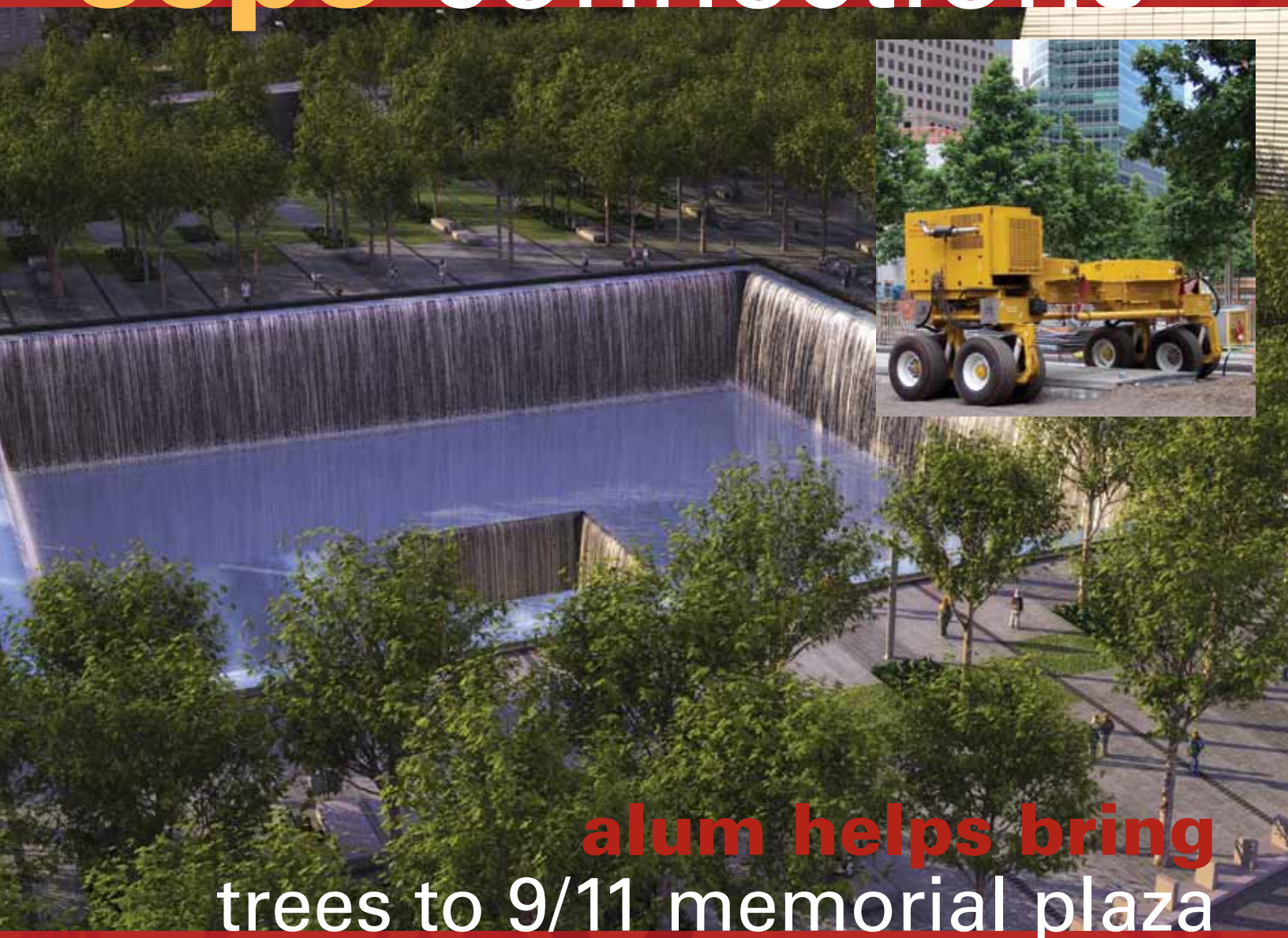
IOWA STATE UNIVERSITY
Department of Electrical and Computer Engineering

alumni newsletter
fall 2011
volume 28
issue 1

ecpe connections



alum helps bring trees to 9/11 memorial plaza

more inside ...

- **computer engineering student** attends google camp
- **faculty makes breakthroughs** in bandwidth recycling
- **alum becomes** new ecpe external advisory board leader

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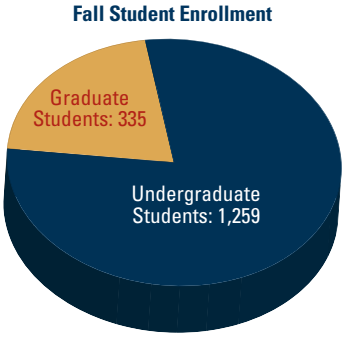
letter from the chair

I am pleased to be able to share exciting news about the growth and continued success of the Department of Electrical and Computer Engineering (ECpE) and report on the accomplishments of our students, faculty and staff, and alumni, as I begin my second year as the Palmer Department Chair in Electrical and Computer Engineering.

With 1,259 undergraduate students enrolled in our electrical, computer, and software engineering programs, our department is contributing to Iowa State University's enrollment being at an all-time high this fall. Our graduate programs also are maintaining strong enrollment, with 335 students in master's and PhD programs.



We continue to develop our curriculum to meet the needs of our growing population, and have introduced a new bio-electrical engineering course for undergraduates and a new online graduate certificate in nondestructive evaluation (page 6).

Not only are our student numbers increasing rapidly, but our faculty and staff is growing as well. We have many new faces in the department (page 3), including **Ian Dobson**, the inaugural recipient of the Arend J. and Verna V. Sandbulte Professorship in Engineering, and Assistant Professor **Faxian Xiu**. Additionally, software engineering faculty members **Samik Basu** and **David Weiss** received joint appointments with the Department of Electrical and Computer Engineering and the Department of Computer Science.

As we grow our department, research efforts continue to increase and strengthen our reputation. Several faculty members recently received prestigious grants and awards to fund their research. **Vikram Dalal**, Thomas M. Whitney Professor in Electrical Engineering, received a 2011 IBM Faculty Award for his work in advancing solar energy (page 16) and Northrop Grumman Assistant Professor **Sumit Chaudhary** received a National Science Foundation (NSF) CAREER Award to improve organic solar cell efficiency (page 19). Assistant Professors **Ayman Fayed** and **Liang Dong** also each received NSF grants to fund groundbreaking research projects they are leading (page 18). Additionally, **James McCalley** received an NSF Integrative Graduate Education and Research Traineeship Program award, which you can read more about online at *www.ece.iastate.edu*.

Many of our alumni also are being recognized for their career achievements, including **Chris Holland**, whose company developed equipment to plant trees in the 9/11 Memorial Plaza (page 10), and **Bruce Trump**, who is leading ECpE's External Advisory Board (page 8).

I am pleased to have been able to renew many acquaintances this year and look forward to connecting with more of our alumni this fall. I welcome you to join us October 22 for Homecoming Weekend, or anytime you have a chance to return to your alma mater.

Kind regards,

David Jiles

David C. Jiles
Palmer Department Chair in Electrical and Computer Engineering
Anson Marston Distinguished Professor

about the cover photo

The 9/11 Memorial Plaza and equipment an ECpE alumnus created to plant trees on the plaza. Memorial photo courtesy of National September 11 Memorial & Museum, created by Squared Design Lab. Equipment photo courtesy of Chris Holland and Natalie Hammer.

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Department Chair: David C. Jiles
Newsletter Coordinator: Kenzie Brennan

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To give a gift to the ECpE department, visit *www.foundation.iastate.edu* or call the ISU Foundation at 515 294-2416.

ecpe welcomes

new faculty and staff

Virginia "Ginny" Anderson became the program assistant for the Information Assurance Center and ECpE department in April. She also assists the Security and Software Engineering Research Center. Anderson had served as a secretary in the department since 2001.

Samik Basu began a three-year appointment in January as director of the software engineering program, a joint position in the ECpE and computer science departments. Basu joined the Department of Computer Science in 2003, where he currently serves as an associate professor.

Paula Beckman (BS JLMC '92) joined ECpE Student Services as a secretary in February. She helps plan student events and schedules graduate exams and advising appointments. Beckman has worked for Iowa State for 17 years. She currently is working on an associate's degree in criminal justice at Des Moines Area Community College (DMACC).

Lucky Bene started in February as an accountant. He prepares budgets and processes reimbursements and student time sheets. He previously was an accountant and accounting officer in Nigeria. Bene received a diploma in accountancy and a postgraduate diploma in business studies in Nigeria. He also has an associate's degree in accounting information systems and an accounting paraprofessional degree from DMACC.

Barbara Brown is the administrative specialist for the Electric Power Research Center (EPRC) and Power Systems Engineering Research Center. Her duties include budgeting, processing reimbursements, managing accounts, and organizing activities for the Wind Energy Science, Engineering, and Policy undergraduate research experience. She previously was an assistant to the area vice president at Ecolab. She has an associate's degree from Baptist Bible College.

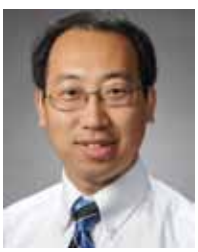
Jenifer Bungert started in May as the program assistant for research and graduate education. Her responsibilities include preproposal preparation, and graduate student admissions and recruiting. She previously was a grant writer for Youth and Shelter Services and an information technology project manager for the USDA. Bungert has a bachelor's degree from Mid-America Nazarene University.

Colin Christy (MSEE '90) came to ECpE in May as the program manager of the EPRC and as an energy systems specialist for the Center for Industrial Research and Service (CIRAS). At the EPRC, Christy works with member companies to select and fund electric power systems research and coordinates short courses. At CIRAS, he works with industrial companies on energy management issues. He received his bachelor's and PhD degrees in electrical engineering from the University of Missouri–Rolla and Kansas State University, respectively.

Ian Dobson joined ECpE this fall as the inaugural recipient of the Arend J. and Verna V. Sandbulte Professorship in Engineering. He has a bachelor's degree in mathematics from Cambridge University and a PhD in electrical engineering from Cornell University. For more than 20 years, he was a faculty member in the electrical and computer engineering department at the University of Wisconsin–Madison. He is a Fellow of IEEE, and is a member of ISU's electric power and energy systems research group and energy infrastructure strategic research area.

Hazel Peterson began as ECpE's secretary in January. She schedules lectures, assists in faculty searches, reserves conference rooms, and more for the department. Peterson previously worked for 10 years as the secretary for ISU Extension and Outreach's Communications and External Relations unit. Peterson has an associate's degree from DMACC.

David Weiss received a joint appointment in the ECpE and computer science departments in August. He joined the Department of Computer Science in 2009 as the inaugural Lanh and Oanh Nguyen Endowed Chair in Software Engineering. He served in several industry positions before coming to Iowa State.



Faxian Xiu joined this fall as an assistant professor. Xiu has bachelor's and master's degrees in materials science and engineering from the Harbin Institute of Technology and the University of California, Los Angeles (UCLA), respectively, and a PhD in electrical engineering from the University of California, Riverside. He previously worked as a staff research associate at UCLA. He is a member of ISU's electromagnetics, microwave, and nondestructive evaluation research group and materials, devices, and circuits strategic research area. •

ecpe announces 2011-12 speakers for

distinguished lecture series

E. Dan Dahlberg
An Investigation of Magnetic Reversal at Almost the Nanoscale
September 8

Abstract: One of the current frontiers in magnetism is to understand the domain structure and the magnetization reversal in nanometer-size particles. Explorations at these length scales have been aided by the development of new magnetic imaging techniques, one of which is the magnetic force microscope (MFM), a variant of the atomic force microscope. Dahlberg and his team have utilized the high resolution MFM (30 nanometers) they developed to increase their fundamental understanding of magnetism on this length scale. Dahlberg will discuss the field induced magnetic reversal in stadia shaped particles on the order of hundreds of nanometers wide and about twice that in length. In general, for the small aspect ratio stadia (length to width ratio), the magnetization reverses by the formation of a single vortex and its propagation down the length of a stadium (when the fields are applied perpendicular to the long axis). The surprising discovery is the importance of virtual particles (vortex-antivortex pairs) creation and annihilation in the magnetic reversal in larger aspect ratio stadia. This lecture is cosponsored by the Committee on Lectures (funded by the ISU Government of the Student Body).

distinguished lecture series at a glance

September 8, 5 p.m., Memorial Union, Sun Room
An Investigation of Magnetic Reversal at Almost the Nanoscale
E. Dan Dahlberg

September 9, 1:10 p.m., Howe Hall, Alliant Energy-Lee Liu Auditorium
Low Frequency Noise in Magnetic Tunnel Junctions and GMR Devices
E. Dan Dahlberg

September 30, 1:10 p.m., Howe Hall, Alliant Energy-Lee Liu Auditorium
Taming Heterogeneous Parallelism with Domain-Specific Languages
Kunle Olukotun

October 19, 1:10 p.m., Howe Hall, Alliant Energy-Lee Liu Auditorium
The Variability Expeditions: Exploring the Software Stack for Underdesigned Computing Machines
Rajesh K. Gupta

December 5, 1:10 p.m., Howe Hall, Alliant Energy-Lee Liu Auditorium
Integration and Operation of Microgrids in the Smart Grid
Reza Iravani

Low Frequency Noise in Magnetic Tunnel Junctions and GMR Devices
September 9

Abstract: The low frequency noise in magnetic tunnel junctions has been investigated. When one of the magnetic layers is switching, the magnetic aftereffect can alter the measured spectra and must be taken into account. When the magnetic aftereffect is taken into account, all spectra are consistent with 1/f noise and have magnitudes similar to those found in other magnetic states. Dahlberg and his team do not observe any magnetic contribution to the noise in any of the large area junctions (on the order of 100 microns on a side). At higher frequencies where the noise is frequency independent, the spectra are consistent with Johnson noise calculated for the junction resistance.

Biography: Dahlberg is the director of the Magnetic Microscopy Center, a College of Science and Engineering Distinguished Professor, and professor of physics at the University of Minnesota. His current research interests include the magnetic properties of magnetic thin films, multilayers, and tunnel junctions. His honors include an Alfred P. Sloan Foundation Research Fellowship, Fellow of the American Association for the Advancement of Science, Fellow of the American Physical Society, George Taylor/IT Alumni Society Award for Teaching, Distinguished Alumnus for the College of Science at the University of Texas at Arlington, University of Minnesota Outstanding Community Service Award, and George Taylor Distinguished Service Award. He also was elected Distinguished Lecturer for the Institute of Electrical and Electronics Engineers (IEEE) Magnetics Society. Dahlberg received his bachelor's and Master of Arts degrees in physics from the University of Texas at Arlington, and he received his Master of Science and PhD degrees in physics from UCLA.

Kunle Olukotun
Taming Heterogeneous Parallelism with Domain-Specific Languages
September 30

Abstract: Computing systems are becoming increasingly parallel and heterogeneous; however, exploiting the full capability of these architectures is complicated because it requires application code to be developed with multiple programming models. A much more productive single programming model approach to heterogeneous parallelism uses domain-specific languages (DSLs). DSLs provide high-level abstractions, which improve programmer productivity and enable transformations to high performance parallel code. In this talk, Olukotun will discuss the DSL approach to heterogeneous parallelism, show example DSLs that provide both high productivity and performance, and describe Delite, a framework that simplifies the development of DSLs embedded in Scala.

Photos courtesy of E. Dan Dahlberg, Kunle Olukotun, Rajesh K. Gupta, and Reza Iravani.

Biography: Olukotun is a professor of electrical engineering and computer science at Stanford University. He is best known as a pioneer in chip multiprocessor (CMP) design and the leader of the Stanford Hydra CMP research project. Olukotun founded Afara Websystems to develop high-throughput, low-power server systems with CMP technology. The Afara microprocessor, called Niagara, was acquired by Sun Microsystems. Niagara-derived processors now power all Oracle SPARC-based servers. Olukotun currently directs the Stanford Pervasive Parallelism Laboratory, which seeks to proliferate the use of heterogeneous parallelism in all application areas using DSLs. Olukotun is a Fellow of the Association for Computing Machinery and IEEE. He received his PhD in computer engineering from the University of Michigan.

Rajesh K. Gupta
The Variability Expeditions: Exploring the Software Stack for Underdesigned Computing Machines
October 19

Abstract: Modern computing is ignorant of the variability in the behavior of underlying components from device to device, chip to chip, its wear over time, or the environment in which the computing system is placed. This is a growing problem, as microelectronic devices scale down to molecular assemblies. The 'guardbands' used to guarantee component behavior (for power, performance) have gone to ridiculous margins accounting for as much as two-thirds of the chip area to meet performance 'specs' and already is undermining the gains from continued device scaling. Changing the way software interacts with hardware offers the best hope to recover the advantages from process scaling. In this talk, Gupta will describe his approach and progress in the Variability Expeditions project that fundamentally rethinks the rigid, deterministic hardware-software interface, to propose a new class of computing machines that rely on an opportunistic software stack to adapt to the conditions in an underdesigned hardware.

Biography: Gupta is a professor and Qualcomm Endowed Chair in Embedded Microsystems in the Department of Computer Science and Engineering at the University of California, San Diego (UCSD). His research interests are in energy efficient systems. Gupta leads the Microelectronic Embedded Systems Lab and is head of the Embedded Systems Group at UCSD. His recent contributions include SystemC modeling and SPARK parallelizing high-level synthesis, both of which are publicly available and have been incorporated into industrial practice. Gupta has led or co-led Defense Advanced Research Projects Agency-sponsored efforts under the Data Intensive Systems and Power Aware Computing and Communications programs. Gupta received a bachelor's degree in electrical engineering from the Indian Institute of Technology, Kanpur; a master's degree in electrical engineering and computer science from the University of California, Berkeley; and a PhD in electrical engineering from Stanford University. Gupta is a Fellow of IEEE.

Reza Iravani
Integration and Operation of Microgrids in the Smart Grid
December 5

Abstract: Environmental issues of central power plants, aging infrastructure, rapid technological developments of renewable resources, and the potential proliferation of plug-in electric vehicles have created the conditions for the utility power industry to consider the concept of "smart grid" to address the challenges of electric power systems. The smart grid integrates information and communication technologies, and advances control, protection, and power management strategies to improve grid performance, reduce environmental impacts, respond to the rising electricity demand based on sustainability, and enable interactions among stakeholders.

This presentation provides a new perspective for migration from the conventional grid to the smart grid, and elaborates on the concepts, technologies, and R&D requirements, with an emphasis on the microgrid as a building block. This view of the smart grid virtually divided the grid into multiple zones where the majority of zones are of the "smart microgrid" type. The microgrids and the other zones within the smart grid can interact with each other and collectively respond to the operational needs of the encompassing smart grid. This talk provides definitions of smart grid, microgrid, and intelligent microgrid; elaborates on the technologies and concepts to realize such entities; describes operational philosophy, control, and energy management strategies for their realization; and highlights some of the barriers.

Biography: Iravani received his bachelor's degree in 1976 in Tehran, Iran, and worked as a consultant for the power utility industry until 1979. He received his master's and PhD degrees from the University of Manitoba, Canada. Iravani currently serves as a professor in The Edward S. Rogers, Sr., Department of Electrical and Computer Engineering at the University of Toronto, Canada. Iravani is the founder and coordinator of the Centre for Applied Power Electronics at the University of Toronto, through which he leads R&D activities for a group of 25 research engineers, graduate students, and postdoctoral fellows related to grid integration of wind and solar-photovoltaic power plants, grid integration of distributed energy resources, and control and operation of high-voltage direct-current converters. •

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For details on other ECpE events and seminars, visit *www.ece.iastate.edu.*

course spotlight:

new bio-electrical engineering course

With the fields of medicine and biology increasingly depending on technology to diagnose diseases and save lives, a basic knowledge in biomedical instrumentation can help future health care providers and the designers of the next generation of biotechnology.

This fall, the ECpE department is introducing a new course called EE 188: Bio-electrical Engineering Fundamentals Laboratory. The half-semester undergraduate course is targeted at students who want to learn more about bioinstrumentation. This hands-on, lab-intensive course, designed by Assistant Professor **Timothy Bigelow**, emphasizes acquiring and analyzing biomedical signals to obtain relevant information. Students in the course will learn about data acquisition from different body systems and gain an understanding of basic medical terminology and anatomy.

Students also will get the opportunity to use circuits to record biomedical signals such as electrocardiograms (ECGs) and electromyograms (EMGs), generate nerve impulses electronically to control muscle motion, monitor brain waves, track eye motion, monitor heart sounds, and more.

"I hope that the students will leave the course with a basic understanding of how technology can help people," Bigelow says. "Hopefully this will help them as they plan for their future careers in medicine or engineering." •

Students in ECpE's new bio-electrical engineering course will use circuits to record electrocardiograms.

new graduate certificate offered in

nondestructive evaluation

Beginning this fall, a new Nondestructive Evaluation (NDE) Graduate Certificate will be offered through ISU's Engineering Online Learning program. The certificate teaches professionals from engineering or physical science backgrounds the fundamentals of three major NDE techniques: eddy-current, ultrasonic, and penetrating radiation methods. The certificate joins Iowa State's undergraduate minor in NDE and an online Nondestructive Testing Educational Resource Center as the latest in educational initiatives from ISU's Center for Nondestructive Evaluation. •

more online

For more information about engineering graduate certificates offered online, or to sign up for courses, visit *www.eol.iastate.edu*.

faculty and staff

recognitions

Congratulations to the following faculty and staff on their recent professional awards and honors:

- **Srinivas Aluru** (MSComS '91; PhDComS '94), Mehl Professor in Computer Engineering, received the ISU Award for Outstanding Career Achievement in Research. He also was selected to serve a three-year term on ISU's Biotechnology Council.
- **Timothy Bigelow**, assistant professor, was named a new recipient of the Harpole-Pentair Developing Faculty Award.
- **Rana Biswas**, adjunct professor, won the ISU Professional and Scientific Research Award.
- **Sumit Chaudhary**, assistant professor, was named a new recipient of the Northrop Grumman Professorship (formerly the Litton Industries Professorship), and received an NSF CAREER Award (see page 19).
- **Vikram Dalal** received an IBM Faculty Award (see page 16).
- **Thomas Daniels**, senior lecturer; **Mani Mina** (BS Physics '82; MS Physics '85; MSEE '87; PhDEE '89), senior lecturer; **Daji Qiao**, associate professor; **Alexander Stoychev**, assistant professor; and **Joseph Zambreno**, assistant professor, each won the ECpE department's Warren B. Boast Undergraduate Teaching Award.
- **Liang Dong**, assistant professor, was renamed a recipient of the Harpole-Pentair Developing Faculty Award. Dong also received the College of Engineering's Early Career Engineering Faculty Research Award.
- **Manimaran Govindarasu** was promoted to full professor.
- **Mani Mina** received the ISU Greek Community Faculty of the Year Award.
- **Mani Mina**; **Robert J. Weber** (BSEE '63; MSEE '66; PhDEE '67), professor emeritus; and **Rashmi Bahuguna** (PhDEE '07), former graduate student, received a patent for "An All Fiber Magneto-Optical Switch for Networking Applications" (no. 7,916,982).
- **Tien Nguyen** was promoted to associate professor with tenure.
- **Ikenna Nlebedim**, postdoctoral research associate, received the Best Presentation Award at the ISU Postdoctoral Research Day.
- **Vicky Thorland-Oster**, manager of ECpE Student Services, won the ECpE department's Mervin S. Coover Distinguished Service Award.
- **Namrata Vaswani** was promoted to associate professor with tenure.
- **Lei Ying**, assistant professor, was renamed a recipient of the Northrop Grumman Professorship (formerly the Litton Industries Professorship). •

more online

For more details on faculty and staff recognitions, visit *www.ece.iastate.edu/news/awards*.

philanthropist and alumnus murray harpole's

legacy remembered

On May 16, Iowa State alumnus and supporter **Murray J. Harpole** (BSEE '43) died suddenly at age 89. Those who knew Harpole remember him as a devoted friend and family member, creative engineer, successful businessman, and generous philanthropist. He made his home in Minnesota, but the many years he spent bettering Iowa State and its engineering education made it hard to believe he ever left campus.

Harpole understood the importance of student resources and exceptional faculty. He was a life member of the Iowa State University Alumni Association and served on the board of directors of the Iowa State University Foundation, Iowa State Research Park, and the Electrical Engineering Advisory Committee.

Harpole was a respected benefactor. He and his wife Ruth sponsored scholarships, two teaching fellowships in electrical and computer engineering, and contributed to the Engineering Teaching and Research Complex, as well as renovations to Coover Hall. Dan Saftig, president of the Iowa State University Foundation, spoke at Harpole's funeral and recalled the gracious way he and Ruth contributed to Iowa State: "Their generosity was to be quiet and understated, he made that clear to us."

Harpole's professional success made his charitable giving to Iowa State possible. His work experience was vast and began with nuclear weapons development after college. He devoted the next 20 years to four different companies working on a variety of projects. Then at age 45, Harpole and four others founded Pentair. Although their original idea of engineering and manufacturing high-altitude research balloons was not viable, Pentair found success purchasing and developing other businesses and as a water solutions and technical product company. Harpole even dipped his toe into writing when he penned a book about the creation of Pentair entitled: *Living the American Dream: Pentair, Inc.—The First Twenty-five Years*.

Murray Harpole, *left,* with his wife, Ruth, at the ECpE Building Dedication ceremony in 2008. The first floor in the new ECpE Building Addition is named for the Harpoles.

Photo by Bob Elbert.

It is a book Harpole's friend and College of Engineering Dean Jonathan Wickert treasures. Wickert pulls the book off a shelf in his office and talks of his long-standing interest in Harpole's background, leadership, and entrepreneurial experience.

"We could talk for hours and cover all kinds of topics, which was something I greatly enjoyed," says Wickert. "His advice and experience helped the electrical engineering program create a strong curriculum, and his involvement reflects the value he placed on education."

The investments he made in Iowa State will not be forgotten and may be best summarized by Saftig's last words at Harpole's funeral: "Iowa State is honored to be linked forever to one of its graduates who embodied Iowa State's own values of honor, integrity, and passion for education. He was the definition of a gentleman and had a profound impact on the lives of many. His legacy will be forever." •

–*Article courtesy of InnovateOnline,* http://innovate.engineering.iastate.edu

honoring deceased alumni

in memoriam

The ECpE department recognizes our alumni who passed away this past year between August 14, 2010 and August 11, 2011. Every effort was made to ensure the accuracy of this list.

1930s

- **Thomas J. Carpenter** (BSEE '33)
- **Roger S. Conrad** (BSEE '39)
- **John L. Cross** (BSEE '33)

1940s

- **Paul M. Anderson** (BSEE '49; MSEE '58; PhDEE '61)
- **David C. Arnold** (BSEE '42)
- **Ward F. Baxter** (BSEE '44)
- **Lawrence A. Ferk** (BSEE '48)
- **William F. Fry** (BSEE '43; PhD Physics '51)
- **Paul F. Fuhrmeister** (BSEE '44)
- **Glenn M. Glasford** (MSEE '42)
- **Frederic G. Hargesheimer** (BSEE '40)
- **Murray J. Harpole** (BSEE '43)
- **Fredrick W. Martinson** (BSEE '49)
- **Gale C. Reynolds** (BSEE '48)
- **Robert R. Stephens** (BSEE '48)
- **Harvey W. Wainright** (BSEE '49)

1950s

- **Merlin E. Burkum** (BSEE '50)
- **David L. Cox** (BSEE '57)
- **Edgar S. Craven** (BSEE '57)
- **Dick D. Duncan** (BSEE '59)
- **Burkett Farquhar** (BSEE '51)
- **James L. Foy** (BSEE '51)
- **Robert E. Huber** (BSEE '51)
- **Howard V. Mathews** (BSEE '56)
- **Darrell E. Newell** (BSEE '52)
- **Alexander J. Pastene** (BSEE '50)
- **William C. Perkins** (BSEE '52)
- **Larry L. Shupe** (BSEE '55)
- **Donnie J. Tieszen** (BSEE '55)

1960s

- **Leland Andersen** (BSEE '68)
- **James D. Fitzgerald** (BSEE '66)
- **George E. Gless** (PhDEE '63)
- **Robert N. Lehnertz** (BSEE '60)
- **Donald F. Lovely** (BSEE '61)
- **Ronald E. McClellan** (BSEE '60)
- **Gerald C. Molloy** (BSEE '69)

1970s

- **John J. Heider** (BSEE '79)

1980s

- **Adly A. Girgis** (PhDEE '81)

2000s

- **Joshua C. Adams** (BSCpE '07)
- **John F. Dorsey** (BSEE '01) •

electrical engineering alumnus bruce trump is

leading the ecpe external advisory board

Over the past 30 years, **Bruce Trump** (BSEE '71) has served and impacted his alma mater through various roles. Trump, who is currently a staff technologist at Texas Instruments, also serves as the chairperson of the ECpE External Advisory Board (EAB), Texas Instruments' ISU sponsor, and a recruiter for Iowa State graduates.

After graduating from Iowa State, Trump, an Ames native, spent several years in positions involving circuit and system design. In 1979 he joined Burr-Brown Corporation in Tucson, Arizona, as a design manager.

Shortly after joining Burr-Brown, Trump began recruiting ISU graduates. After Texas Instruments acquired the company in 2000, Trump continued recruiting and became involved in Texas Instruments' university relations program. Eventually, Trump assumed responsibility for the company's engagements with Iowa State, and he became Texas Instruments' ISU sponsor.

"As Texas Instruments' ISU sponsor, I plan and organize our recruiting efforts at ISU, including arranging our recruiting visits and participation at the Engineering Career Fair," Trump says. "I also have made presentations to students to assist in their career planning by surveying the engineering job functions common in industry, and I discuss research issues with ECpE professors involved in microelectronics, including Richardson Professor in Electrical and Computer Engineering **Randall Geiger**, Professor **Degang Chen**, and assistant professors **Nathan Neihart** and **Ayman Fayed**."

Trump furthered his relations with Iowa State and the ECpE department in February 2007 when he became a member of the department's External Advisory Board (EAB). "**Arun K. Somani** holds the Junkins Endowed Chair, which was created in memoriam of **Jerry R. Junkins** (BSEE '59), an Iowa State graduate and former CEO and president of Texas Instruments. In handling some administrative details of this appointment, Dr. Somani learned of my connections with ISU and asked me to join the EAB," Trump says.

Bruce Trump

In May 2010, Trump became chairperson of the EAB, assuming external leadership in the search for a new department chair. "Dr. Somani accomplished many goals during his tenure as department chair before making good on his plan to return to full-time research. I served on the search committee for his replacement remotely from Tucson and was thrilled when **David C. Jiles** accepted the position," Trump says. "My greatest concern was for the EAB to assist in a smooth transition, establishing a constructive relationship with Dr. Jiles, and offering support during his critical early assessment of the department and the setting of his own goals."

According to Trump, the primary tasks of the EAB are to listen, advise, and assist the department. "We strive to inject an external perspective into the planning of the curriculum, research, and programs. Most of us are from industry and are 'consumers' of the department's graduates who bring our needs and concerns to the board," Trump says. "Others are academic representatives from peer institutions who can offer triangulation from the perspective of another similar program."

The department also is at a critical point in defining a new degree program in software engineering with the computer science department. Trump says that the EAB is assisting with affirmation and advice in supporting this move. "We cannot take any credit for the progress on this goal, but we are eager to assist and see this through to a successful launch," Trump says. "This will be an important topic at this year's meetings."

Due to the present economic realities, another priority of the EAB this year is to help the department find new sources for research funding. Trump says the EAB hopes to make significant ▶

celebrating

alumni awards

Congratulations to the following alumni who recently received national and departmental awards for exceptional work in their fields:

- **Raj Aggarwal** received the ECpE Exemplary Service Award in recognition of his exemplary service to the department for serving as the former chairperson of the department's External Advisory Board from 2000 to 2010.
- **Leo (Lee) Edward Ott** (BSEE '64; MSEE '68; PhDEE '71) received the ECpE Engineering Impact Award to recognize his contributions to the satellite navigation systems StarFix and OmniStar.
- **Amit Pande** (PhDCpE '10) was named a 2011 ISU STATEment Maker. This ISU Alumni Association award recognizes young alumni's early personal and professional accomplishments and contribution to society.
- **Charles Sidebottom** (BSEE '68) was named a Medtronic Technical Fellow for his 31 years of leadership and exemplary contributions to the company. Sidebottom currently serves as the director of corporate standards and as a distinguished standards advisor in the Global Regulatory Affairs organization at Medtronic. For the past 20 years, Sidebottom has been a key leader in the company's effort to influence the direction of technical standards.
- **Bruce Trump** (BSEE '71) received the ECpE Exemplary Service Award in recognition for his exemplary service to the department for serving on the External Advisory Board, recruiting ISU graduates to work at Texas Instruments, and serving as Texas Instruments' executive sponsor for Iowa State University. (See more on Trump above.)

more online

For more details on alumni honors and awards, visit *www.ece.iastate.edu/alumni.*

▶ continued from page 8

progress on the new funding goals Jiles has set for the department.

In addition to the overall goals of the EAB, Trump is committed to preserving the quality of education in the ECpE department. "I make it a personal goal to promote and recognize good teaching, a profession that runs in my family. While research is extremely important, we must hold true to a goal of excellence in teaching," Trump says. "Good teachers not only educate our students; they train our students to be good teachers, mentors, and communicators—skills and behaviors that are valued in industry, as well as academia."

In 2011, Trump was honored for his dedication and service to the department over the years as a recipient of the ECpE Exemplary Service Award. "When I met Bruce, I was extremely impressed with his straightforward way to deal with business. He clearly showed that he was ready to work for the department, was dedicated toward the role he was asked to perform, and was very serious about good education delivery at Iowa State University and in the ECpE department. He cares for students and wants to ensure that Texas Instruments' support for Iowa State remains intact," Somani says. "Given his dedication, I believe he truly deserves the award."

Over the years Trump has served in numerous roles at Texas Instruments, including design manager, applications engineering manager, and product line manager. From 2006 to 2010, he served as a product line manager for a precision analog business group at Texas Instruments and was involved in strategic planning for the development of high-performance amplifiers, voltage references, temperature sensors, and various other precision analog integrated circuits.

In May 2010, he stepped down from his leadership role in the precision analog business group. In his new role at Texas Instruments, Trump will serve as a staff technologist, investigating new technology, mentoring, writing, and assisting with customer application issues. •

ecpe introduces 2011-12 external

advisory board

Each year, the ECpE department's External Advisory Board (EAB) advises the department on ways to improve and ensure that the department's degree programs continue to excel and meet the needs of industry and academia employers. The board is comprised of industry experts and academicians, several of whom are ECpE alumni. The following individuals are on the 2011-12 EAB:

- **Bruce Trump**, the board's chairperson, is a staff technologist at Texas Instruments in Tucson, Arizona. He also serves as Texas Instruments' sponsor for Iowa State.
- **Bill Boswell** is senior director of Global Partner Marketing for Siemens PLM Software in Ames, Iowa. Boswell directs worldwide marketing and go-to-market strategy for the Teamcenter software product line.
- **Rob Bowen** (BSCpE '94; MSCpE '96) is a senior engineering manager responsible for ASIC and FPGA designs related to information assurance and cryptographic products at Rockwell Collins in Cedar Rapids, Iowa.
- **Mitchell Corbett** (MS Systems Eng '02) is the software systems and support manager for the Engineering Field Automation group at Pioneer Hi-Bred in Johnston, Iowa. He is responsible for the development and support of software and electronic systems for the field research groups at Pioneer.
- **Bob Driggs** (BS Chemistry '77) is the dean of the mathematics and science department at Kirkwood Community College in Cedar Rapids, Iowa.
- **Hamid Elahi** (BSEE '77; MSEE '79; PhDEE '83) is the general manager of energy consulting at GE Energy in Schenectady, New York. Elahi is responsible for leading the GE Energy Consulting team in support of clients worldwide.
- **Sam Ellis** (BSComS '83) is the IBM campus relationship manager for Iowa State and program director for InfoSphere Streams Development at IBM in Rochester, Minnesota.
- **Bob Erger** is a staff software engineer at Schneider Electric in Cedar Rapids, Iowa.
- **Shawn Hanson** is a senior test manager in the Microsoft Business Division in Fargo, North Dakota. He is responsible for leading a team of engineers testing the Dynamics AX product.
- **John Kenkel** (BSEE '03) is a design engineer at Garmin International in Olathe, Kansas.
- **David J. Lilja** (BSCpE '81) is the Louis John Schnell Professor in Electrical and Computer Engineering and department head of the Department of Electrical and Computer Engineering at the University of Minnesota in Minneapolis.
- **Daniel Mineck** (BSME '71) is the retired vice president of performance engineering and environment at Alliant Energy in Cedar Rapids, Iowa. Currently, he is a part-time faculty member at the University of Iowa's College of Engineering.
- **Nicholas J. Multari** is the senior manager for trusted cyber technology at Boeing Research and Technology in Seattle, Washington. He directs and leads a group of 45 researchers conducting research, development, and technology assessment of cyber and information assurance technologies in support of Boeing Business Unit needs.
- **Albert (Bert) Nelson** is the managing director at Zenergy Power in Burlingame, California.
- **V.R. Ramanan** is an executive consulting R&D scientist in the U.S. Corporate Research Center at ABB in Raleigh, North Carolina. He serves as the global project manager for amorphous distribution transformers.
- **Ren Russie** (BSEE '77) is the director of quality trend management for Boston Scientific, CRV Rhythm, in St. Paul, Minnesota.

In addition to serving on the ECpE EAB, Boswell, Ellis, and Hanson participate on the Software Engineering EAB. **John Gustafson** (MS Applied Math '80; PhD Applied Math '82), director of Intel Labs Santa Clara; **Tom Miller** (BSComS '72) from Microsoft Research; and **Ron Wolf** (BSComS '74; MSComS '76), software engineering manager at Keynote, also serve on the Software Engineering EAB. •

more online

For more details on external advisory board members, visit *www.ece.iastate.edu/the-department/external-advisory-board.*

Alumnus Chris Holland stands next to the Straddle Mover his company designed for placing trees on the 9/11 Memorial Plaza in New York City.

Center and right photos courtesy of Chris Holland and Natalie Hammer. Memorial photo courtesy of National September 11 Memorial & Museum, created by Squared Design Lab.

alumnus helps develop equipment to

bring trees to 9/11 memorial site

Living in small-town Iowa doesn't keep someone from impacting the world. **Chris Holland** (BSEE '99), president of Holland Moving & Rigging (HMR) Supplies in Forest City, Iowa, helped bring a symbol of hope, renewal, and rebirth to the families of 9/11 victims by designing equipment to move dozens of trees to New York City's 9/11 Memorial Plaza, which opened last month on the 10-year anniversary of the attacks on the World Trade Center, Pentagon, and on United Airlines Flight 93.

Holland's involvement with the 9/11 memorial began in 2009 when he first was approached about designing a custom piece of equipment to transport trees weighing up to 10 tons. In the fall of 2010, Holland's company was asked to create the equipment to plant more than 80 of the 400 swamp white oak trees on the elevated 9/11 Memorial Plaza in areas not easily accessible via a crane—mainly the trees near the fountains and other difficult to reach areas. Holland's company quickly began designing and fabricating the Straddle Mover and finished creating it within 12 weeks.

"It was a very tight deadline, but our company put forth the extra effort involved in order to help keep the 9/11 memorial on schedule," Holland says. "HMR Supplies designed the Straddle Mover to meet the special needs of planting trees on the 9/11 Memorial Plaza. It was important for the equipment to be able to carry the tree on the center of all the axles, be capable of traversing sideways, and be able to negotiate openings on the surface of the plaza. The Straddle Mover also was required to have a wider tire base to reduce the ground pressure on the plaza, which lies over eight stories of underground rail, museum, and equipment access."

According to Holland, the knuckle suspension can lift and lower the frame and load up to 20 inches, while their standard dolly equipment has a lifting cylinder with only 16 inches of stroke. The block and cable system can lower the load below ground level, and 135 degrees of steering allows the Straddle Mover to negotiate the tight quarters on the plaza.

Although the Straddle Mover, which is controlled by a single operator and a remote control, was originally designed for moving trees, it also can be used for bridge deck replacement. Holland says that upgrading bridges has been a high priority in the past couple years, and an easier method of upgrading the bridge decking will reduce the downtime during bridge repair.

HMR Supplies was founded as part of Ron Holland Housemoving in 1981. Ron Holland, Chris' father, began designing and manufacturing Holland Dollies to provide a better and safer product for the structural moving industry. Chris went to work full-time in the family business in 2000 after graduating from Iowa State. In 2007, HMR supplies officially was incorporated, and Chris became president.

"I have used my engineering education extensively throughout our business development. Iowa State provides a strong core engineering program that has enabled me to excel in the crossdisciplinary design required for this project," Holland says. "Electrical engineering has played a role in many aspects of our business—from setting up our computer server to applying electrical engineering concepts to hydraulic control systems."

In addition to Holland, two other ISU College of Engineering alumni played a part in the project. Senior design engineer Gus Marmaras (BSIE '97) led the project and provided all on-site training in New Jersey at the tree farm, and Chris' wife Natalie Hammer (BSAerE '95) also works for the family business.

"Taking on the project, we knew that it would be a lot of work," Holland says. "But we were excited to be able to be a part of the 9/11 memorial. This was a way that Iowa could contribute to the memorial and honor all those who were affected by the tragedy on September 11, 2001. Everyone remembers what they were doing that day, but not everyone has the opportunity to contribute in such a significant way. Years from now, we will be able to go and see the trees and know that our company from the heartland of America was able to be a part of an amazing memorial." •

keep in touch!

We want to hear about your career moves and personal news for future issues of *ECpE Connections*! Please fill out the form below or online at *www.ece.iastate.edu/alumni* submit your news and class notes.

Name: _____ Graduation year(s) and degree(s): _____

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News I'd like to share: _____

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support the department

The ECpE department relies heavily on the support of our alumni and friends to ensure that students have access to scholarships and the latest lab facilities and classroom spaces, that faculty can continue to support graduate students and conduct state-of-the-art research, that department facilities remain updated for staff to do their jobs efficiently, and that student organizations and department events can continue to thrive.

If you would like to help the department continue to be one of the best in the country, you can support the department through several funds. Additional opportunities are available to support endowments and building space. Please check the appropriate box below if you want to offer your support today, or visit *www.foundation.iastate.edu*. For more information about the funds, contact the College of Engineering Development Office at 515 294-2416 or jmeseke@iastate.edu.

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Mailing Instructions: Detach this form along the perforated edge. Fold the form in thirds so that the ECpE address shows on the outside. Tape the form closed and place your stamp in the labeled box. If you are mailing a check, remember to completely seal the edges of the form or send the form along with your check in a standard envelope.

student group spotlight:

information assurance student group

Since 2003, the Information Assurance Student Group (IASG) has provided educational and leadership opportunities for students interested in security. IASG, advised by University Professor **Doug Jacobson** (BSCpE '80; MSEE '82; PhDCpE '85), is one of the largest security student groups in the nation with over 100 members. "While most student security clubs at other schools are targeted at upperclassmen who already have security knowledge, IASG encourages freshmen to get involved," Jacobson says. "Most importantly, the group aims to make studying security fun."

Kristen Muehlenthaler, senior in computer engineering, has been an IASG member for four years and previously served as an officer. "I first heard about IASG from a high school friend who told me all about the cool topics that are covered during the IASG meetings," she says. "After the first meeting, I wanted to learn more about security and keep updated on the latest news about security."

IASG hosts four Cyber Defense Competitions each year in conjunction with the ISU Information Assurance Center and the Internet-Scale Event and Attack Generation Environment (ISEAGE) lab. These competitions, which attract hundreds of students from across the state, allow teams to build and secure networks in an allotted time period. A team of experienced intrusion specialists then attack the networks to bring them down.

Last spring, IASG held their first ever Hack-a-Thon, an all-day event to give students hands-on experience with security testing. **Michael Davis**, junior in computer engineering and treasurer of IASG, was one of more than 30 students who attended the event. "Our first-ever Hack-a-Thon allowed students to switch roles and start attacking systems instead of defending them," Davis says. "The event was a runaway success, and the winner of the attacking exercise walked away with a $250 grand prize."

Four ISU students—Ryan Eikanger, Allison Sapienza, Matthew Sullivan (BSMIS '11) and Kristen Muehlenthaler—participating in the Hack-a-Thon event last spring

Christopher Marczewski, senior in management information systems and IASG co-president, says that this year the group hopes to draw large numbers of students back to their events, increase the number of members and activities, and hold events that teach the complexities of ethical hacking.

IASG also has several new things planned for the 2011-12 academic year. "With the newly created Security Testing Laboratory, students will have the opportunity to help evaluate and test security products, giving them additional practical experience. This testing ranges from trying to break a product to doing comparison testing between several products," Jacobson says. "IASG also is starting a capital campaign with the goal of raising money to support the Cyber Defense Competitions." •

how alums can help the iasg

The Information Assurance Student Group (IASG) is always looking for electrical, computer, and software engineering alumni to speak at meetings and to participate as hackers in Cyber Defense Competitions. If you are interested in helping out at any of IASG's events, please contact Ginny Anderson at ginny@iastate.edu.

Cristian Lopez came to Iowa State from Puerto Rico to participate in last summer's Wind Energy Science, Engineering, and Policy Research Experience for Undergraduates program.

Photo courtesy of Christopher Neary.

symposium showcases students'

summer wind energy research

For 10 weeks last summer, 11 students from universities across the country came to Ames to participate in research, group projects, industry trips, and more as part of Iowa State's new Wind Energy Science, Engineering, and Policy Research Experience for Undergraduates (REU). The program culminated on August 4 when the 11 students participated in an ISU Wind Energy Science, Engineering, and Policy Symposium, held in 3043 ECpE Building Addition.

At the symposium, the students presented a topic, ranging from the materials of wind turbines, to the environmental impacts of wind farms, to how wind will become a major U.S. energy source.

For one student, wind energy research is a lifelong passion and thousands of miles in the making. Cristian Lopez, a senior in a five-year electrical engineering program at the University of Puerto Rico, was one of the 11 chosen for ISU's REU program.

"We are developing our whole (energy) future now through wind energy research," says Lopez, who focused on solar/wind hybrid research at the University of Puerto Rico before coming to Ames. He spent his 10 weeks at Iowa State studying the effects of wind power and how it affects investment in America's power grid for the next 40 years.

Gene Takle, professor of geological and atmospheric sciences, and **James McCalley**, Harpole Professor in Electrical Engineering, led the REU this year.

"Our goal here is to produce both undergraduate and graduate programs in wind energy. Students must understand the political, scientific, and engineering aspects of wind energy to make it a major energy source," Takle says.

Two ISU aerospace engineering students, Christine Kirpes and Aaron Rosenberg, and two ISU materials engineering students, Chad Macziewski and Zachariah Rueger, participated in this year's REU class along with seven students from other universities across the country such as Humboldt State University (California), Louisiana State University, Penn State University, South Dakota School of Mines, and Rochester Institute of Technology (New York).

Several ISU engineering faculty, including ECpE's McCalley, Assistant Professor **Dionysios Aliprantis**, and postdoctoral research associate **Venkat Krishnan**, mentored the students during the summer REU. The REU program was funded by the National Science Foundation. •

more online

For details on Iowa State's NSF Wind Energy Science, Engineering, and Policy REU program, visit *www.windenergy.iastate.edu.*

student

honor roll

Congratulations to the following student award winners:

- **Daniel Congreve** (BSEE '10), former graduate student in electrical engineering, and **Roy Lycke** (BSCpE '11), former graduate student in computer engineering, both won National Science Foundation Graduate Research Fellowships.
- Graduate students **Carl Deakyne**, **Mirzad Mohandespour**, **Brian Peck** (BSEE '10), and **Justin Rilling** (BSEE '09) each received an ISU Teaching Excellence Award.
- **Sasha Kemmet-Oster** (BSEE '07; PhDEE '11) and **Kanwar Nalwa** (PhDEE '11), both former PhD students in electrical engineering, each won a Spring 2011 ISU Research Excellence Award.
- **Yang Li**, PhD student in electrical engineering, won an IEEE Antennas and Propagation Society Doctoral Research Award for his proposal, "Design of a Non-Metallic, Low-Loss Metamaterial Planar Superlens at Microwave Frequency."
- **Amit Pande** (PhDCpE '10) received the 2011 ISU Zaffarano Prize for Graduate Student Research.
- **Zijun Yan** (PhDEE '11), a former PhD student in electrical engineering, and **Xiao Yang** (PhD Bioinformatics '11), a former PhD student in bioinformatics and computational biology, both won a Summer 2011 ISU Research Excellence Award. •

more online

For more information on student awards, visit *www.ece.iastate.edu/news/*awards.

Computer engineering student Taehyun Park spent a week at Google Android Camp in Mountain View, California.

Photo courtesy of Taehyun Park.

computer engineering student attends first

google android camp

Taehyun Park, sophomore in computer engineering, was one of 26 college students invited to Mountain View, California, for the first Google Android Camp. Over the course of the weeklong camp held June 5–11, the students met with and attended seminars given by top Google engineers.

"At Google, we are committed to helping the innovators of the future," says Andrew Neginskiy, university programs specialist for Google. The company believes open source development is a very useful and accessible way for students to get involved with computer science and engineering in a practical and rewarding manner.

Neginskiy was looking for the most passionate applicants to attend the camp. "For this program we looked for students who have a strong academic background, as well as proven Java experience," he says. "In addition, we are always excited to see students who find genuine interest in and are passionate about computer science and technology, and pursue their interests both in and out of class."

According to the camp registration website, applications were open to all freshmen and sophomore students majoring in computer science, computer engineering, and software engineering at a four-year university. Applicants also were asked to have a strong math background, among other qualifications.

Park, who was selected from hundreds of applicants, graduated from Sunrin Internet High School in Seoul, Korea, a specialized high school that prepared him for the information technology field.

"During high school, I self-studied advanced networking, operating systems, and programming," explains Park. "I obtained the CCNA certificate at the end of the first year and the SCJP certificate during my last year." According to the Cisco website, the Cisco Certified Network Associate (CCNA) certificate "validates the ability to install, configure, operate, and troubleshoot medium-size route and switched networks." The Sun Certified Java Programmer (SCJP) certification proves knowledge of the programming language.

In addition to being president of his high school class and Network Club and winning a grand prize in a hacking competition sponsored by the South Korean government, Park's résumé also includes extensive volunteer service, honors, and a startup company that began as a project at the Google Android Camp.

The camp itinerary included "interactive and collaborative curriculum focusing on a practical introduction to developing applications for Android." The attendees also explored the concepts behind Android, the framework for constructing an application, and the tools for developing, testing, and publishing software for the platform. They also had the opportunity to attend a San Francisco Giants baseball game and visit the California Academy of Sciences.

"Our goal is that these 26 campers walk away from this experience with the knowledge and tools necessary to continue to grow technically and develop their skills," says Neginskiy. "This program offers a dynamic and exciting environment for students to utilize the concepts they learn in class in a real-world setting, where they can see immediate results and impact."

Park says he was excited that the campers had a lot of field experience. "It is really tough to find other freshmen and sophomores with good programming skill sets. I was looking forward to working on a project and making connections with them."

During the camp, Park attended several workshops and other activities. "Talking with Google interviewers was really useful," he says of one of the workshops. "I learned about the interviewing process, how it works, and what I need to focus on to prepare for an interview."

The scheduled events ended around 8 p.m., and all of the campers used the evenings to develop apps, a project that was assigned to them.

"Although we stayed up until 2 to 3 a.m., no one complained about it, and I enjoyed the atmosphere," Park says. "My team has still been developing the app we started to build at the camp, and we recently decided to form an enterprise."

Park highly recommends the camp. "It adds to my other experiences and taught me a lot," he says. "The camp would be a good opportunity for anyone interested in the Android platform." •

–Article courtesy of InnovateOnline, http://innovate.engineering.iastate.edu

ecpe postdoctoral research associates'

research in brief

Seven postdoctoral research associates work in the ECpE department and contribute greatly to the department's research efforts. Below are highlights of four postdocs and their recent research. Look for research highlights from ECpE's other postdoctoral research associates in the Spring 2012 *ECpE Connections*.

Juan Jose Jaramillo is developing algorithms to efficiently stream real-time video using peer-to-peer (P2P) networks, allowing content providers to deploy scalable architectures that can cope with the exponential growth of streaming services over the Internet. By better understanding how the arrival and departure of peers can impact the quality of service, Jaramillo and his collaborators are creating mechanisms that allow peers to disseminate video in dynamic P2P networks with improved streaming quality.

The problem with existing approaches is that they do not mitigate the effects of content loss due to peer departures, and they do not efficiently exchange information under limited bandwidth constraints. Recent results show it is possible to overcome such problems while maintaining scalable networks, allowing media providers to offer better service with minimal infrastructure.

Jaramillo's research is funded by the National Science Foundation (NSF) and the Defense Threat Reduction Agency. **Lei Ying**, a Northrop Grumman assistant professor, is Jaramillo's advisor.

Julie A. Rursch (MS JLMC '88) is creating a decision support tool that models critical infrastructure and assets using real-time data to assist emergency planners and first responders in disaster situations. Unlike current approaches where data from infrastructure-specific models are aggregated to provide a composite view of a disaster, the unified framework Rursch is developing includes heterogeneous critical infrastructure components such as roads, bridges, rail systems, water treatment facilities, power grids, telephone systems, and cyber networks, as well as their interdependencies and interactions. The homogeneous backplane used for the project is an interconnected IP network model. All physical critical systems and their corresponding real-time physical data are transformed into IP network nodes, IP traffic, and node data, which can be processed on ISU's Internet-Scale Event and Attack Generation Environment (ISEAGE) test bed.

Rursch's tool, named the Critical Infrastructure Modeling and Response Environment (CIMoRE), provides emergency planners and first responders with resilient and flexible critical infrastructure evaluation in the face of nonrecurrent, disruptive events. CIMoRE's primary goal is to create a new paradigm for modeling critical infrastructure sectors, analyzing real-time physical data, and providing best-fit mitigations to impending failures and responses.

Rursch is working collaboratively with the Iowa Homeland Security and Emergency Management Division and the Iowa Department of Administrative Services to incorporate iterative feedback into her tool. Rursch's advisor is University Professor **Doug Jacobson** (BSCpE '80; MSEE '82; PhDCpE '85).

Venkat Krishnan (MSEE '07; PhDEE '10) is one of the developers of a national long-term electrical and transportation planning software, National Energy and Transportation Planning (NETPLAN), which is related to an ongoing $2 million NSF research project, NETSCORE-21 (short for "The 21st Century National Energy and Transportation Infrastructures Balancing Sustainability, Costs, and Resiliency" research project). NETPLAN helps researchers find the best infrastructure investments, including a future generation portfolio for the entire country for the next 40 years. Krishnan is responsible for modeling the operational effects of renewable generation's variability within the expansion planning software, as well as incorporating the capability to find cost effective, sustainable, and resilient solution strategies into the software.

Krishnan's advisor is **James McCalley**, Harpole Professor in Electrical Engineering.

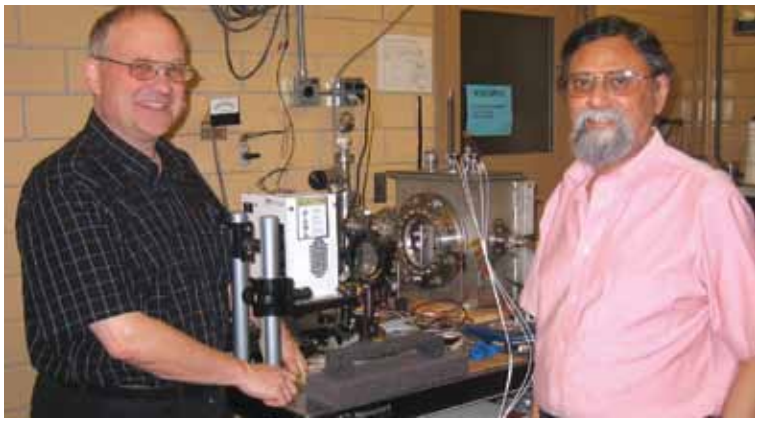
Ikenna Nlebedim is developing suitable instrumentation for studying the magnetostrictive and magnetoelectric components of the multiferroic composite. His goal is to create a novel functional multiferroic material using ferrimagnetic cobalt ferrite that he previously worked on. The multiferroic composite will consist of magnetostrictive and electrostrictive components for magnetoelectric sensor development. The research involves modeling and simulation using multi-physics applications capable of capturing the physics involved and the coupling between the components. Nlebedim's research also includes a nondestructive approach to determining stress-depth relationships in ferromagnetic components using magnetic Barkhausen signals, aimed at preventing catastrophic damage in structures.

In addition to his research in multiferroic composite and Barkhausen signals, Nlebedim contributes to research in Transcranial Magnetic Stimulation (TMS) for noninvasive activation of brain neurons. TMS is useful for studying brain functions and has potential applications in both diagnostic and therapeutic studies of psychiatric and neurologic diseases.

Nlebedim's advisor is **David C. Jiles**, Palmer Department Chair in Electrical and Computer Engineering and Anson Marston Distinguished Professor. •

more online

For more information on ECpE department research, visit *www.ece.iastate.edu.*



Vikram Dalal, *right,* and graduate student Robert Mayer, *left,* stand in front of the stability testing apparatus for organic solar cells.

dalal receives
ibm faculty award

The search for eco-friendly energy sources is a worldwide affair, and researchers are drawing closer to new innovations every day. Among this group of determined professionals is **Vikram Dalal**, Thomas M. Whitney Professor in Electrical and Computer Engineering.

Dalal, who is working to advance solar energy, recently received the 2011 IBM Faculty Award. IBM has awarded Dalal $38,000 to aid his research. "I am delighted that IBM has recognized the value of innovation in solar energy," he says.

Because of the threat of pollution and the potential energy that rests in the sun, solar energy has become a leading alternative to carbon producing energy systems. The National Academy of Engineering, which presents "Grand Challenges" each year, has made solar energy affordability a top priority for engineers. Dalal's response to this challenge rests in a more efficient solar photovoltaic cell.

"We are developing photo cells based on materials that both absorb light and conduct electricity," he explains. Dalal says a photovoltaic cell is based on the principle of light absorption, a process wherein light gets absorbed by a material and creates electrons that can be collected. He adds that to collect the maximum amount of light, the material must be able to more efficiently harvest the entire spectrum of visible light.

The cells Dalal and his research team are working with are made of organic materials, which are known to absorb light very well but are poor at conducting electricity. To address this issue, Dalal and his team have developed a new architecture that combines an inorganic material with an organic material, and he says preliminary experiments are producing promising results.

For these solar cells to become a reality, the design must reach 10 percent efficiency. "Right now we are at about 6 percent. We hope to get to 10 percent using this new concept, and that will take about two to three years," Dalal says.

If Dalal's group reaches its goals, the future of solar energy dramatically will be changed. Most importantly, solar energy will be modified into an affordable source of energy. Structural costs substantially will decrease as the new material is used as a coating on windows. Clients seeking solar energy would simply install these "solar windows" in their buildings rather than using expensive solar panels.

Thanks to the IBM Faculty Award, Dalal will be able to make significant headway in his research. "The funds I received will go towards equipment purchases and to support some of the activities of my graduate and undergraduate students," he says.

The IBM Faculty Award is an annual worldwide competitive program. Each year, IBM employees nominate someone they believe has an outstanding reputation for contributions in their field. Dalal, nominated by IBM senior manager **Karl Erickson** (MSEE '98), was one of 240 nominations this year. In 2011, the company recognized 84 recipients representing 74 institutions and 33 countries.

As Dalal continues working towards more efficient solar cells, he hopes recognition like this award from IBM will help make Iowa State a leader in the solar energy industry. His connection to the university has been an important element in his research as other funds, such as his endowment fund from the Thomas M. Whitney Professorship, have provided him with finances needed to support his research and graduate students. Dalal says he is thankful that the university has been a great promoter of his research over the last 23 years. •

–by Kelsey Schirm

helping biologists understand
microorganisms

Research Assistant Professor **Jaroslaw Zola** is collaborating with **Srinivas Aluru** (MSComS '91; PhDComS '94), Mehl Professor in Computer Engineering, to develop new algorithms to help biologists better classify metagenomic sequences and gain a better understanding of the role microorganisms play in their environments. Zola and Aluru's approach combines advanced text preprocessing techniques to detect resemblance between DNA sequences and a formal graph-theoretic model of a cluster. Zola says that their approach allows classification of short DNA sequences at different taxonomic levels, a unique feature of the method.

"Typical metagenomic data consist of millions of DNA fragments that come from microbial organisms directly extracted from environmental samples," Zola says. "Recent studies show that in most cases only half of the genes discovered in a metagenomic sample come from known species."

Understanding genetic composition of metagenomic samples has profound implications for medicine, agriculture, and investigations of changes in ecosystems, explains Zola. For instance, microorganisms in a gastrointestinal tract in humans and animals can influence the host's physiology and metabolism, particularly in the context of obesity and its related diseases.

"Because the problem is computationally challenging, we are developing a parallel software based on map-reduce paradigm that can be executed on computational clouds consisting of thousands of interconnected processors," Zola says. "Thanks to this, the software can process metagenomic samples that otherwise could not be analyzed." •

Dalal photo courtesy of the College of Engineering.

professor's research aims to improve

wireless networks


Lei Ying

Wireless technology has important civilian and military applications in today's world. Wireless networks, unlike wired networks, suffer uncertainties, including unreliable channels, time-varying topologies, and bursty traffic flows, making it extremely difficult to provide reliable high-speed, low-delay communications.

To reduce and ultimately prevent these uncertainties, Northrop Grumman Assistant Professor **Lei Ying** and his research team are developing innovative theories, network architectures, and protocols that support reliable, responsive, and high-speed wireless networks. "We are working on new network architectures that are self-organizing without centralized control, self-healing under failures and attacks, and support fast and high-speed communications," he says.

Ying and his team have developed new network architectures and protocols that reduce transmission latencies by two orders of magnitude in certain traffic regimes, meaning their protocols can deliver information hundreds of times faster than current algorithms. The research team also has invented self-organizing, self-healing algorithms that enable networks to automatically recover connectivity and communications upon node and link failures.

"Our networks control algorithms that require only local and partial network information for making data transmission decisions, such as link scheduling and packet routing, and do not require centralized network controls," Ying says. "When nodes or links fail, the network itself will automatically redirect traffic flows over undisrupted routes to get to the destinations."

Ying's next step focuses on communication fabric for cyber-physical systems, including networked physical devices such as smart grids, military ad hoc networks, and vehicular networks. Ying says highly dynamic networks require reliable and responsive communications for coordinating physical elements for various uses.

"Traditional network designs are for static networks and are not suitable for cyber-physical systems, where the traffic consists of short, bursty, deadline-constrained messages mixed with occasional long streams of data. Our next focus is to develop network architectures to support heterogeneous, time-constrained traffic generated by cyber-physical systems, such as collision warnings, road sign alarming, and real-time traffic information in vehicular networks, and command and control messages, streams of video, and sensed data in robotic systems and mobile sensor networks."

Ying says his team's proposed theories and algorithms for general wireless networks can be used in many of today's emerging applications and networks, including delivering multimedia over wireless networks, such as mobile television; in mission critical wireless networks, such as citywide wireless mesh networks for public safety and emergency response; and in wireless sensor networks for monitoring, medical care, and border security.

Ying's team includes postdoctoral research associate **Juan Jose Jaramillo** and graduate students **Xiaohan Kang**, **Shihuan Liu**, **Ming Ouyang**, **Bhavani Satyanarayana Rao**, **Weina Wang**, **Shan Zhou**, and **Kai Zhu**. The research is funded by the National Science Foundation and the Defense Threat Reduction Agency. •

ecpe faculty lead high-throughput computational biology

dean's research initiative

Researchers in the ECpE department are establishing a research initiative in high-throughput computational biology as part of the new Dean's Research Initiatives announced last spring. The initiative received a $500,000 grant to use over three years to build public-private teams by partnering with faculty and researchers from other colleges, universities, federal laboratories, and industry to compete for and win multi-million dollar grants, spur economic development, and drive technologies that benefit Iowa and the nation.

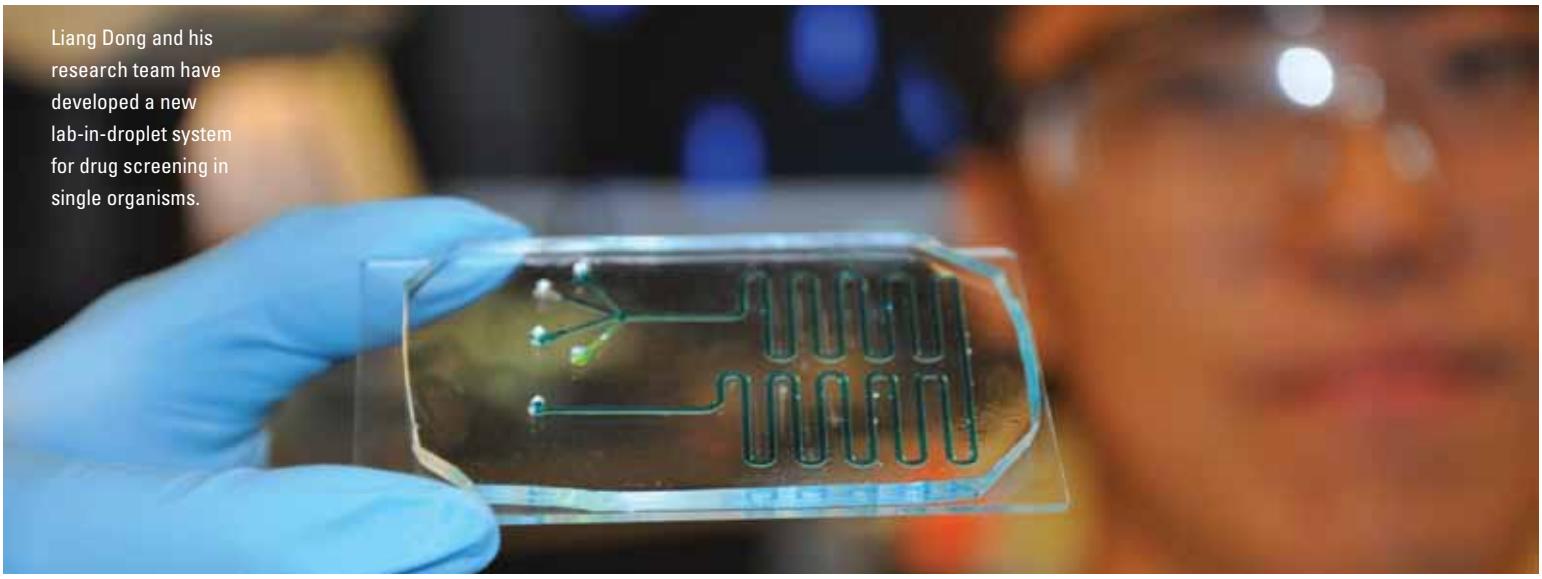
Srinivas Aluru, Mehl Professor in Computer Engineering, is leading the high-throughput computational biology initiative. He and ECpE faculty **Julie Dickerson**, **Liang Dong**, **Santosh Pandey**, and **Aditya Ramamoorthy** are conducting fundamental and applied research in modern computational genomics and systems biology arising from the emergence and increasing prominence of high-throughput instrumentation.

"Instrumentation that generates a high volume of data is becoming commonplace in modern biology and life sciences. At the same time, emerging technologies in computing, such as multicore computers and many-core graphics processors, are providing a way to implement high performance and high-throughput computing at modest costs," Aluru says. "The goal of our Dean's Research Initiative in High-Throughput Computational Biology is to marry the two fields and develop and deliver solutions for high-throughput computational biology using high performance computing."

The center is focusing on critical computational challenges arising from the development of new technologies, such as next-generation DNA sequencing; fundamental and long-term research pursuits, such as systems and synthetic biology driven by heterogeneous data-intensive approaches; and development of bioinformatics methods for advancing technologies designed at Iowa State, such as microfluidic technologies for phenotypic discovery.

"The Dean's Research Initiatives provide significant resources to create interdisciplinary research groups and nurtures a critical mass to pursue big engineering and science projects," Aluru says. "From what I know at other universities, such an initiative is rare, if not unique. It already has helped us form research teams."

So far, Aluru's team has partnered with IBM, Illumina, Micron Technology, Monsanto, Pacific Biosciences, and Roche. In the coming year, the group will work to submit several large research proposals. •



Liang Dong and his research team have developed a new lab-in-droplet system for drug screening in single organisms.

Photo courtesy of Liang Dong.

nsf awards boost

materials, devices, and circuits research

Two faculty members in the newly established materials, devices, and circuits strategic research area recently received major boosts in their research funding. **Ayman Fayed** and **Liang Dong**, both assistant professors, each recently were awarded National Science Foundation (NSF) grants for groundbreaking research projects they are leading.

efficient power delivery schemes for systems-on-chip

Fayed was selected to receive a $359,885 three-year NSF grant to develop new highly efficient power delivery schemes for mixed-signal Systems-on-Chip (SoCs) that achieve higher power efficiency and lower implementation cost.

Fayed's goal is to replace existing power delivery schemes in electronic devices with energy-efficient, cost-effective, and small footprint alternatives that will significantly increase the running time of energy-restricted portable devices. "Electronic devices that are currently not plausible due to their unrealistic size, cost, and battery life needs will become technically and economically feasible. This includes applications such as biomedical implants, self-powered sensor grids, and remotely-deployed communication/navigation devices," Fayed says. "Devices with strict thermal efficiency requirements, such as multicore processors, will also benefit greatly from this work."

The research, which is a collaborative project with Texas Instruments, is focused on leveraging the ultra-high speed-to-power ratio of sub-65 nanometer complementary metal–oxide–semiconductor (CMOS) technologies to enable implementation of fully integrated switching regulators.

The project is currently in the system design phase. "This includes the modeling of passive components in 65 nm/45 nm CMOS, as well as passives implemented on the package substrate. Preliminary design of a 600 MHz fully-integrated buck regulator is underway using these passive components," Fayed says. "The next step is to evaluate the different types of conduction and switching losses in our proposed fully-integrated regulator and evaluate its efficiency, followed by test chip fabrication in 65 nm."

smart droplet microfluidics for drug screening

Dong is leading a research effort to develop an integrated lab-in-droplet system for parallel screening of drug resistance in parasites. The system could be used to develop new drugs to treat parasites in humans, animals, plants, and against tropical diseases.

According to Dong, nematode parasites cause massive environmental and economic loss, and these parasites have developed drug resistance. Because existing drug screening technologies are time-consuming, new techniques for screening drug compounds against these parasites are in high demand. "Current methods lack the throughput and informational content needed to adequately test one or a range of drugs, and real-time observation of drug effect is not possible," Dong says. "The total time for one experiment is 4 to 6 hours—even for a trained nematologist."

Dong and his team have developed a new lab-in-droplet system that, in just minutes, generates thousands of microdroplets that provide various drug-coded pharmacological libraries, and they have tested the drug response of some nematodes using the system.

Ultimately, the total time used to obtain several hundreds of dose responses could be less than 10 minutes for even a person with minimal training. "The lab-in-droplet system will be able to generate drug-coded pharmacological droplet libraries, stimulate worm movement, and measure electrophysiological signals for worms," Dong says.

"Our next step will be working on integrating microelectronics into the system to measure electrophysiological signals for worms," Dong says. "Nematode worms generate transient currents and potentials during movement, and these signals can be used by biologists to conduct electrophysiological analysis."

This project, which is a collaborative work between ECpE faculty and animal scientists at the ISU College of Veterinary Medicine, is funded by a $359,999 three-year NSF grant and a McGee-Wagner Interdisciplinary Research Fund Award. Members of Dong's research team include Assistant Professor **Santosh Pandey** and College of Veterinary Medicine faculty members Richard Martin and Alan Robertson. •

ecpe researchers develop tools for

recycling in the digital space

Two ECpE researchers are starting a new trend in recycling, shifting from conserving materials like paper and aluminum cans to being more resourceful with digital space. The unique concept, called bandwidth recycling, is a response to the unprecedented changes taking place in the mobile industry.

Many of these changes are a result of the growing popularity of multimedia applications running on smartphones and mobile applications, which places bandwidth availability in high demand. This trend creates logistical problems that Professor **Morris Chang** says his bandwidth recycling project can solve.

Chang and graduate student **David Chuck** have been working together to bring innovation to the mobile computing industry that will revamp the newly introduced 4G network. Their project, aimed at decreasing bandwidth waste, has made a promising emergence that can lead to further developments in the industry.

the launch of a new network

Mobile carriers have come to expect quicker technology from the industry, prompting service providers to shift from the existing 3G network to an enhanced 4G network. The switch to 4G allows mobile carriers to use Internet Protocol, as well as experience a substantial increase in data speeds and smoother transitions between cell towers and networks when on the move.

"Another important feature of 4G is the Quality of Service (QoS) agreement, which ensures you will not have any delay on your video playback," says Chuck. "To guarantee this service, a reservation-based method is adopted in 4G technologies."

The reservation method works by determining the quality level needed to playback a video. For example, if a user wanted to watch a video at 10 megabits per second (mb/s), the provider makes sure that the 10 mb/s is available at all times. While a video may take up to 10 mb/s at times, there will be times when it uses less space, creating bandwidth waste.

creating a simple, effective solution

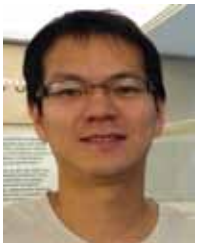
To formulate possible solutions for bandwidth waste, Chang and Chuck first needed to assess the depth of the problem. "We found that 30 percent of bandwidth was not being used, giving us a good range for improvement," says Chuck.

Chang and Chuck created a protocol with a simple, yet effective design by utilizing four scheduling algorithms to transfer the unused bandwidth to other users. The simplicity of their new protocol allows it to be added onto the existing protocol for the 4G network, so carriers won't have to reconfigure their network.

Deciding how to allocate the recycled bandwidth is based on a scale of priorities. Tasks that don't have a strict QoS, including web browsing and file downloads, would have low priority. Higher priority would be reserved for things such as Voice-Over-Internet Protocol (VOIP) and videos. "The use of recycled bandwidth cannot be expected on a regular basis, but if a high-priority task produces unused bandwidth, we can allow other users to recycle this bandwidth for low priority tasks," explains Chuck.

The researchers developed a variety of protocols before finding the best option. The earliest version of their protocol resulted in an improvement of about 15 to 20 percent. After experimenting with scheduling algorithms, improvement percentages began to increase, and eventually the protocol reached a high of about 80 percent, averaging out at 40 percent improvement of network throughput.

Morris Chang



David Chuck

patiently awaiting a patent

Chang and Chuck are in the process of patenting their work. They were approved for a professional patent through the Iowa State University Research Foundation (ISURF), and the U.S. patent is currently pending. Once the project receives a U.S. patent, ISURF will begin licensing the technology.

"We are hoping that as the 4G network becomes more populated, the value of our technology will become more obvious to cell phone carriers," says Chang. "We are happy to see our project has been well-received within the research community and look forward to seeing the future acceptance by the industry. As a researcher in engineering, there is nothing more rewarding than that."

continuing to advance mobile technology

Chang and Chuck say their work in mobile networks is far from finished. Future projects include producing a "greener" network, something Chuck says he and Chang accidentally stumbled across in their bandwidth recycling project. "At the time, we weren't concerned with saving energy, but we know that our protocol can also save some energy." •

–Article courtesy of InnovateOnline, http://innovate.engineering.iastate.edu

Photo courtesy of David Chuck.

chaudhary receives

nsf career award

Assistant Professor **Sumit Chaudhary** was awarded a $400,000 National Science Foundation (NSF) CAREER Award for his project "Utilizing Ferroelectrics for Multifaceted Device Engineering of Polymer Solar Cells."

Chaudhary's project continues his effort to improve organic solar cell efficiency and also improve the technology for widespread applications. In the short-term, he hopes to increase the efficiency of the cells from 5 percent to almost 10 percent, which would be useful in charging small electronic devices. By introducing ferroelectrics into the organic layers used to fabricate polymer solar cells, Chaudhary hopes to make the technology available to consumers in the near future. •

more online

For details on Sumit Chaudhary's NSF CAREER award research, visit *www.ece.iastate.edu/news.*

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ecpe professor directs iowa state's

strengthening of the professoriate

In February 2011, Professor **Diane Rover** (BSComS '84; MSCpE '86; PhDCpE '89) began her appointment as faculty director of Strengthening the Professoriate (SP@ISU), a project started in summer 2010 to support faculty, postdoctoral associates, and advanced graduate students in science, technology, engineering, and mathematics (STEM) as they develop broader impact activities for National Science Foundation (NSF) proposals and integrate these activities into their research. The SP@ISU also provides professional recognition for faculty members' broader impacts work through the promotion and tenure process.

Broader impacts of research are important factors in determining which grant proposals will receive NSF funding. According to NSF, broader impact activities could include advancing discovery while promoting teaching and learning, broadening participation of underrepresented groups, enhancing the infrastructure of research and education, broadly disseminating the research to enhance scientific and technological understanding, and conducting research that benefits society.

SP@ISU aims to strengthen the professoriate by enabling professional development in STEM, while promoting and enhancing a diverse community of scholars and learners.

"The goals of the SP@ISU program are intended to make faculty aware of resources and programs on campus that will make the broader impacts plans in their proposals more competitive and effective, more relevant to their research plans, and more beneficial to their own professional development and advancement," Rover says.

For example, Rover says that instead of proposing an activity from scratch, a professor could work with ISU's Science Bound program, which has established relationships with urban schools in the Des Moines area, to support minority student interest in STEM. Alternately, a professor could work with ISU's Science Communications program to more effectively inform the public and policymakers about the impact of their research.


Diane Rover

Throughout its first year, SP@ISU has initiated some innovative programming that professors can build on, including the development of Web resources that contain information about campus programs, and literature to support broader impacts' effectiveness and to promote upcoming events.

SP@ISU also has offered multiple workshops to provide information to faculty and established a network of experts on campus that research project principal investigators can refer to for assistance in developing a broader impacts plan.

SP@ISU is funded by a five-year award from the NSF Innovation through Institutional Integration program. The ISU Office of the Executive Vice President and Provost and Office of the Vice President for Research and Economic Development provide additional institutional support. •