteo Chaire d'Excellence** for research on the topic of "Distributed Active Networks: Sensing and Estimation," applied to both gene regulation networks and ad hoc communications networks.

KARL KRUSHELNICK was named **Fellow of American Physical Society (APS)** for, "pioneering contributions to experimental high-intensity laser plasma physics including the production of high-quality relativistic electron beams, energetic proton beams and the development of techniques to measure very large magnetic fields in intense laser-produced plasmas."

PALLAB BHATTACHARYA

Member, National Academy of Engineering
John Bardeen Award

Pallab Bhattacharya, Charles M. Vest Distinguished University Professor of Electrical Engineering and Computer Science and James R. Mellor Professor of Engineering, has been elected to the National Academy of Engineering (NAE) for his contributions to quantum-dot optoelectronic devices and integrated optoelectronics.

He was also presented with the 2008 John Bardeen Award at the annual meeting of The Minerals, Metals and Materials Society (TMS). He received this award for his pioneering contributions to the epitaxy and characterization of strained semiconductor heterostructures and self-organized quantum dots and their device applications.

Since coming to the University of Michigan in 1984, Prof. Bhattacharya has pioneered technological advances in synthetically modulated semiconductor structures, nanophotonic devices, and other optoelectronic device and integrated circuit developments. One of his first important breakthroughs was the discovery of quantum dot formation, accomplished with his colleague Jasprit Singh. In 1996, with his graduate students and colleague Ted Norris, Bhattacharya demonstrated the first room temperature quantum dot laser. Quantum dot lasers outperform other semiconductor lasers and are finding numerous applications in communications and other areas. Bhattacharya subsequently worked on quantum dot infrared photodetectors capable of operating at high temperatures with his graduate student (and now colleague) Jamie Phillips. These detectors are now being inserted into infrared cameras.

He is currently working on high-speed and high-power quantum dot lasers, quantum dot infrared photodetectors, photonic crystal quantum dot devices, and spin-based heterostructure devices. His group recently demonstrated the first semiconductor based spin valve, spin amplifier, and an electrically injected spin laser.

SCOTT MAHLKE received the **Young Alumni Achievement Award** from the University of Illinois at Urbana-Champaign, "in recognition of his technical contributions to computer architecture and compiler techniques for instruction-level parallel-processing compilers."

IGOR MARKOV received the **Microsoft A. Richard Newton Breakthrough Research Award** for his research in "Faults, Bugs, IP Protection, and Secure Hardware."

PINAKI MAZUMDER was named **Fellow of American Association for the Advancement of Science (AAAS) f**or contributions to the field of VLSI systems.

DRAGOMIR RADEV Coached Team USA to Linguistics Victory in the sixth International Linguistics Olympiad in Bulgaria. He led high-school teams to several awards, including gold medals, in 11 out of 33 individual and team events.

KAMAL SARABANDI received a **Humboldt Research Award** in recognition of his entire achievements to date, which reflect fundamental discoveries, new theories, or insights that have had a significant impact on his discipline.

FAWWAZ T. ULABY has been selected as the Founding Provost and Executive Vice President of King Abdullah University of Science and Technology (KAUST) in Saudi Arabia.

Staff Award

DENISE DUPRIE received the **2008 U-M Distinguished Research Administrator Award** for her superlative service to the research community in a manner exemplifying the highest goals of research administration.

NSF CAREER and Young Investigator Awards

LADA ADAMIC
NSF CAREER Award
"Social Dynamics of Information in Virtual Spaces"

VALERIA BERTACCO
NSF CAREER Award
"Correctness Constrained Execution for Processor Designs"

TONY GRBIC
NSF CAREER Award
"Advances in Metamaterial Structures and Devices"

Air Force Office of Scientific Research Young Investigator Award

SETH PETTIE
NSF CAREER Award
"Advanced Data Structures for Shortest Paths, Routing, and Self-Adjusting Computation"

MARTIN STRAUSS
NSF CAREER Award
"Next-Generation Algorithmics for Sparse Recovery"

New Faculty

We welcome these fifteen outstanding individuals who have joined EECS since Fall 2007

TAL CARMON

Assistant Professor
ECE Division

PhD, Physics,
Israel Inst. of Tech., 2003

Research Interests: opto-mechanical effects, photonic-MEMS, harmonics and microcavity dynamics

Prof. Carmon joins us from the Center for the Physics of Information at CalTech, where he was a postdoctoral scholar. His research involves on-chip visible emitters and photonic-MEMS driven by radiation pressure, as well as opto-mechanics. He recently discovered a geometrical effect that involves the crossing between different optical modes (see also pg. 10).

ROBERT P. DICK

Associate Professor
ECE Division

PhD, EE, Princeton, 2002

Research Interests: embedded systems, computer-aided design, data compression, VLSI, operating systems, power and thermal analysis and optimization, wireless sensor networks, hardware/software specification languages, and computer architecture

Prof. Dick will join the faculty January 2009 from Northwestern University where he received an NSF CAREER award and the Best Teacher of the Year award in 2004. His research focuses on improving embedded systems and easing their design. In 2007 his technology won a Computerworld Horizon Award, and his paper was selected by *Design, Automation & Test in Europe* as one of the 30 most influential in the past 10 years. He is an Associate Editor of *IEEE Trans. on VLSI Systems* and serves on the technical program committees of several embedded systems and CAD/VLSI conferences.

ALEX J. HALDERMAN

Assistant Professor
CSE Division

PhD, CS, Princeton,
2008 (exp)

Research Interests: computer security, electronic voting, digital rights management, information privacy, digital forensics, and tech law/policy

Alex Halderman will join the faculty January 2009 from Princeton University. His publication record already includes two best paper awards. Halderman was involved in the creation of a center at Princeton that focuses on information technology policy. He is frequently consulted for his expertise in electronic voting and for his insight into digital rights management (DRM).

IAN A. HISKENS

Professor
ECE Division

PhD, EE, U. of Newcastle, 1991

Research Interests: power system analysis, including integration of alternative energy sources, such as wind generation, active grid control concepts, and methods for assessing the impact of uncertainty

Prof. Hiskens joins the department from the University of Wisconsin-Madison. He looks forward to helping establish a program in electrical power and energy systems within the department and college. He has extensive practical experience in the power utility industry, and has made fundamental contributions to the study of power system dynamics. He believes U-M is well positioned to work with both the auto and energy industries in the production of electric vehicles and in future power system control strategies. Prof. Hiskens is a Fellow of the IEEE.

MONA JARRAHI

Assistant Professor
ECE Division

PhD, EE, Stanford, 2007

Research Interests: terahertz electronics and applications, millimeter-wave/RF integrated circuits, millimeter-wave/RF MEMS, optoelectronics, and microwave photonics

Prof. Jarrahi comes to Michigan from UC-Berkeley, where she has been investigating MEMS-based terahertz electronics. She utilizes novel technologies such as electro-optical, electromagnetic, plasmonics and MEMS techniques to realize terahertz and millimeter-wave sources, modulators, and other components for a variety of medical, biological, and security applications.

BENJAMIN KUIPERS

Professor
CSE Division

PhD, Mathematics, MIT, 1977

Research Interests: artificial intelligence, robotics

Prof. Kuipers joins the U-M faculty from the University of Texas at Austin. His research accomplishments include developing the TOUR model of spatial knowledge in the cognitive map, the QSIM algorithm for qualitative simulation, the Algernon system for knowledge representation, and the Spatial Semantic Hierarchy model of knowledge for robot exploration and mapping. Kuipers is a fellow of IEEE and AAAI, and served as Chair of the CS Department at UT from 1997-2001.

MARK J. KUSHNER

Professor
ECE Division

PhD, Applied Physics, CalTech, 1979

Research Interests: Plasma science and engineering

Prof. Kushner joins U-M from Iowa State University, where he was Dean of the College of Engineering. He will head the newly-created Michigan Institute for Plasma Science and Engineering (MIPSE). Mark's research in low temperature plasma science and engineering addresses fundamental transport and reaction chemistry of partially ionized gases and their application to technology. He has won numerous national research and teaching awards, and is a Fellow of IEEE, Optical Society of America, Institute of Physics, American Physical Society, and the American Vacuum Society.

KRISTEN R. LEFEVRE

Assistant Professor
CSE Division

PhD, Computer Sciences, U. Wisconsin-Madison, 2007

Research Interests: database privacy and security, database systems, data mining

Prof. LeFevre's research interests include database systems, applications, and mining, with particular emphasis on privacy and security. She has specifically focused on techniques for protecting individual privacy and anonymity when publishing or distributing non-aggregate data. Lefevre teaches courses related to database systems and informatics.

SATISH NARAYANASAMY

Assistant Professor
CSE Division

Ph.D., Computer Science, UC-San Diego, 2007

Research Interests: computer architecture, program analysis, dependable systems, programmer productivity, parallel computing

Prof. Narayanasamy's research is focused on developing self-healing systems and increasing the de-bugging efficiency of parallel- and distributed systems. He has co-authored two important papers arising out of his work on de-bugging codes, each of which were named "Top Pick" papers by IEEE in 2005 and 2006. Most recently, he has worked to develop BugNet, a memory-efficient, system-independent checkpoint replay program.

EDWIN OLSON

Assistant Professor
CSE Division

PhD, CSE, MIT, 2008

Research Interests: autonomous robotics, machine learning, machine perception, human-robot interaction

Prof. Olson's research focuses on finding ways for robots to sense and understand their environment while coping with uncertainty and ambiguity. Practical applications range from indoor robots that can lead tours to autonomous cars that can navigate urban environments. His work includes both fundamental algorithm research and system building. Ed developed a popular hands-on undergraduate robotics laboratory at MIT, and is eager to repeat that success here at Michigan.

SILVIO SAVARESE

Assistant Professor
ECE Division

PhD, EE, CalTech, 2005

Research Interests: computer vision, object and scene recognition, shape representation

and reconstruction, human visual perception and visual psychophysics

Professor Savarese joins us from the University of Illinois-UC, where he was a Beckman Institute Fellow. In 2002 he was a recipient of the CalTech Walker von Brimer Award for outstanding research initiative. He co-chaired and organized the first workshop on 3D Representation for Recognition held in conjunction with the *2007 IEEE International Conference of Computer Vision*. Prof. Savarese looks forward to expanding the department's research interests in computer vision, visual recognition, and image and video understanding.

THOMAS F. WENISCH

Assistant Professor
CSE Division

PhD, ECE, CMU, 2007

Research interests: computer architecture

Professor Wenisch's research in computer architecture focuses on multiprocessor and multicore systems, multicore programmability, enterprise computing, data center architecture, and performance evaluation methodology. He has recently launched a new project, "MPowered Data Centers," which aims to improve the energy efficiency of the physical and computing infrastructure of enterprise data centers.

DAVID D. WENTZLOFF

Assistant Professor
ECE Division

PhD, MIT, 2007

Research interests: RF circuits and systems, ultra-wideband (UWB) communication, highly integrated energy-constrained wireless systems such as implantable devices and sensor networks

Professor Wentzloff's current research focuses on integrated circuit design for adaptable wireless communication systems for both high-performance and energy constrained applications. This includes integrated power conversion, power management techniques, scalable RF, analog, and mixed-signal circuit design, cognitive radios, and networking. He is investigating new fields for applying integrated circuits to expand the pervasiveness of wireless communication.

EUISIK YOON

Associate Professor
ECE Division

PhD, EE, U. Michigan at Ann Arbor, 1990

Research Interests: solid-state integrated sensors, microfluidic biochip, microactuators, analog and digital circuits, RF wireless circuits

Professor Yoon joins the U-M faculty from the University of Minnesota, where he led the Nano & Microsystems Applications Center (NMAC). Before this, he served as Director of the National Research Lab. for 3D Microstructures and the Bio Micro/Nanosystem Research Forum at KAIST (Korea Adv. Inst. of Science and Tech.). He has won two student paper awards at IEEE International Microwave Symposium, and two teaching awards. His current research focuses on cell assay biochip, wireless neural probe and smart CMOS vision sensors, each of which should result in self-contained microsystems.

ZHAOHUI ZHONG

Assistant Professor
ECE Division

PhD, Chemistry, Harvard U., 2005

Research Interests: nanoelectronics and nanophotonics, microwave and terahertz frequency nanoelectronics, solar cell technology, chemical and biological sensing, and nanomaterial synthesis

Professor Zhong comes to Michigan from Cornell's Center for Nanoscale Systems. His research interests lie on the frontiers of both Nanoelectronics and Nanophotonics. His plans include: demonstrating high-frequency nano-devices operating at microwave and terahertz (THz) frequencies; investigating the photovoltaic effect in nanomaterials with applications to solar cell technology; developing highly sensitive chemical and biological sensors based on novel nano-devices; and synthesizing nanomaterials in novel ways. His research has been featured in two articles in *Science.*

Continuum Wins the North American Solar Car Race

After a remarkable 2,400 mile ride from Dallas, TX to Calgary in Canada, Team Continuum won the 2008 North American Solar Challenge for an unprecedented 5th time! In addition, the Michigan team was honored to be presented with the teamwork award.

"The officials presented this award to us because of the incredible sense of team and responsibility that each team member showed throughout the entire event," said Jeff Ferman (CSE '08), race manager. "This award means quite a bit to the team."

EECS students figured prominently in the 2008 racing team. Steven Hechtman (EE '09), project manager and solar car driver, has been a member of the team since 2005. He drove 100 miles in 105 degree temperature to qualify the team, which earned first position in the race. He is already looking forward competing in the 2009 World Solar Challenge in Australia with the next Michigan solar car, Infinium.

Jeffrey Rogers (CSE '08), the micro-electrical team leader, was responsible for all of the non power-related electronics on Continuum, including 55 microprocessors. Jeff will continue with the team as he works toward a Master's degree in computer science. He says that being on the team is "fun and educational to the extreme. The team's commitment to be the best drives all of its team members to do whatever is necessary to improve the vehicle. As a result, almost anything you can think of is achievable. If you have a good idea to make the car better, try it – it is encouraged and expected. The end result is the best solar car in the world, and the knowledge you gained while building it."

Other EECS members of the 20-member race team include Evan Quisenberry (CSE '08), strategist, Gerald Giarmo (EE '10), power electrical, Chris Hammond (CE '10), power electrical, and Josh Feldman (CSE '11), strategist. In all, the solar car team numbers about 100 students.

"Team members learn how to work with students from other engineering disciplines," explains Hechtman, "as well as students from the Ross School of Business, the College of Literature, Science, and the Arts, the School of Art and Design, and the School of Education. Additionally, we learn how to work closely with 300 sponsors who provide over 2 million dollars of support to the team. These skills are invaluable once students graduate from the University and enter industry."

"Almost anything you can think of is achievable"

HKN Produces Student Leaders

Eta Kappa Nu (HKN), the national honor society for electrical and computer engineering students, assists its members become better professionals as well as better citizens. Involvement in HKN helps students think beyond themselves, develop their leadership abilities, and perhaps most importantly, have some fun! This issue, we focus on four current HKN students who were leaders of student societies during the past academic year.

FRANCINE SHAMMAMI, EE MAJOR

President, HKN

Francine Shammami described her decision to join HKN as "the best decision I've ever made in college. HKN strikes a really good balance between professional and social. We have lots of really smart people with a lot of different interests. We've got musicians, we've got artists. We can have intelligent conversations about physics or programming or psychology, or we can go the other end of the spectrum and talk about awesome cartoon characters."

Each HKN member completes 30 service hours per term in projects like Arbor Day or Habitat for Humanity. Shammami enjoys the opportunity to serve at the Ronald McDonald House: "I really like kids and cooking, so it combines two of my favorite things."

HKN also provides excellent professional development opportunities. Shammami's two internships with Texas Instruments evolved out of connections she made with HKN alumni. Shammami accepted a job at Microsoft, where she will be working on circuit innovations for the XBox.

MATTHEW MORLOCK, CSE MAJOR

President, CSE Scholars

Matt Morlock ran for president of CSE Scholars to keep the young society moving forward. "HKN is a long-standing, well-established society," said Morlock, "so being a leader within that society is entirely different from being a leader within CSE Scholars, where if I want to do something, I have to create it around me."

Under his tenure, members of CSE Scholars organized last Fall's EECS Welcome Day, reached out to newly accepted students, and managed the EECS Learning Center.

Matt has been incredibly efficient with his time at U-M. On track to graduate a year early with a degree in Computer Science, he stayed for his fourth year to complete a concurrent degree in Financial and Risk Mathematics. Following graduation, Morlock looks to apply his enthusiasm for both software development and financial engineering to the private sector, noting that "the trading industry is on the forefront of technology."

Francine Shammami

Matthew Morlock

ASHLEY ISSA, CSE MAJOR

President, Society of Women Engineers

"I love doing SWE, and if SWE could be my job, that's all I would do," stated Ashley Issa. Issa was also a member of Epeians, CSE Scholars and HKN. She's excited about the prospect of continuing her association with SWE after graduation, noting that "You have this support network specifically for women. It's a small community you have automatically."

SWE meetings are quite varied. Past presenters have included yoga instructors and speakers addressing a range of issues from work/life balance to the new International Engineering minor and opportunities abroad with the Engineering Global Leadership Honors Program.

SWE's outreach program sponsors events like the Mr. Engineering fundraising competition (to benefit a local women's shelter), visits to schools and Girl Scout meetings, and Shadow Day. Issa explains Shadow Day, "High school girls can come and spend the night with one of our members and go to their U-M classes the next day."

Issa anticipates eventually going to graduate school in finance or a related field, but is currently looking into the Peace Corps, where she hopes to continue her work in HIV education in South Africa.

ADAM BARNETT, EE MAJOR

President, Tau Beta Pi

"It's probably what I think about almost every morning, first thing when I wake up," Adam Barnett remarked of his commitment as president of Tau Beta Pi (TBP). TBP's membership in their award-winning U-M chapter stands at over 600, and Barnett tries to make them all feel comfortable.

TBP members complete 15 hours of community service and two additional hours of tutoring. The fall Career Fair that TBP sponsors in conjunction with the Society of Women Engineers is one of its most visible and successful endeavors. Barnett, a natural teacher who was recently honored with an EECS Undergraduate Instructional Aide Award, has a soft spot for Cub Scout Day.

On top of leading TBP, Barnett maintained a rigorous course of study. He recalled stumbling into a project on microneedle research, which he initially took up as a means of improving his candidacy for graduate school. The resulting research, described in the paper, "An In Vivo Blood Microsampling Device for Pharmacokinetic Applications," was presented at the prestigious *IEEE International Conference on Solid-State Sensors and Actuators* in Lyon in June of 2007. He is now interested in medical school.

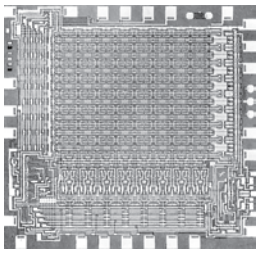
Ashley Issa

Adam Barnett

Lee Boysel Returns to Discuss Entrepreneurship with EECS Students

"I graduated from Michigan with a solid education in vacuum tubes, and a burning desire to be an entrepreneur and start my own company," stated Lee Boysel (BSE EE '62; MSE EE '63), entrepreneur, industry leader, private investor, and recipient of the 2007 Alumni Society Merit Award for Electrical and Computer Engineering. Mr. Boysel was excited to return to U-M to talk to EECS students about entrepreneurship. His talk, *Making Your First Million and Other Tips for Aspiring Entrepreneurs,* featured never-before-seen photographs detailing the early history of the microprocessor.

Lee Boysel's garage lab using military surplus



First DRAM 7/68 (256-bit with CPU & video ports), designed by Boysel's group

The presentation documented Boysel's contributions to the development of the microprocessor, from his early days working in his garage lab, through his tenure as the head of chip design at Fairchild Semiconductor, and his establishment of Four-Phase Systems (bought by Motorola in 1981). Throughout the presentation, he highlighted his experiences with sage advice for aspiring entrepreneurs, such as "Don't go for top dollar; go somewhere where you can continue to learn," and "Don't worry about control...Your venture capitalists already have it!"

Boysel's inspirational address also contained some words of warning: "When you start your company, you will not have a staff. You'd better know everything from how to design whatever it is you're doing - to how to make the coffee." He noted that there is significant stress accompanying entrepreneurship, but that his only regret was that he couldn't do it all over again. Said Boysel, "I was called nuts for most of my career, and that was just fine with me."

4-Phase became Fortune 1000 company before acquisition by Motorola in 1981

A Sampling of Lee Boysel's Tips for Aspiring Entrepreneurs:

1. Take jobs that offer learning opportunities
2. Take courses that will broaden your expertise
3. Attach yourself to a high-tech mentor.
4. When opportunities are limited, move on.
5. When possible, get hands-on production floor experience. Learn all areas of your technology, and don't be afraid to get your hands dirty.
6. Build a well-trained, dedicated team, and take care of your teammates.
7. To make your first million, either do it yourself or join someone else's winning team.
8. Leave your ego at the door!
9. Get good board members, and utilize them.
10. Act quickly. To quote Andy Grove of Intel, "Only the paranoid survive."

Lee Boysel's talk and slides are available on the web, at http://www.eecs.umich.edu/eecs/about/media.html.

HKN Wins Again!

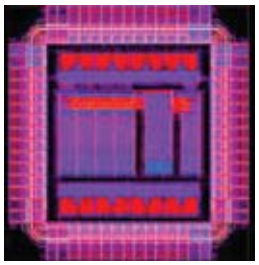
U-M's Beta Epsilon Chapter of Eta Kappa Nu is a recipient of the Outstanding Chapter Award for 2006-2007, for the third straight year. Pictured: (L) Ryan Wilkerson (Corresponding Secretary), Matt Fojtik (Recording Secretary), Dheeraj Sanka (Activities Officer), Francine Shammami (President), John VanderKolk (Operations Officer), Josh Smith (Events Officer), Nick Collins (Treasurer), Paul Hou (Projects Officer), Matt Morlock (Vice President)

STUDENT AWARDS

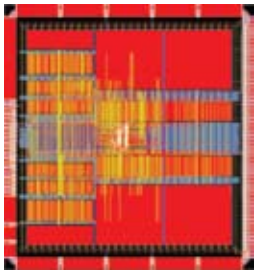
Games 4 Girls Competition

Three freshman women, Rebecca Malinowski, Alyssa Glickman, and Seonghwa Choi, won an Honorable Mention in the Games for Girls (G4G) National Competition held at University of Illinois. All three were students in Dr. David Chesney's class, ENG100: Gaming for the Greater Good. None of the three had any previous programming experience before ENG100.

2008 AMD/Michigan Student Design Contest



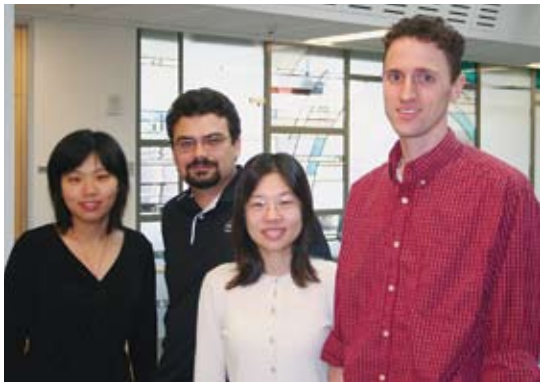
Student winners of the third annual Advanced Micro Devices (AMD) / Michigan Student Design Contest for VLSI Design I were: Gautam Bhatnager, Brent Climans, Andrea Pellegrini, Bo Xiao, and Dan Zhang, for their project, "FreeFood: A 1GHz High-Performance 16-bit DSP with SIMD Multimedia Extensions."



Winners from VLSI Design II were: Orijit Dhar, Chris Hsiong, Evan Li, and Darryl Prudich, for their project, "Energy Efficient MPEG-1 Video Decoder with Dynamic Voltage and Frequency Scaling."

4th Annual CSE Honors Competition

Each year, graduate students in CSE compete against each other for top honors in the CSE Honors Competition. The competition is sponsored by Google.



L: Ying Zhang (honorable mention), Ilya Wagner (first place), Yuanyuan Tian (second place), David Wingate (honorable mention)

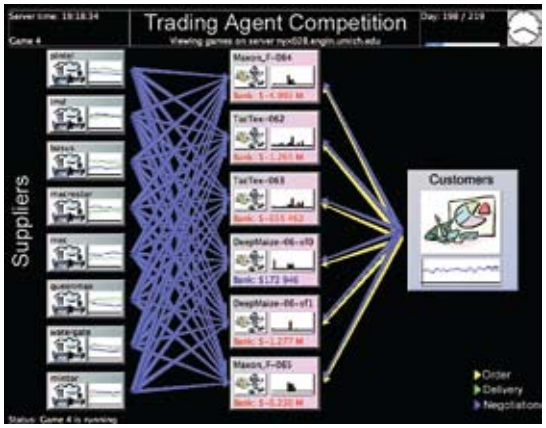
Two Top Awards at MICRO-40

Shuguang Feng, Michael Chu

At the *40th International Symposium on Microarchitecture*, Shuguang Feng received a Best Student Presentation Award, and Michael Chu received a Best Paper Award for his paper co-authored by Rajiv Ravindran and Prof. Scott Mahlke.

U-M Team Takes First Place in Trading Agent Competition (TAC)

Team members Patrick Jordan (PhD student) and Lee Callender (BSE '08) captured first place at the international TAC Supply Chain tournament in a competition of 13 teams from seven different countries. The team was advised by Prof. Michael Wellman.



Jarrod Roy and Michael Moffitt Take Top Honors at ISPD 2007 Contest - Release Code as Open Source

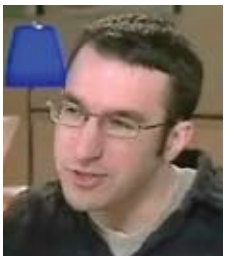
Graduate student Jarrod Roy and Michael Moffitt (PhD CSE '07) were honored at the *2007 ACM International Symposium on Physical Design* for their winning entries in the inaugural Global Routing Contest. In a move that is expected to aid CAD research, they have since released their code as open source for their IC global routers Fairly Good Router (for which Roy took 1st place, 2D category, and 3rd place, 3D category) and MaizeRouter (for which Moffitt took 2nd place, 2D, and 1st place, 3D).

Kai-hui Chang receives EDAA Outstanding Dissertation Award

Dr. Kai-hui Chang (PhD 2007) received the 2007 Outstanding Dissertation Award in the area of "New directions in logic and system design" from the European Design and Automation Association. His dissertation, which will be published by Springer, is titled, "Functional Design Error Diagnosis, Correction and Layout Repair of Digital Circuits."

Lisa Hsu Awarded Intel Fellowship

Lisa Hsu was presented with an Intel Foundation Ph.D. Fellowship for her research on cache resource allocation in large-scale chip multiprocessors.



Eric Dattoli Receives NDSEG and NSF Research Fellowship

Eric Dattoli received an NSF Graduate Research Fellowship and a National Defense Science and Engineering Fellowship from the Department of Defense for his work on more efficient nanotubes and nanowires.

Michael Moffitt Awarded Joseph Raviv Memorial Postdoctoral Fellowship

Recent Ph.D. graduate Michael Moffitt was awarded the 2007 Joseph Raviv Memorial Postdoctoral Fellowship for promising research in computer science. He will spend his post-doctoral year at the IBM Austin Research Lab.

IEEE Programming Challenge

Smita Krishnaswamy and Stephen Plaza, graduate students in CSE, were honored with a Second Best Contribution Award at the IEEE Programming Challenge at the International Workshop on Logic and Synthesis for their paper, "AnSER: A Lightweight Reliability Evaluator for Use in Logic Synthesis," which implements OAGear software.

UNDERGRADUATE STUDENT AWARDS

EECS Senior Outstanding Achievement Award

Benjamin Kempke, CE
Scott Wolchok, CS
Joseph Steinmeyer, EE

EECS Outstanding Research Award

Dan Zhang, CE

EECS Outstanding Service Award

Ashley Issa, CS

EECS Entrepreneurship Award

Chen-Chao Zhang, EE

William L. Everitt Student Award of Excellence

Jacky Lo, CE
Hajoon Ko, CS
Nibal Arzouni, EE

Charles F. Barth, Jr. Prize

Pascal Carole, CS

Tau Beta Pi Award

Alfred Eng, EE

Richard K. Brown Scholarship

Mark Swiderski, EE

CoE William Harvey Seeley Prize

Shane Boehner, EE

Cooley Writing Prize

Hanz Kuder, EE

CoE Distinguished Achievement Award

Paul Cooper, CE
Lee Callendar, CS
Adam Barnett, EE

GRADUATE STUDENT AWARDS

CoE Distinguished Achievement Award

Scott Hanson, EE
Joonki Noh, EE:Systems
Yuanyuan Tian, CSE

U-M Rackham Distinguished Dissertation Award

Guoqing (Noah) Chang (PhD EE '06), for his dissertation, "Nonlinear Propagations and High Power THz Generations Using Ultrashort Pulses."

STUDENT INSTRUCTOR AWARDS FOR 2007-08

EECS Graduate Student Instructor Award

Patrick Jordan, CSE
ShiNung Ching, EE:Systems
Phil Choi, EE

EECS Undergraduate Instructional Aide (IA) Award

Adam Barnett, EE

EECS IA Honorable Mentions

Paul Chowdhry, EE
Elson Liu, EE
Nick Quinnell, CE
John Schmotzer, EE:Systems
Chih-Wei Wang, EE:Systems

ASEE 2008 Outstanding Student Instructor Award

Joonki Noh, EE:Systems
Arvind Jayaraman, EE:Systems

PROFESSIONAL SOCIETY PAPER AND PRESENTATION AWARDS

Mark Woh is first author on the paper, "The Next Generation Challenge for Software Defined Radio," which received Best Paper at the *International Workshop on Systems, Architectures, Modeling, and Simulation*. The paper was co-authored by Sangwon Seo, Hyunsoek Lee, Yuan Lin, Prof. Scott Mahlke, Prof. Trevor Mudge, Chaitali Shakrabarti and Krisztian Flautner.

Francesco Andriulli placed 1st in the Student Paper Competition at the *2007 North American Radio Science Meeting* for "A Multiplicative Calderon Preconditioner for the Electric Field Integral Equation," co-authored by K. Cools, F. Olyslager and Prof. Eric Michielssen.

Michael Chu received the Best Paper Award at the *40th International Symposium on Microarchitecture* for his paper, "Data Access Partitioning for Fine-Terrain Parallelism on Multicore Architectures," co-authored by alumnus Rajiv Ravindran and Prof. Scott Mahlke.

Shuguang Feng received the Best Student Presentation Award at the *40th International Symposium on Microarchitecture* for his presentation of the paper, "Self-calibrating Online Wearout Detection," co-authored by Jason Blome, Shantanu Gupta, and Prof. Scott Mahlke.

Jianbai Wang received the Roger A. Haken Best Student Paper Award at the *2006 IEEE International Electron Devices Meeting* for the paper, "An Integrated Position-Sensing System for a MEMS-Based Cochlear Implant," co-authored by M. Gulari and Prof. Ken Wise.

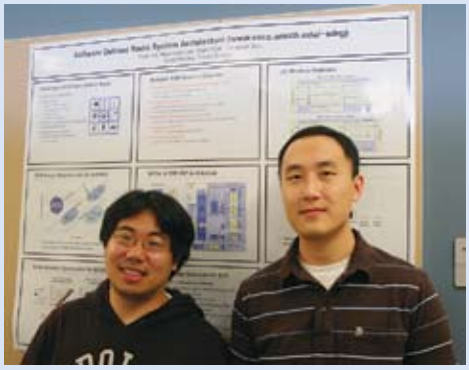
Koen Van Caekenberghe, Kenneth Brakora, Karan Jumani, Mustafa Rangwala, Yun-Zhen Wee, and Prof. Kamal Sarabandi received third prize for their paper, "A probe Station Based Setup for On-wafer Antenna Measurement," at the *28th Annual Symposium of the Antenna Measurement Techniques Association*.

Karl F. Brakora received 3rd prize in the student paper competition at the *IEEE International Antennas and Propagation Symposium* for his paper, "Integration of Single-Mode Photonic Crystal Waveguides to Monolithic MMW Subsystems Constructed Using Ceramic Stereolithography," co-authored by Prof. Kamal Sarabandi.

Karan Jumani was awarded 3rd place Student Paper Prize at the *2007 IEEE International Geoscience and Remote Sensing Symposium* for the paper "An Investigation of PN Sequences for Multi-Static SAR/InSAR Applications," co-authored by Prof. Kamal Sarabandi.

SDR Research Featured in IEEE Micro's 2007 Top Picks Issue

Research in Signal-Processing On-Demand Architecture (SODA) for Software Defined Radio (SDR) was selected for inclusion in *IEEE Micro*'s 2007 Special Issue of Top Picks from the past year's computer architecture conferences. Papers were selected on the basis of novelty and the potential for short or long term impact on industry.



Mark Woh, Yuan Lin

The paper, "SODA: A High-Performance DSP Architecture for Software-Defined Radio," was authored by U-M graduate students Yuan Lin, Hyunseok Lee, and Mark Woh, Yoav Harel from Intel, U-M faculty Scott Mahlke and Bredt Family Professor of Engineering Trevor Mudge, Arizona State U. faculty Chaitali Chakrabarti, and U-M alumnus Krisztián Flautner, now at ARM Ltd.

Alumni Society President's Message

The EECS alumni society is primarily about staying connected— with each other and with the department.

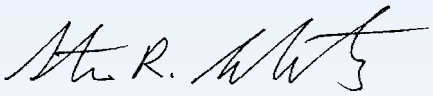
It can be easy and convenient for alumni to reach out to other graduates from the department and get together. It can be anything from a side party at a large conference, to a company event, to a simple evening watching the Michigan game at the local pub.

If you have an idea for a gathering, we invite you to take the initiative to put things in motion. You can use the EECS Alumni Society online directory (https://www.eecs.umich.edu/eecs/alumni/membership.html), Michigan's alumni social networking tool 'InCircle' (http://alumni.umich.edu/incircle/ - search under 'EECS Alumni'), or contact the EECS Alumni Society (see below) to find others who may want to join or help.

If you are even a little bit of a self starter then give it a try. Think of an opportunity that you would like to be part of. Can you think of an event to bring alumni of all EECS stripes (graduates, students, or staff) together? All you need is the idea to get started.

Our alumni are everywhere, so wherever you are there are likely to be others looking to reconnect and stay involved. Interested? Please let us know! Contact the EECS Alumni Society Secretary, Catharine June, at cmsj@umich.edu.

Stay true and go blue!



Steve Schwartz
President
EECS Dept. Alumni Society
stevschw@umich.edu

The Society is looking for EECS alumni

who would like to become more involved with the EECS Alumni Society. You can help in many significant ways: serve on important committees; participate in surveys used to guide the Society's future activities; mentor students, etc. Join today! It's fun, it's exciting, and you will be contributing to the life of current students and your fellow alumni.

Contact the Alumni Society Secretary, Catharine June, at cmsj@umich.edu.

HOMECOMING WEEKEND

EECS Entrepreneurs Lead the Way

"Serial entrepreneur." "Industry leader." "Pioneer." These were a few of the words used to describe the EECS honorees celebrated at the Michigan Engineering Alumni Weekend gathering on the 12th of October, 2007. Following a meeting of the EECS Alumni Society, all returning alumni were invited to lunch with EECS faculty and students in the atrium of Tishman Hall (see photo above).

ECE Merit Award winner Lee Boysel followed lunch with a lively and entertaining presentation specially geared to students about his adventures starting his own company and creating the first single-chip CPU microprocessor (also see Student News).

Later in the afternoon, the College hosted a panel discussion on the topic of entrepreneurship strategies. Scott Kliger (BSE CE '90), co-founder and CEO of the innovative directory assistance company Jingle Networks, was among the panelists. Also featured was Nancy Benovich Gilby, recipient of the CSE Merit Award.

Gilby and Alan Steremberg, founder of Weather Underground and recipient of the Recent Engineering Graduate Award, shared their insights with student leaders of the new U-M entrepreneurship program, MPowered.

Friday evening was capped by the awards dinner. Many alumni stayed the following day to witness a rousing 48 - 21 victory in the football game versus Purdue. Go Blue!

2007 COLLEGE OF ENGINEERING ALUMNI SOCIETY MERIT AWARDS

Electrical and Computer Engineering

Lee Boysel *(BSE EE '62; MSE EE '63)*

David C. Munson, Jr. (Dean, College of Engineering), Lee Boysel, Brian Gilchrist (Interim Chair, ECE Division)

Lee Boysel headed the team that created the first single-chip CPU microprocessor. The legacy of his work is packaged into every computer, car, toaster and virtually anything else controlled these days by a silicon chip. Boysel began his storied career as a launch sequence specialist stationed at Douglas Aircraft's Johnson Island Anti-Satellite Facility. In his spare time, he assembled his own research lab using surplus equipment he bought from Douglas. Far ahead of the curve, Boysel had already made the jump from vacuum tubes to transistors to the infancy of the MOS chip, which he further developed at IBM, Fairchild Semiconductor and his own start-up, Four-Phase Systems. The machines produced by Four-Phase distributed mainframe power to remote user locations and featured the first semiconductor memory and the first LSI CPU. Four-Phase CRTs were used for many years in hospitals, pharmacies, and, up until the year 2000, at the IRS. Teams he led were credited with designing and fabricating the first A/D chips, the first static and dynamic MOS ROM, the first parallel ALU and the first DRAM. Since the buyout of Four-Phase by Motorola in 1981, Boysel has advised, chaired and invested in several high-tech start-ups.

Computer Science and Engineering

NANCY BENOVICH GILBY *(BSE CE '85; MSE CSE '87)*

David C. Munson, Jr. (Dean, College of Engineering), Nancy Benovich-Gilby, Farnam Jahanian (Chair, CSE Division)

Nancy Benovich Gilby has been developing successful start-ups for the last 20 years. She co-founded the enterprise software company MarketSoft and the mobile phone application company PocketThis. Her leadership in software applications has contributed to a string of successful companies, including Firefly (purchased by Microsoft), Wildfire (purchased by Orange), Component Software (now part of Java) and On Technology, a thriving public company. Gilby served as Vice President of Product Engineering at both SNAPin Technology and, currently, Asurion Mobile Applications. Asurion is the largest provider of wireless roadside assistance services in North America. She has ushered her start-up businesses through eight rounds of venture funding. Along the way, Gilby's work in product, company, and market development have been the subjects of three Harvard Business School studies.

Alan Steremberg, David C. Munson, Jr. (Dean, College of Engineering)

Recent Engineering Graduate Award

ALAN STEREMBERG *(BSE CE, '94)*

Alan Steremberg was honored for his visionary work in developing Weather Underground, Inc., of which he is co-founder and President. Following graduation from U-M, he worked at Apple and then at a small internet start-up in Seattle. In the process of completing his master's degree in Human-Computer Interaction at Stanford, he returned to the idea of a real-time internet weather service, and Weather Underground was born (the idea had its beginnings as a U-M research project under the direction of Prof. Perry Samson -- designed to bring internet weather to K-12 classes). Today, the company is a highly successful venture supplying many newspapers and television stations with their weather forecasting data. Weather Underground uses a specialized web interface and a grassroots network of subscribers outfitted with personal weather stations to provide weather forecasts around the globe and in 50 languages. Users turn to Weather Underground for a comprehensive array of data on temperature, heat index, wind chill, humidity, radar precipitation, dew point, wind velocity, visibility, satellite imagery, fronts, snow depth, jet stream, UV index, air quality and even influenza incidence.

CSE@50

CSE alumni gathered May 7-9 to celebrate a rich legacy of more than 50 years of computing at Michigan. You can view photos and videos from the event online at:

www.eecs.umich.edu/eecs/about/media.html

1950s

Howard Sachar *(BSE EE '50)* received an Emmy Engineering Award from the Academy of Television Arts and Sciences at the Shrine Auditorium in Los Angeles this past September, 2007. The award, which annually recognizes a "historic contribution to television technology," was given jointly to Sachar and his design partner, Dr. Simon Ramo, for their development of the Varicap capacitor at TRW Corp. The Varicap, which enabled electronic tuning, was patented in 1960. Today, over 40 manufacturers still rely upon the Varicap design.

Following his graduation from U-M, Sachar began his varied career as part of a top secret Infra Red project mapping Manhattan in a B-17. While wearing several important hats at TRW, he consulted with international aerospace ventures and coordinated activities with NASA. He served on the IEEE and JEDEC technical committees for solid state devices. He also worked as a Director of International Operations at Xerox and as a Vice President for three Japanese manufacturers. Between 1985 and 1995, he consulted for a number of technology corporations.

Since 1995, Sachar describes himself as having been retired (more or less). His recent acceptance of the Emmy has allowed him the chance to reflect on his Michigan education, stating "I am grateful to Michigan for the generalist engineering education for it enabled me to perform in many fields from semiconductors and computers to mining and space technology, with a little help from graduate schools around the country." These days, he keeps abreast of news from Ann Arbor via his granddaughter, who is a junior in aeronautical engineering.

1980s

Thomas M. Parris *(BS CCS '82)* is back in his home state of Vermont (after a long journey with stops in Boston, New York City and Washington, DC), where he is Director of Sustainability Programs for ISciences, LLC (an Ann Arbor-based science and engineering consultancy). ISciences conducts research in the area of sustainable development, human security and the environment. Parris has also been appointed to the National Research Council's Committee on Geographical Sciences. He has published articles on environmental information policy and sustainable development for journals such as *Environment, Annual Reviews of Environment and Resources,* and *Proceedings of the National Academy of Sciences.* Thomas and his wife, Victoria, have two children: David (12) and Noah (7).

Oscar Lankford *(BS CS '86)* has been working in the IT industry for the last 20 years. For the past four years, he has worked for Blue Cross Blue Shield in Chicago. He credits the EECS Department for preparing him for a successful career.

Hossein Jadvar *(MSE CI & CE '86, also PhD in Bioengineering '88)* completed his MBA in the Executive Program of the Marshall School of Business at USC in 2007. He is USC's Director of Radiology Research and is also the President of the Los Angeles Radiological Society, Nuclear Medicine Section. Additionally, he is a charter member and investigator for the NIH-funded Medical Imaging Review Panel. He lives with his wife Mojgan Maher, DDS, and two daughters, Donya and Delara, in the foothills of Mount Wilson in the beautiful "City of Roses," Pasadena, California.

Vikram Verma *(MSE EE '89)* recently helped negotiate the acquisition of Savi, which he co-founded and of which he is now CEO, by Lockheed Martin in 2006. Verma has served in several roles at Savi, which he kept intact as a subsidiary of Texas Instruments and Raytheon. Savi develops and manufactures cargo security and management systems for global supply chains using Radio Frequency Identification technology.

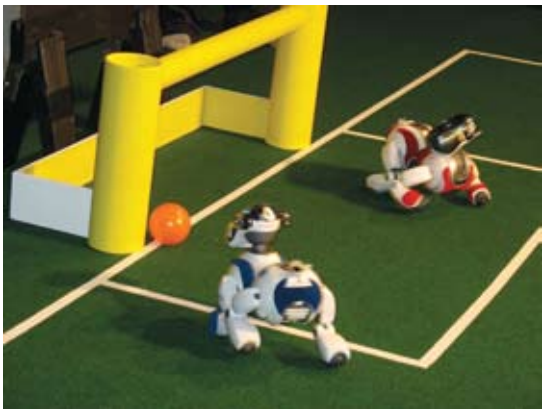
1990s

Krishnendu Chakrabarty *(PhD CSE '95),* Professor of Electrical and Computer Engineering at Duke University, was recently named an IEEE Fellow. His current research is focused on design and test of system-on-chip integrated circuits, microfluidics-based biochips (digital microfluidics, microelectrofluidics), and wireless/sensor networks. His advisor at U-M was Prof. John Hayes.

Eric Chown *(PhD, CSE '94),* Samuel S. Butcher Associate Professor of the Natural Sciences at Bowdoin College, led his students' team, NorthernBites, to victory in the 2007 RoboCup in Atlanta, Georgia.

Northern Bites has been active for only two years and was victorious over teams from Germany, Australia, and the United States. In the RoboCup competition, teams of four identical Sony AIBO dogs compete on a 3- by 5 meter field. Through the aid of a muzzle-mounted camera, the dogs are programmed to recognize the ball

and move, shoot and pass in a coordinated effort. The dogs receive no active commands during the course of the game, it's all up to their team-programmed code. In a CNN-online interview, Professor Chown outlined the challenge: "The problems in RoboCup are the same as what roboticists face in any domain. The robot needs to sense the world, figure out a problem, and make a decision. That fits soccer the same way it does the Mars Rovers, or a robot in an advanced car plant." His overriding goal is "to make science fun and exciting and attract young people."



Blue scores!

Chown is married to colleague Rachel Beane, a Geology professor at Bowdoin. He teaches courses in artificial intelligence, cognitive architecture and computer programming. They have a four-year-old son, Zander, and at the time of writing, were expecting another baby in January.

Michelle Marchena Curtis *(BSE EE '94)* is new mother to Charlie Marchena Curtis, born June 20th, 2007. Curtis, who works for Cisco, reports that her son "bleeds blue and cannot wait to attend Michigan!"

Ronald Kim *(BS CS '90, MBA Ross School of Business '05)* recently left his job as a Partner at Accenture and took on a role as a Vice President of Information Technology for Exelon Corporation (www.exeloncorp.com). Exelon is one of the country's largest utility/power generation/energy companies. He is responsible for all Information Technology at PECO, and for the large customer system which is shared by both ComEd and PECO. He tell us, "In many of my technical discussions I still draw on concepts learned during my time as an undergraduate in the Engineering and Computer Science program."

Paul Lotz *(MSE EE '98)***.** After spending six years in CT designing cutting-edge photolithography machines, Paul moved to Flagstaff, AZ where he is leading the development of the software for the Discovery Channel Telescope for Lowell Observatory.

Timothy Strong *(MSE and PhD EE '97 '04)* is happy to announce his engagement to Rebecca (Becky) Palmer, a registered nurse at Oakwood Southshore Surgery Center. They will be married in January. Tim is a senior R&D engineer at General Electric Analytical Instruments, formerly Sensicore, in Ann Arbor.

Jean Verheyden *(nee Hwang; BSE EE '91)* works in Bend, Oregon, as an otolaryngologist. She is married to James Verheyden and is mother to James (7), Elizabeth (5) and Eric (2).

2000-

Gregory Carver *(BSE CE '01)* has been streamlining and digitizing patient information at GE Healthcare's facilities at the U-M Medical Center since 2001. He has put his software development skills to use improving ED, ICU and Anesthesiology Department functionality through the development of digital whiteboards and other care-tracking systems. He recently stepped down from his position at GE to pursue another healthcare software venture, Care Evolution (headed by Dr. Vik Kheterpal, another U-M alumnus), which he says is creating new and exciting connections in electronic health records.

Koushik Das *(MSE and PhD EE '00 and '03)* is Manager of the High-Performance Circuit Design Department at TJ Watson Research Center (IBM Research Division).

Dmitri Dolgov *(MSE CSE '02, PhD CSE '06*) was named to the 2008 edition of the IEEE Intelligent Systems "Ten to Watch." Dolgov is currently Senior Research Scientist in the AI & Robotics group at the Toyota Technical Center in Ann Arbor, MI, and visiting research scientist at Stanford University. While a student at Michigan, he studied artificial intelligence with Prof. Ed Durfee.

Dhruv Gupta *(BSE CS '03)* moved to New Delhi, India last year. After working with PwC in Cincinnati, he co-founded a social networking site, www.desimartini.com, in 2006, which recently was sold to HT Media. He now works as DesiMartini's business head.

Ryan at the Lone Pine Koala Sanctuary in Brisbane, Australia

Ryan at the Guam History museum on the island of Guam

Ryan Haag *(BSE EE '04)* completed extensive nuclear technician training after his graduation and enlisted aboard the nuclear fast-attack submarine USS Hampton, for which he now serves as the Communicator and Assistant Operations Officer. He participated in an overhaul of the Hampton's reactor control and combat systems before setting sail around the globe on four major operations. He and his wife, Rachel, are expecting their first child in July. They live in Chula Vista, CA.

Wan-Thai Hsu *(PhD EE '01),* CTO of U-M startup Discera, was recently named "Innovator of the Year" by *EE Times.* Hsu's work on a MEMS replacement to quartz technology has revolutionized timing-applications devices. The EE award is given for "leadership, creativity and out-of-the-box thinking to a technology, a product or a business."

Patrick McDaniel *(PhD CSE '01)* led a recent study of electronic voting systems in use in Ohio. The investigation concluded that "all of the studied systems possess critical security failures that render their technical controls insufficient to guarantee a trustworthy election," and was widely cited in the *New York Times* and other publications. McDaniel is an Associate Professor of Computer Science and Engineering at Penn State University.

Samuel C. Miller *(BSE CE '02),* a Captain in the USAF, recently returned from a six-month deployment in Kabul, Afghanistan, where he served at International Security Assistance Force (ISAF) Headquarters. As Chief of the Electronic Warfare Coordination Cell, he coordinated over 3000 air support requests for coalition forces scattered throughout the country of Afghanistan. He also flew combat missions as a Weapons Systems Officer aboard an F-15E Strike Eagle. He is currently stationed at RAF-Lakenheath in the United Kingdom.

Samuel Miller, left

Jeremy Nelson *(BSE CE '00)* In October 2007, along with college roommate and former Wolverine Chris Akerley (CSE CE '00), Jeremy started Afia, Inc., a Healthcare IT Strategy and Electronic Health Record design company. Currently, Afia is focusing on the behavioral health field and bringing Information Technology strategy and expertise to a field which he describes as long overdue for the benefits of technology. Afia has clients in Michigan, Virginia, and Missouri and is growing nationally. More information can be found at: www.afiahealth.com.

Abigail Short *(CS LSA '04)* has been working as a software development engineer on Microsoft Access since she graduated. In February, she gave a presention at the Office Developers Conference in San José. In the last few years she has taken up ballroom dancing, which is how she met Adam Welborn, also a development engineer at Microsoft and now her fiancé. The wedding will be in November of this year.

Photo by Jonathan McPherson

In Memoriam

CLASS OF 1930-39

Emil M. Anderson
'31; Jul. 27, 2007

David C. Apps
'34; Apr. 23, 2006

Charles H. Armstrong
'35; Jan. 15, 2008

Harley M. Newcomb
'35; March 10, 2008

James R. Davey
'36; Mar. 20, 2007

Arthur. D. Hulbert
'37; Apr. 14, 2008

Thomas B. Friedman
'38; Nov. 23, 2006

Tony Bogleff
'39; May 7, 2007

John B. Gmeiner
'39; Oct. 21, 2007

CLASS OF 1940-49

Richard B. Gethmann
'40; Feb. 3, 2008

Arthur R. Keeler
'40; Nov. 10, 2006

John Abraham Weller
'40; Feb. 11, 2008

Eugene Beach, Sr.
'41 '47, '53;
Dec. 9, 2007

Richard T. White
'41; Jan. 22, 2007

Edward L. Fairchild
'32, '42; Oct. 20, 2007

Thomas F. Inman
'43; May 11, 2007

Neil J. Schairer
'43; Nov. 21, 2007

Walter M. Strickland
'43; June 19, 2008

Wayne B. Middleton
'45; Jan. 25, 2007

Walter L. Coss
'46; Feb. 27, 2007

Richard C. Drutowski
'44, '46; Dec. 9, 2006

Clifford J. Craft III
'46, '47; Oct. 27, 2007

Arthur H. Redfern
'47; June 28, 2008

Eugene A. Hanysz
'45, '48; Sep. 25, 2005

John L. Artley
'47, '48; Sep. 27, 2007

Robert C. Engel
'45, '48; Sep. 28, 2006

Thomas C. Bamford
'48; Mar. 22, 2008

Leonard J. Blumenthal
'48; June 2, 2008

Clifford R. Frohmberg
'48; May 7, 2007

Raymond C. Holt
'48; July 29, 2008

Ralph Karson McBee
'48; Jul. 5, 2007

The Rev. Peter Weller
'48; Jan. 22, 2008

Chih-Chi Hsu
'49; Jul. 11, 2007

Robert A. Schnaars
'49; Dec. 14, 2006

CLASS OF 1950-59

John R. Flick
'50; Oct. 22, 2007

Clark R. Honig
'50; Apr. 4, 2008

Paul E. Johnson
'50; June 16, 2008

Karl Herman Klaffke
'50; May 17, 2007

Clarence A. LaFaive
'50; Jul. 12, 2007

John H. Petter
'50; Jul. 7, 2007

John O. Reimann
'50; Sep. 16, 2007

Eugene A. Riedel
'50; May 27, 2007

John McLay Tillotson
'50; Oct. 25, 2006

Elias J. Titefsky
'50, '51; Mar. 17, 2008

Thoephil Aprill, Jr.
'51; Apr. 23, 2008

Harvey F. Connor
'51; Nov. 27, 2006

Thomas F. Donaldson
'51; Mar. 28, 2007

Jack R. Raymond
'51; Jan. 10, 2008

James Edward Stewart
'52; Nov. 2, 2004

H. William Welch
'48, '52; Nov. 10, 2007

Edwin E. Henry
'43, '47, '53;
Sep. 21, 2007

Arthur T. Bublitz
'53, '54; May 21, 2008

Eldon M. Barnes
'54; Jul. 28, 2007

John D. Newton
'53, '55; Jan. 31, 2007

Robert C. Hawley
'55; Sep. 23, 2007

John C. Pangborn
'55; Jan. 30, 2008

James A. Donohue
'56; Sep. 21, 2007

Alan D. Nichols
'56; Dec. 19, 2006

David E. Thouin
'57; Jan. 25, 2007

Carl R. Battjes
'58; Apr. 28, 2007

Kurt E. Richter
'58; Oct. 9, 2005

Robert L. Boggess
'40, '57, '59; Apr. 12, 2007

William J. Graessley
'57, '59; Jan. 15, 2007

Earl W. Engelbrecht
'59; Jan. 31, 2008

S. Robert Ward
'59; Jan. 26, 2008

CLASS OF 1960-69

Howard Diamond
'60; Aug. 14, 2008

Gayle L. Rowe
'60; Jul. 28, 2007

Ahmet Ferit Konar
'57, '61; Mar. 10, 2007

Robert J. Salmer
'59, '61; Mar. 7, 2007

Joseph P. Cox
'61; Nov. 10, 2007

Eddie W. Levijoki
'61; Apr. 3, 2008

Oliver H. Tallman II
'61; Oct. 8, 2007

Dennis H. Sponseller
'62; Jun. 6, 2008

Richard J. Szoke
'60 and '63;
Jun. 11, 1999

Eddie W. Levijoki
'61, April 3, 2008

Gordon Feltman
'62, '63, Jan. 29, 2008

Michael T. Boyer
'64; June 6, 2006

Charles L. Coleman
'64; Sep. 12, 2007

James O. McDermott, Jr.
'64; Aug. 12, 2008

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'65; Jan. 26, 2008

Dale A. Holtzer
'66; Aug. 30, 2007

Albert M. Chammah
'63, '69; Jan. 24, 2008

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'70; Apr. 13, 2008

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'70; Mar. 22, 2007

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'72; Aug. 5, 2007

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'71, '73; Jun. 13, 2008

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'74; Dec. 1, 2007

Anita Goldner,
'75; Dec. 30, 2005

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'47, '80; May 23, 2006

Jeffrey Dee Wiggs
'80; Jul. 9, 2008

Steven J. Ramer
'81; Sep. 16, 2007

Charles D. Riechers
'82; Oct. 14, 2007

CLASS OF 1990-99

Jeffrey C. Jacobsen
'91; Sep. 14, 2007

Deborah A. Land
'91; Jan. 30, 2008

Chao-Ju Hou
'89, '91, '93;
Dec. 2, 2007

CLASS OF 2000-

Ross T. Hughes
'05; Apr. 14, 2007

ARTHUR W. BURKS (1915 – 2008)
Master Programmer of the ENIAC

B.A., Math, DePauw University, 1936
M.A., Philosophy, University of Michigan, 1937
Ph.D., Philosophy, University of Michigan, 1941

Arthur Burks in front of a portion of the original ENIAC

Professor Arthur W. Burks passed away May 14, 2008 at the age of 92. He was an active member of the University of Michigan faculty for 40 years, before retiring in 1986. As a new faculty member in the Dept. of Philosophy, he quickly began to define the emerging discipline of computer science. He founded the Logic of Computers Group in 1949, the first research organization dedicated to computing at the University. He helped create the graduate program in Communication Sciences in 1957, and later the Department of Computer and Communication Sciences (CCS) in 1967, for which he served as its first chair. He was the recipient of many awards and honors including U-M's Henry Russell Lectureship in 1978. In 1984 he joined EECS when CCS merged with the Department of Electrical and Computer Engineering.

Prof. Burks is well known for his work as Master Programmer of the first general purpose electronic computer, called the ENIAC (Electronic Numerical Integrator and Computer). He joined the team working on the ENIAC in 1943.

Those who witnessed Burks demonstrating the ENIAC in 1946 were absolutely amazed, for it took only 20 seconds to solve a problem that just one week before would have taken 15 minutes by an analog differential analyzer. Parts of the original ENIAC are on display in the entrance to the CSE Building thanks to Prof. Burks' efforts.

John Holland, Professor of Psychology and EECS, described Prof. Burks as his mentor and shield – shield because he allowed Holland, known as the "father" of genetic algorithms, the freedom to pursue his own original interdisciplinary research, while buffering him against an academic environment that seemed not to encourage such freedom. Holland recalled Prof. Burks' ability to phrase questions that penetrated to the heart of any discussion, academic or not. "His broad knowledge, and his understanding of relations across disciplines, brought a wide spectrum of problems within his bailiwick. I've never encountered anyone his equal in this respect," said Holland.

The Department of Electrical Engineering and Computer Science is honored to pay tribute to Professor Burks – a pioneer in the field of computer science, and a warm and generous individual. He is survived by his beloved wife of 65 years, Alice, and their three children.

BERTRAM HERZOG (1929 – 2008)
Computer Graphics Pioneer

B.S., Physics, Case Institute of Technology, 1949
M.S., Eng. Mechanics, Case Inst. of Technology, 1955
Ph.D., Eng. Mechanics, University of Michigan, 1961

Professor Bertram Herzog passed away July 11, 2008 at the age of 79. He was hired as a member of the faculty of Engineering Mechanics in 1961, and later joined the Department of Industrial Engineering. He served as the first director of MERIT—the information-sharing network that served as a research forerunner to today's Internet—during its critical formative years (1968-74), when mainframe computers were first being connected in network. He left U-M in 1975 to become Professor of Engineering and Computer Graphics at the University of Colorado, and returned in 1987 to become the first director of the Center for Information Technology Integration (CITI) 1987-92. He proceeded to teach courses in computer science for many years as an adjunct faculty member of Computer Science and Engineering.

During the early 1960's, Prof. Herzog saw the potential of the emerging computer graphics technology for mechanical design and embarked on a career that focused on computer graphics and engineering computation, especially using computer-aided-design. He built a distinguished career in the area of computer graphics and received the 2002 ACM SIGGRAPH Outstanding Service Award for his exemplary service to the community. He was an ACM fellow.

Bert Herzog was born in Offenburg, Germany. His family life was shattered by the outset of World War II, when he and his younger brother were sent out of Germany on the Kindertransport in 1938. He was reunited with his mother years later when she managed to flee Germany. Bert's father did not survive the war.

Despite these turbulent early years, Bert exhuded a remarkable *joie de vivre*. He opened his home to a wide array of acquaintances, and the dinner parties at his home were known as the place to "see and be seen," said Toby Teorey, longtime friend and emeritus faculty member of Computer Science and Engineering. Just last year, Bert and his third wife, Jo, moved to the lifelong learning community Academy Village, in Tucson, and quickly became fixtures of their new community.

In addition to his wife, Jo, he is survived by his three children, three grandchildren, three great grandchildren, five step-children and four step-grandchildren. The EECS Department and his many friends pay tribute to the pioneering spirit, strength, leadership, and style of Bertram Herzog.

Thanks to our Donors

DONOR SPOTLIGHT

Arlindo Jorge: Electrical Engineer, Inventor, and Philanthropist

As a man with three children, and eight granddaughters, Arlindo Jorge knows the value, and price, of a university education. Jorge earned his own undergraduate degree while on the GI Bill as one of the first students in the University of Massachusetts Amherst's electrical engineering program. Soon afterward Jorge earned a master's degree from the University of Michigan in electrical engineering.

He has now capitalized on a successful engineering career and reaffirmed his strong belief in the value of higher education by establishing the Arlindo Jorge Scholarship Fund, targeting undergraduate students with financial need.

Jorge and his late wife Evelyn shared a passion for promoting education, endowing the Evelyn Jorge Scholarship fund at the Massachusetts College of Liberal Arts, and the Arlindo Jorge Scholarship Fund at University of Massachusetts, Amherst. They have also provided support for the elementary school where Evelyn taught for 43 years. "That's how much we believe in education," Jorge said.

Recalling his start in electrical engineering at Michigan, Jorge fondly remembers his mentor, Prof. William Gould Dow. "That year with Professor Dow influenced my life for the next twenty years," stated Jorge. "It was the best thing to happen to me. He influenced me to such a degree that I *loved* the work I did."

After graduating, Jorge worked for the Sperry Gyroscope Company, where he developed many of the electron tubes used in army and navy radar during the Cold War. He was awarded a patent for his dual oscillator.

Photographs from the time show Jorge gripping the12-foot-long barrel of the klystron device he helped engineer. A klystron projects an electron beam through a magnetic field in order to produce a high-frequency, high-power microwave pulse useful in radar, weather forecasting, telecommunications, and medical equipment. Originally developed for wartime purposes, klystrons quickly became integral research tools with multiple valuable applications for civilian life. "We had rooms full of the equipment to test it, and it was all very unique and new. It was a really great career," Jorge said with delight.

After his work at Sperry, Jorge discovered he had a talent for investment. In 1970, after several years as a successful investment advisor, he founded Syncor Industries Corporation, a business dedicated to electronics production for the U.S. Army and Navy. Now technically retired, Mr. Jorge continues to develop electronics technologies; he is currently very interested in assistive technology for the elderly.

Remarkably even to Mr. Jorge, projects he had a hand in years ago are still proving useful today. This reaffirms Jorge's commitment to engineering.

On behalf of the many students who will benefit from your generosity, thank you Mr. Jorge!

"That year with Professor Dow influenced my life for the next twenty years"

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

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DR. GEORGE I. HADDAD INNOVATORS SCHOLARSHIP FUND

Frederick W.W. Bolander (BSE and MSE EE '83, '85) recently established the Dr. George I. Haddad Innovators Scholarship Fund, a need-based scholarship targeting EECS undergraduate students. He explains why he named this new scholarship in Prof. Haddad's honor:

L: Prof. George Haddad, Rick Bolander, true Blue fans!

"Dr. George Haddad fostered innovation through a creative and inspiring culture that provided students and professors alike the ability to move outside of the norms and stretch themselves. The ability to explore and test new ideas was led by Dr. Haddad's example and his willingness to let students take on as much responsibility as they were willing to be accountable for. Dr. Haddad's leadership instilled confidence to foster the entrepreneurial skills that have been instrumental in my personal academic and professional careers. From my perspective Dr. Haddad's spirit of entrepreneurship continues with graduates and faculty today. I wish to recognize Dr. Haddad's leadership and tradition of excellence through this scholarship for students to benefit from his legacy, as I and others have benefited from Dr. Haddad."

Rick Bolander is co-founder and Managing Director of Gabriel Venture Partners, a Redwood Shores, CA firm committed to identifying and helping the best entrepreneurs succeed. He distinguished himself while at Michigan, first as an undergraduate student member of the national honor society Eta Kappa Nu. As a fellowship graduate student, he designed an innovative RISC microprocessor prototype, taught courses, and wrote a thesis on the application of fault detection algorithms that was later used by AT&T.

Upon graduation, Rick turned his attention to management. He had great success increasing productivity at two companies while working in various capacities at AT&T, including marketing, sales and operations. He cemented the direction of his future by earning an MBA from Harvard, at the same time managing a company he founded several years earlier called Blue Sky Ventures.

Bolander co-founded Gabriel Venture Partners in 1999. He has led over $100 million in early-stage financings in the areas of digital media, communications, information technology, and the Internet. His expressed goal is to build the next generation of industry leaders by identifying the best entrepreneurs and working side by side with them to win. With this scholarship, many students will be able to pursue their dreams and aspirations in the rich entrepreneurial culture of Michigan Engineering. We hope they will one day return and help others, following the example of Rick Bolander.

FRED T. SHEN ENDOWED SCHOLARSHIP FUND

Fred T. Shen (BSE '66) recently established this need-based scholarship targeting undergraduate students pursuing a degree in computer engineering.

Mr. Shen is President of Shen Milsom Wikle: Integrated Communications Technology and Acoustic Consulting, an international firm based in New York. Founded in 1986 as an acoustical consulting firm, Shen Milsom & Wilke's services have grown to include multimedia - audiovisual, information technology - telecommunications, and building security consulting, design, and research.

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New Fellowship Funds Established For Our Graduate Students

Now is a wonderful opportunity to ensure that Michigan continues to attract the best students in the world by contributing to a departmental Fellowship Fund. Until $20M in dedicated funds have been allocated, every two dollars given in support of Graduate Fellowships will be matched with one dollar by U-M President Mary Sue Coleman.

You can contribute to any of the following funds:

CSE Fellowship Fund
Bernard A. Galler Fellowship Fund
ECE Fellowship Fund
George I. and Mary N. Haddad Fellowship Fund

Many have already contributed. We thank all of those who recognize the great need for graduate fellowships to keep Michigan Engineering strong!

Fellowship Makes the Difference for Jonathan Brown

PhD student Jonathan Brown can still recall the excitement that first attracted him to U-M as an undergraduate: "Ann Arbor was lively—and I was also excited about the research being done here, particularly in Wireless Integrated Microsystems." It wasn't long before Brown—a native of Okemos, MI—became involved in research himself. As an undergraduate, his group project in Analog Design was voted best in the class, and his instructor, Professor Michael Flynn, invited Brown's team to build their design, an innovative, low-power temperature sensor.

Brown says he still feels stunned at the number of potential real-world applications the project may have, and became motivated to follow the project through the testing phase as a PhD student. He toured a number of schools and received several full-funding offers, but U-M's offer of funding, combined with the opportunities offered here, made the difference.

Entertaining the idea of starting his own business, Brown has already taken advantage of special courses offered at U-M, including a graduate course taught by Engineering and Business School professors, and a graduate course in Entrepreneurial Studies, which attracts engineering, business and law students. He stands poised to make the most of the opportunities afforded to him by his Graduate Fellowship.

George I. and Mary N. Haddad Fellowship Fund

Prof. George and Mary Haddad recently established the George I. and Mary N. Haddad Fellowship Fund to support graduate student education in Computer Science and Engineering, Electrical Engineering, and Electrical Engineering: Systems.

Prof. Haddad (BSE, MSE, PhD, EE, '56, '58, '63) was Chair of the Department for nearly 19 years between the years of 1975 and 1997. He began as Chair of the ECE Department, and was instrumental in bringing together the department of Computer and Communication Sciences and the Computer Information and Control Engineering graduate program to form the present EECS Department. It is a great honor for the Department to count Prof. Haddad as one of its most esteemed alumni, as well as emeritus faculty member, former Chair, and friend. His remarkable accomplishments and contributions to EECS at Michigan can't possibly be summarized here. Please read more in the FW2005 issue of EECS News (available online).

Mary Haddad was known for her devotion to the Department and the faculty. She was the social center of EECS for many years, organizing numerous parties for faculty and their spouses. She was, and is still, a kind and gracious hostess with a great sense of humor.

Prof. Haddad graduated 58 PhD students, and was a mentor and source of inspiration to countless others. The Department is deeply honored to have his and Mary's support of EECS graduate students continue in perpetuity through this fellowship.

Bernard A. Galler Fellowship Fund

In memory of the substantial contributions of Bernard A. Galler (1928-2006) over the 39 years he was a professor at U-M, the division of Computer Science and Engineering established the Bernard A. Galler Fellowship Fund, supporting academically gifted graduate students pursuing an advanced degree in computer science.

Professor Galler began teaching at U-M in 1955 and was a leader in the development of both the Computer Science Department and the Computing Center. He helped establish the Communication Sciences Program and chaired the combined Department of Computer and Communication Sciences from 1973-75. As a programming researcher, he helped develop the Michigan Algorithm Decoder (MAD) and an automated course registration program. He was President of the Association for Computing Machinery from 1968-70, and was later awarded ACM's Distinguished Service Award.

His most important legacy was his absolute devotion to the students of Michigan. For more than forty years, he inspired and mentored hundreds of undergraduate and graduate students in the field of computer science.

TO GIVE PLEASE GO ONLINE TO:
www.eecs.umich.edu/giving

LNF Dedicated April 11, 2008

Housed in the EECS Building and fundamental to much of the research conducted in the Solid-State Electronics Laboratory and the NSF ERC for Wireless Integrated Microsystems, the Lurie Nanofabrication Facility (LNF), pictured on the lower front cover, was dedicated April 11, 2008. The total investment in the LNF, combining the existing facility, the latest addition and equipment, exceeds $100M.

The LNF will enhance the capabilities of the current world-class facility in all areas of semiconductor device and circuit fabrication, integrated micro-systems and MEMS technologies, nanotechnology, nanoelectronics, nanophotonics and nanobiotechnology. It will also enable researchers to explore new frontiers of material science for applications ranging from healthcare to national security.

"The LNF will change the future more than any of us now realize, and we recognize in it a continued commitment to excellence as a University, as a state and as a nation," stated Prof. Ken Wise, Director of the Solid State Electronics Laboratory and the NSF ERC for Wireless Integrated Microsystems, at the dedication ceremony.

The generous donors who made the LNF possible were given a special tour of the facility. Here (left), Vincent Gorguze is being shown one of the nanoimprint lithography tools.

Sixth grader Emily Good (right) "gowns up" so she can enter the LNF clean room during her time at Nanocamp. Educating children and science teachers is part of the mission of the NSF National Nanotechnology Infrastructure Network (NNIN), of which Michigan is a member.

Photo: Martin Vloet, U-M Photo Services

Electrical Engineering and Computer Science

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