



IOWA STATE UNIVERSITY

CONNECTIONS

The Department of Electrical and Computer Engineering Newsletter for Alumni and Friends | Spring 2008

New Building Addition Opens

ECpE Celebrates Centennial

Garmin Establishes ECpE Scholarships



MORE NEWS:

- Alumnus Reflects on Creating World's First Portable Phone
- Students Develop UAVs
- Prof. Ajjarapu Named IEEE Fellow

IT Olympics Brings H.S. Students to Campus

Letter from the Chair

Dear alumni and friends,

Beginning this spring, our Department of Electrical and Computer Engineering (ECpE) will celebrate two major milestones: 100 years of our department and the completion of our new, \$16.5 million building addition.

We will kick off our centennial celebration during VEISHEA weekend April 12-13 by inviting alumni, former and current faculty, students, and friends to join us for cake, refreshments, and a short celebration in our new building following the VEISHEA parade (see page 16 for details). We're also putting together a photographic history book, which alumni will find in their mailboxes later this summer.

The new building, completed this semester, provides state-of-the-art facilities to our students and researchers. It will house all of our department's research and teaching labs, as well as three new classrooms (page 5).

In addition to these two special milestones, our department also is celebrating our other successes, including the growth of our PhD program. Our PhD enrollment has jumped in the last year due to concerted recruitment efforts by our faculty. We now have 180 PhD students studying in our program and providing research assistance to our 43 faculty members. Our master's degree programs are growing, too. Currently, 93 students are enrolled in our on-campus and distance education programs. In the near future, our department will offer distance education programs in all of our master's degree areas and expand our concurrent BS/MS program, where Iowa State undergraduate students can start earning credits toward a master's degree during their senior year.

And as always, our faculty, students, and alumni continue to excel. Professor **Suraj Kothari** received an award for innovative teaching (page 3), Professor **Venkataramana Ajjarapu** was named an IEEE Fellow (page 4), and our researchers continue to earn prestigious grants to pursue cutting-edge research (see pages 6, 7, and 8 for examples).

As we begin celebrating our centennial and building grand opening, we thank all students, alumni, faculty, staff, industry partners, and donors who have contributed to our department's success in the past and who we know will continue to help us excel in the future. ■



Arun K. Somani

Department Chair

Anson Marston Distinguished Professor

Jerry R. Junkins Chair Professor

IOWA STATE UNIVERSITY



IN THIS ISSUE

departmentNEWS

Ajjarapu Elected IEEE Fellow page 4

IT Olympics Interests High School
Students in IT Careers page 4

Coover Building Opens,
Centennial Celebration Begins page 5

Chu Receives U.S. Patent
for FastPlace Software page 5

New Faculty & Staff page 6

Iowa State & Community College
Earn \$2 Million Grant page 6

ECpE Hosts IEEE EIT 2008 page 16

Calendar of Events page 16

researchNEWS

Qiao's Team Receives
NSF CyberTrust Grant page 7

Vaswani Earns Grant to
Study Nonlinear Change Detection page 8

ECpE Researchers Featured on
International Society's Web site page 8

studentNEWS

Undergraduate and Graduate
Students Win Awards page 10

Grad Student Develops Micro
UAVs and System to Secure
America's Power Grid page 11

Senior Design Students Help
Community, Use New Technologies page 12

IEEE Student Chapter Grows page 13

alumniNEWS

Class Notes page 14

Alumni Awards & Achievements page 14

Alumnus Wins Award for
Creating First Portable Phone page 15

Photo courtesy of Craig Carroll Photography.

Spring 2008 | Vol. 24 Issue 2

Department Chair: Arun K. Somani

Newsletter Editor: Dana Schmidt

Faculty Newsletter Coordinator: Srinivas Aluru

Published twice a year by the Department of Electrical and Computer Engineering, 2215 Coover Hall, Iowa State University, Ames, IA 50011-3060; www.ecp.e.iastate.edu; schmidt@iastate.edu, (515) 294-3071. © 2008

Cover illustration: New Coover Hall building addition by OPN Architects.

If you're planning a gift to the ECpE department, please visit www.foundation.iastate.edu/gift or contact Keith Fortmann, (515) 294-4280 or kfortman@iastate.edu.

Iowa State University does not discriminate on the basis of race, color, age, religion, national origin, sexual orientation, gender identity, sex, marital status, disability, or status as a U.S. veteran. Inquiries can be directed to the Director of Equal Opportunity and Diversity, 3680 Beardshear Hall, (515) 294-7612.

Garmin Establishes Scholarships for ECpE Undergrads

Garmin International has announced that Iowa State University is one of eight universities at which the Kao Family Foundation is establishing scholarships for electrical and computer engineering undergraduate students. The Kansas-based Garmin International is part of a group of companies that designs, manufactures, markets, and sells navigation, communication, and information devices and applications—most of which are enabled by Global Positioning System technology. Garmin provides products to the automotive, mobile, fitness/outdoor recreation, marine, and aviation markets.

"This is a great recognition of the high quality of our electrical and computer engineering program at Iowa State," says **Arun K. Somani**, ECpE department chair. "Industry is acknowledging the value of our students as future employees and is willing to support their education. We thank Garmin for its support and hope to continue to build relationships with other industry partners in the future."

The Kao Family Foundation was established by Min H. Kao, Garmin's co-founder and CEO. The Garmin Electrical and Computer Engineering Educational Initiative is designed to help improve the United States' competitiveness in an increasingly technological society.

Garmin will award eight \$5,000 scholarships per year to Iowa State electrical and computer engineering students. Junior and senior scholarship recipients, named "Garmin Scholars," also will be given first consideration for one of more than 75 annual paid internship opportunities at Garmin. Preference will be given to students who have education, experience, and/or interest in at least one of the following fields: analog circuit design, digital circuits/

system design, electronic devices and applications, microprocessor architecture, embedded software engineering, RF/microwave circuit design, and digital signal processing.

"It is my hope that this program will help attract the best and brightest students in the field of electrical and computer engineering," says Kao. "We believe that this combination of scholarship money and hands-on experience at one of the world's premier electronics design and manufacturing companies will inspire college students to commit to an engineering career."

To qualify for a scholarship, applicants must be full-time students pursuing an electrical and computer engineering degree. They also must achieve and maintain a satisfactory grade point average. Past recipients will be given priority to renew their scholarship and internship yearly, based on eligibility. ■



Garmin representatives recruit students at the Engineering Career Fair.

Faculty & Staff Receive Awards and Honors

The ECpE department congratulates the following faculty and staff members for their recent achievements:

■ **Jason Boyd**, lab coordinator, was named one of the first recipients of the College of Engineering's Staff Exceptional Performance Awards. The award recognizes staff members' exemplary service to their departments, the college, and university.

■ **Gary Bridges**, electronic technician and building supervisor, was honored for his service to Iowa State and the ECpE department by being inducted into the university's 35-Year Club.

■ **Stephanie Drake-Zierke**, account clerk for the Electric Power Research Center (EPRC), was inducted into Iowa State's 25-Year Club for her service to

the EPRC, ECpE department, and university.

■ **Suraj Kothari**, professor, and his software company, EnSoft Corp., won the \$25,000 top prize in the second annual statewide John Pappajohn Business Plan Competition. The prize was awarded during the Iowa Venture Capital and Entrepreneur Conference in Des Moines, Iowa. The Technology Association of Iowa also awarded the 2008 Prometheus Award for Innovation in Teaching to Kothari and Innovator of the Year to his company, EnSoft.

■ **Mani Mina**, senior lecturer, received an award for teaching and leadership from Iowa State's Engineering Student Council.

■ **Diane Rover**, professor; **Zhao Zhang**, assistant professor; and graduate students **Daniel Helvick** and **Ramon**



Suraj Kothari (right) receives a 2008 Prometheus Award.

Mercado won the Best Paper Award for their paper, "Reflections on Implementing and Teaching an Advanced Undergraduate Course in Embedded Systems," published in the *Proceedings of the 2007 International Conference on Microelectronic Systems Education* last June. ■

Ajjarapu Elected IEEE Fellow

Professor **Venkataramana Ajjarapu** recently was named a Fellow of the Institute of Electrical and Electronics Engineers (IEEE). This honor recognizes outstanding IEEE members for their significant accomplishments in the advancement or application of



Venkataramana Ajjarapu

engineering, science, or technology and for their contributions to the mission of IEEE.

Ajjarapu came to Iowa State in 1986 after receiving

his PhD in electrical engineering from the University of Waterloo in Canada. Throughout his career, he has won numerous awards, including the National Science Foundation Research Initiation Award, and has been invited to give lectures at many national and international conferences. He also has served as the chair of IEEE's voltage stability focus group, a member of the Korean Institute of Electrical Engineer's editorial advisory board, editor for IEEE *Power Engineering Letters*, and faculty adviser for Iowa State's IEEE student chapter.

Ajjarapu's research focuses on power system security (with an emphasis on reactive power dispatch and voltage security), real-time control of power, and power electronics systems. His work has been published in 112 articles, more than 40 of which were published in reviewed journals, reports, or proceedings.

He joins the ranks of seven other current Iowa State EC&E professors who have received this honor: **Randall Geiger, Ratnesh Kumar, Mark J. Kushner, Chen-Ching Liu, James McCalley, Arun K. Somani,** and **Robert Weber.** ■

IT Olympics Interests High School Students in IT Careers

On April 25, nearly 400 high school students from 40 Iowa high schools will descend on Hilton Coliseum in Ames to compete in the first annual IT Olympics—a two-day capstone event where students battle in cyber defense, robotics, and video game design activities to showcase the information technology (IT) knowledge they have gained throughout the year as part of the IT Adventures program.

"The goal of IT Olympics is to get kids, parents, teachers, business representatives, and spectators excited about the opportunities in IT," says **Doug Jacobson**, professor and director of the IT Adventures program. "It's a celebration of IT and its impact on society."

IT Adventures is an innovative program that engages Iowa high school students in exploration and experimentation with IT through content delivery, competitive events, and service learning projects. Participating schools form IT Clubs to provide avenues for students to gain access to learning materials from Iowa State University; experiment with provided equipment in an inquiry-based learning environment; and ask questions of IT professionals, university faculty, college students, and other high school students.

The IT Olympics event expands on

smaller Cyber Defense Competitions that Iowa State held in 2006 and 2007, which brought kids from the IT Adventures program to campus to compete in a contest to ward off computer hackers in a virtual Internet environment.

"We have already seen an impact on many of the students that participated in the Cyber Defense Competition, and IT Olympics will impact even more kids this year," says Jacobson. "Next year, we plan to take IT Adventures national with state competitions feeding into a national IT Olympics in Ames."

In addition to competing at the IT Olympics, high school students will have the opportunity to visit booths set up by corporate partners and participate in a panel discussion to learn more about careers in the IT industry.

IT Adventures is a partnership among Iowa State's Information Assurance Center, the Iowa Department of Economic Development, the Technology Association of Iowa, the Iowa chapter of InfraGard, and other local Iowa businesses, including Hy-Vee Food Stores and FBL Financial Group.

The public is invited to attend the IT Olympics competition. For more details, visit www.it-adventures.org. ■



Students prepare for the Cyber Defense Competition in 2007.



Team Red works to stop computer hackers in a virtual Internet environment.

Coover Building Addition Opens

The new addition to Coover Hall, the home of the ECpE department at Iowa State, is now complete. This addition contains 23,000 square feet of new space for students and research activities. It houses all of the department's state-of-the-art teaching and research labs, plus three classrooms. The project is the first phase of a multi-phase, \$38.8 million project to renovate electrical and computer engineering facilities on campus.

The \$16.5 million building addition was funded in part by state funds and private donations. The ECpE department thanks the individuals and organizations who have contributed to this building.

"We are pleased to announce the opening of our new building," says ECpE Department

Chair **Arun K. Somani**. "This additional space will provide an outstanding learning, teaching, and research environment for our students, faculty, and staff."

A dedication and naming ceremony for the building will be held this semester. ■



For more pictures of the new building (above) visit www.ecp.ece.iastate.edu and Click the Coover Building Renovations link.

Chu Receives U.S. Patent for Innovative FastPlace Software

When **Chris Chu**, associate professor, and his former master's student **Natarajan Viswanathan** described their software, FastPlace, at the International Symposium on Physical Design in 2004, reviewers almost rejected it because no one believed it. They thought it was too good to be true and asked



Chris Chu

Chu to verify it. He did, and the paper earned a Best Paper nod that skyrocketed the software from obscurity to a prominent spot on the radar screens of the country's top computer companies.

Now the software's makers have achieved another feat: They've received a U.S. patent for the software.

FastPlace is a VLSI placer that is an order of magnitude faster than anything seen before—reducing the time from hours to minutes. And if you're a computer engineer who's fitting millions of circuit devices on a silicon chip the size of a fingernail, you welcome this tool to help you speed up your ability to arrange the devices' interconnections.

Since 2004, several circuit companies have expressed interest in FastPlace. And because of the software's success, Viswanathan left his job at Micron Technology to return to Iowa State to pursue his PhD and work on other VLSI placement problems. ■

ECpE Kicks Off Centennial Year

For 100 years, the Iowa State ECpE department has been providing an outstanding education to electrical and computer engineering students and creating innovative technology. An event kicking off our yearlong celebration will be held in

conjunction with VEISHEA, the university's annual spring celebration, in April (see page 16). The timing of this event is quite fitting since an electrical engineering professor, **Frank Paine**, submitted the winning moniker in 1922 to name the university's spring celebration. The letters in the name stand for the original colleges at Iowa State: V—Veterinary Medicine, E—Engineering, IS—Industrial Science, HE—Home Economics, A—Agriculture.

The department was formed in 1909 when it split off from the Department of Physics. Throughout the years, Iowa

State electrical and computer engineers have played an integral role in developing many technologies we use today: **Clifford Berry** (BSEE '39, MS physics '41, PhD '48) helped create the world's first electronic digital computer; **David Nicholas** (BSEE '67, MSEE '68, PhDEE '71) invented the encoding process that helped make fax machines a staple in office equipment; and **Thomas Whitney** (BSEE '61, MSEE '62, PhDEE '64) led the Hewlett-Packard team that designed and built the first handheld scientific calculator.

This summer, alumni will receive a photographic history book commemorating the department's first 100 years. This book will showcase everything from a 1912 field trip students took with the department's first chair, Fred A. Fish, and the Cyclone Computer developed in the 1950s, to CyBot created in the 1990s and research labs throughout the department's history. ■



New Faculty & Staff Join ECpE Department

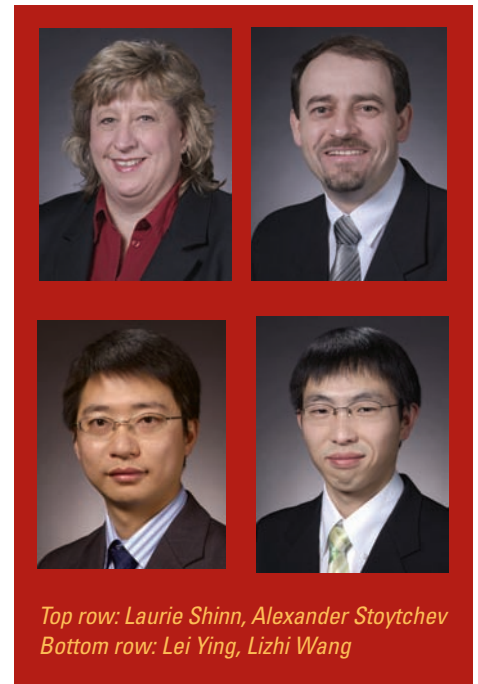
The ECpE department recently welcomed several new faculty and staff, including the following:

Laurie Shinn, accounting secretary, came to Iowa State last October after spending five years as an office manager. In her position with ECpE, she will process reimbursements and coordinate purchasing for the department, among other duties. She received a bachelor's degree in business from William Penn University in January.

Alexander Stoytchev, assistant professor, comes to the ECpE department after two years as an adjunct assistant professor of computer science at Iowa State. Stoytchev's research interests are in developmental robotics, autonomous robotics, machine learning, and computational perception. He is currently a principal investigator and/or co-principal investigator on several research projects receiving nearly \$8 million in federal and industry funding. He received his bachelor's degree from American University in Bulgaria in 1997, and his master's and PhD degrees from Georgia Tech in 2001 and 2007, respectively.

Lei Ying, assistant professor, joins ECpE from the University of Illinois at Urbana-Champaign, where he received his PhD in 2007. He also received a master's degree from the University of Illinois at Urbana-Champaign in 2003 and earned his bachelor's degree from Tsinghua University in Beijing, China, in 2001. He was the recipient of the University of Illinois' Vodafone Fellowship, and in the summer of 2005, he worked at IBM's T.J. Watson Research Center. His research interests include wireless sensor networks, resource allocation in wireless networks, and mobile ad hoc networks.

Lizhi Wang, courtesy assistant professor, joined Iowa State in the fall 2007 semester. His research interests include operations research with applications in decision-making under uncertainty in electric power systems, as well as engineering sustainability. He also is an assistant professor in Iowa State's Department of Industrial and Manufacturing Systems Engineering. He received two bachelor's degrees in automation and



Top row: Laurie Shinn, Alexander Stoytchev
Bottom row: Lei Ying, Lizhi Wang

management from the University of Science and Technology of China in 2003, and a PhD in industrial engineering from the University of Pittsburgh in 2007. ■

Iowa State and Community College Earn \$2 Million

A five-year, \$2 million grant from the National Science Foundation (NSF) will help Iowa State University and Des Moines Area Community College (DMACC) encourage students to study science, technology, engineering, and mathematics. The grant sends \$1.5 million to Iowa State and \$500,000 to DMACC.

Diane Rover, associate dean of academic programs in the College of Engineering and ECpE professor, is leading the NSF project for Iowa State.

The program's goal, Rover says, is to boost the number of Iowa State students earning a bachelor's degree



Diane Rover



Mani Mina

in engineering by 120 per year beginning in 2012. The project also calls for women to account for 20 percent of Iowa State's undergraduate engineering graduates and

minorities for 10 percent. (Iowa State's 2005 class of undergraduate engineering graduates included 15 percent women and 9 percent minorities.)

Rover says the project's goal of increasing the number of Iowa State engineering graduates by 120 students will be a challenge. But she believes it's a realistic one.

"We want this to work," she says. "We want students to have educational and career opportunities made possible through engineering. We want parents, teachers, and other mentors to encourage today's youth to study science and engineering and become tomorrow's leaders addressing energy,

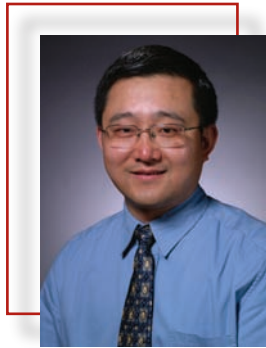
Qiao's Team Receives NSF CyberTrust Grant

The National Science Foundation has awarded a three-year, \$250,000 CyberTrust Grant to a team of Iowa State University researchers, including **Daji Qiao**, EcpE assistant professor; Wensheng Zhang, assistant professor of computer science; and Johnny Wong, professor of computer science. The CyberTrust Grant supports the trio's efforts to develop an integrated solution to provide confidentiality, integrity, and reliability protection for sensor data management.

"This grant helps to expand my research horizon to new areas such as sensor networking security and wireless networking security in general," Qiao says.

Sensor networks are widely deployed for military and civilian use, and have become an indispensable segment of national cyber infrastructure. For example, the military uses sensor networks to monitor the concentration levels of hazardous gas on the battlefield and to track vehicles, and industry uses sensor networks to monitor the structural health of high-rise buildings and bridges.

In sensor networks, sensor nodes sense continuously and generate data to describe the environment. Once data have been generated, the network manages sensor data such that useful data are stored safely and authorized users can access data in which they are interested. Meanwhile, sensor nodes usually are deployed in unattended, even hostile, environments, and they typically lack tamper resistance. Because of this, sensor data management is susceptible to various security attacks. Although a few schemes have been proposed against selected attacks, the limitations are salient: They lack protection for emerging sensor data management approaches, disrupt normal data management operations, have high



Daji Qiao

overhead, lack adaptability to balance security level and system overhead, and offer no systematic solutions to counter multiple types of attacks at the same time.

To address these issues, Qiao and his research colleagues will design an integrated solution to provide novel privacy, confidentiality, integrity, and reliability protection for sensor data management. The project includes four components: location privacy protection, data confidentiality protection, data integrity protection, and data reliability protection. These components will be integrated via a carefully designed hierarchical and modular software structure, and be evaluated through a combination of model checking, simulation, and implementation on a sensor network test bed. The project will contribute to the development of innovative solutions for protecting sensor networks. It also will train a diverse cadre of young scientists, students, and professionals in wireless networking and security and, most importantly, enhance security for cyber infrastructure. ■

Grant to Increase Engineering Graduates

health, and many other issues."

To accomplish those goals, Iowa State and DMACC will:

- enhance the engineering learning communities at Iowa State and make some programs available to community college students. DMACC also will create its own learning communities. Learning communities allow students with similar academic interests to take classes together and live in the same residence halls.
- redesign the first-year curriculum for engineering students and make some courses available to community

college students via distance education technology.

- develop and enhance advising and mentoring programs.
- establish a recruiting and outreach network across the state with the help of alumni, Iowa State University Extension, and DMACC. The network will help students, parents, and teachers understand the benefits of an engineering education and career.
- share success stories and best practices with other universities and community colleges.

"This NSF program is a tremendous

opportunity for Iowa State University," says Elizabeth Hoffman, Iowa State's executive vice president and provost. "It will help Iowa State meet the national goal of recruiting and retaining new engineering students. And, it will help Iowa State reach its goals of strengthening undergraduate education, increasing experiential learning opportunities, and partnering with community colleges to facilitate student success."

Mani Mina, senior lecturer, also is involved in the project, along with many other Iowa State officials. ■

Vaswani Earns Grant to Study Nonlinear Change Detection for Biomedical Applications

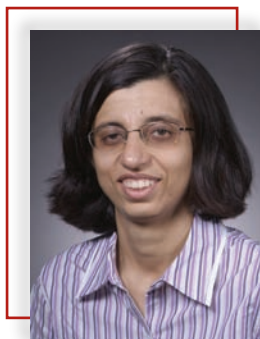
A patient's heartbeat pattern changes and his doctors instantly are notified. An abnormal brain shape is detected as a neurosurgeon is performing an image-guided surgery, allowing her to make crucial decisions to save the patient's life. A person engaging in suspicious activity while deplaning at the airport is recognized and authorities are alerted immediately.

These scenarios illustrate the possible applications of **Namrata Vaswani's** new change detection research, which recently was given a boost thanks to a \$265,529 National Science Foundation grant. Vaswani, an assistant professor, is planning to develop and analyze algorithms so tracking applications can detect both slow and sudden changes and take corrective action as soon as possible. Current technology and research mostly covers change detection in linear systems and sudden changes in nonlinear systems, not slow changes in nonlinear systems. Vaswani's research

will address these slow changes in noise-corrupted nonlinear systems.

"Change detection is required in most tracking applications," says Vaswani. "In fact, the inability to detect and adapt to gradual changes is the main reason that most practical trackers diverge after some time and need to be re-initialized. Re-initialization is expensive and prone to errors."

Vaswani's work proposes a novel approach that uses the fact that slow changes get partially tracked and uses this "tracked part of the change," for detection. In addition, her work also will delve into the stability of particle filters—a recently introduced method for tracking nonlinear systems—to model errors induced by changes and then use this analysis to design more robust tracking methods.



Namrata Vaswani

For example, during a police car chase, a suspect who's attempting to get away from officials may accelerate or brake after traveling for a distance at a constant speed.

The suspect may do this either suddenly or gradually, or while starting to maneuver a turn. With technology created from Vaswani's research, the police car will be able to detect immediately those changes in speed so the police officer can adjust his or her car's speed accordingly.

The research also could be applied in areas such as positioning, navigation, and defense applications that require target tracking; video-based surveillance that requires abnormal behavior detection; and biomedical signal and image sequence analysis applications where abnormalities can indicate disease. ■

Three ECpE Researchers Featured on International Society's Web site

The work of three ECpE researchers has been featured on the SPIE Web site (www.spie.org). SPIE is an international society for advancing an interdisciplinary approach to the science and application of light.

Rana Biswas, adjunct associate professor and research scientist at the Ames Laboratory; **Gary Tuttle**, associate professor; and **Preeti Kohli**, a former ECpE graduate student are featured along with Kai-Ming Ho, distinguished professor of physics, in a technical article about

using three-dimensional photonic crystals (PCs) as add-drop filters.

According to the article, Tuttle, Biswas, Kohli, and Ho developed an add-drop filter with a microwave-scale layer-by-layer PC that was created extensively at the U.S. Department of Energy's Ames Laboratory and Iowa State University with a complete band gap from 11 GHz to 12.9 GHz, for all directions of wave propagation. The add-drop filter contains no leakage to the outside—something that was an "inherent problem with both two-dimensional PCs



The SPIE Web site showcases research conducted by ECpE's Rana Biswas, Gary Tuttle, and Preeti Kohli.

and add-drop filters using ring resonators."

At press time, the complete article is available online at spie.org/x15275.xml?highlight=x2414. ■



Fill out this form online!
Visit www.ece.iastate.edu/alumni (click Alumni News Form).*

We want to hear about your career moves and personal news for future issues of *ECpE Connections*. You're welcome to enclose photos; however, we can't return them. We need your help, too, with gifts to the department's scholarship funds, lab facilities, building improvements, student organizations, and other departmental activities. If you're making a contribution to Iowa State, please consider designating it for the Department of Electrical and Computer Engineering using the form below. Please enclose your pledge or gift with your news, and mail it to: Iowa State University, Department of Electrical and Computer Engineering, Attn: Communications Specialist, 2215 Coover Hall, Ames, IA 50011-3060. Also, feel free to give us a call at (515) 294-2664 or e-mail us at schmidt@iastate.edu (subject line: Newsletter).

Name: _____ Graduation Year: _____
Address: _____
City: _____ State: _____ Zip: _____ Country: _____
Home Phone: _____ Business Phone: _____
E-mail Address: _____
News I'd Like to Share: _____

I want to help the ECpE department remain the best!

Please contact me about supporting:

- ☐ endowed chairs and professorships
- ☐ scholarships and fellowships
- ☐ laboratories and classroom space
- ☐ Coover Building Project Fund

I'd like to support the:

ECpE Excellence Fund

- ☐ \$1,000
- ☐ \$500
- ☐ \$250
- ☐ Other \$ _____

Other Fund[†] _____

- ☐ \$1,000
- ☐ \$500
- ☐ \$250
- ☐ Other \$ _____

Payment Type:

- ☐ Check enclosed (payable to ISU Foundation) ☐ Credit Card Select Type: ☐ Visa ☐ Mastercard ☐ Discover

Credit Card Number: _____ Name as shown on the credit card: _____

Expiration Date: _____ Cardholder Signature: _____

*Only the Alumni Information Form is online. Contributions must be sent via standard mail.

[†]For more information on the funds, contact Keith Fortmann (515-294-4280 or kfortman@iastate.edu).

Thank You!

07 EC8:03

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

Undergraduate and Graduate Students Win Awards

The ECpE department congratulates the following students who recently received recognition for their excellent work:



Matt Swanson

■ **Kyle Byerly** and **Matt Swanson**, both seniors in computer engineering, received honorable mentions in the Computer Research Association's 2008 Outstanding

Undergraduate Award competition. The award recognizes students in North American universities who show outstanding research potential in an area of computing research.

■ **Kyle Byerly** also won the Research Internships in Science and Engineering Scholarship sponsored by the German Academic Exchange Service and the Databases and Distributed Systems group at the Technical University of Darmstadt in Germany.

■ Graduate students **Baozhen Chen** and **Chengwu Tao**, along with Assistant Professor **Santosh Pandey**, received

the Best Student & Postdoc Paper Award at the Institute of Electrical and Electronics Engineers (IEEE) and National Institute of Health's Biomedical Information Science and Technology Initiative conference on Life Science Systems and Applications in November 2007. The paper was titled, "A Novel Floating-Gate Biosensing Device with Controlled Charge-Modulation."

■ Graduate students **Samarjit Das** and **Daniel Stieler** each received a university Teaching Excellence Award, which recognizes and encourages outstanding achievement by graduate



Michael Frederick

students in teaching.

■ **Michael Frederick**, graduate student in computer engineering, earned a Best Paper Award at the IEEE's 15th International Conference of Computer Design.

His paper, which was coauthored by ECpE Department Chair **Arun K. Somani**, was titled, "Non-arithmetic Carry Chains for Reconfigurable Fabrics."

■ **Harsh Goel**, sophomore in computer engineering, was selected as a Cyclone Aide for 2008. Cyclone Aides help new students transition to the university.

■ **Alex Sheng Huang**, senior in electrical engineering, was named the Outstanding Member of Iowa State's IEEE student chapter.

■ Graduate students **Vinod Shukla**, **Vikas Yadav**, and **Lu Zhang** each won a university Research Excellence Award. The award recognizes graduate students at the time of their graduation for outstanding research accomplishments as documented in their theses and dissertations.

■ **Cory Simon**, senior in computer engineering, received the Dean's Student Leadership Award. The award recognizes exemplary leadership by juniors or seniors in one or more major college, university, community, or professional organizations. For more information on Simon, see the article in our Fall 2007 *ECpE Connections* (available at www.ece.iastate.edu/alumni). ■



IOWA STATE UNIVERSITY
Dept. of Electrical and Computer Engineering
Attn: Communications Specialist
2215 Coover Hall
Ames, IA 50011-3060

Please place
stamp here.



Graduate Student Develops Micro UAVs and System to Secure America's Power Grid

PhD student **Koray Celik** started his engineering career as a young child in Turkey. From an early age, he played with cables and other gadgets to figure out how they worked. Now at Iowa State University, he's married his hobby—model aviation—with his research interests—machine vision—to develop a multifunction optical sensor design for flying micro autonomous vehicles. He also has created a system for real-time monitoring of power grids.

For Celik's first project in 2006, he worked with Department Chair **Arun K. Somani** to develop a system for obtaining a complete physical health and electrical performance picture of power systems in real time.

"Our NSF-supported research aimed to monitor power lines against sabotage and natural disasters, as well as prevent blackouts like the one in New York City in 2003," Celik says.

Celik and Somani created a system based on a cluster hierarchical model with a multi-hop wireless sensor network in a sublinear topology. In the system, each power tower is equipped with multiple sensors, a Webcam the size of a ping-pong ball, and a cluster head (aka gateway). Like a burglar alarm, the sensors monitor their surroundings and provide information about intruders. If the sensor detects suspicious behavior—such as an animal roaming

where it shouldn't, a human trying to rip down power lines, an abandoned object, or a conductor breaking—it can report the activity to other sensors in the cluster, and then send that information to the gateway, the brains of the system. The gateway then passes the information to another gateway and another until it reaches a monitoring station. It then provides the monitoring station with a description and picture of the problem and details regarding any dangers it poses so the electric company can take appropriate action.

The system also has a deterrent—a speaker in the system that warns humans participating in suspicious behavior that they are being monitored.

"The biggest challenge for the machine vision aspect is actually the amount of processing power it takes," says Celik.

Celik's research was featured on a 2006 newscast on Des Moines, Iowa's NBC affiliate as well as in *New Scientist* magazine. His next step is to build a larger prototype and conduct real-life testing in a test bed provided by Great River Energy, an electric power company based in Elk River, Minnesota.

Celik's second research project began when Rockwell Collins came to the university looking for someone to create lightweight sensors for unmanned autonomous vehicles (UAVs). Celik started working on the project right away and developed technology for a 1-pound helicopter to fly at 40 mph while carrying a small Webcam. The UAV used a video stream to navigate itself, and could be used in urban environments to navigate around large concrete buildings. Celik created a horizon detection algorithm to detect the sky's horizon and a platform attitude detection algorithm to measure the helicopter's banking angle.

"It was supposed to be a semester project, but I developed the core system of



Graduate student Koray Celik tests the micro UAV he developed for Rockwell Collins.



The micro UAV weighs 10 pounds and flies at speeds up to 100 mph.

phase one and demonstrated it to Rockwell Collins in two weeks," Celik says.

Rockwell Collins then added requirements to the phase, making it more challenging. When the first phase was completed successfully, Rockwell Collins added a second phase and extended the project funding. As part of this, Celik investigated a helmet-mounted system for pilots that would allow a soldier in unknown territory where GPS is unavailable to record his moves and generate a map for him to use to trace his original path.

Celik also is continuing to work on an avionics computer design project with Iowa State's aerospace engineering department to create an outdoor model of his micro UAV that weighs 10 pounds and flies at speeds from 90 to 100 mph at a sustained altitude of 1,000 feet. He hopes to publish his research next year and develop his doctoral thesis on vision-guided navigation of unmanned aircraft in crowded areas. ■



This model shows how stations along America's power grid could be disrupted by roaming animals.

Senior Design Students Help Community, Experiment with New Technologies

Helping the Blind See

Imagine you can't see anything and you're in the kitchen trying to cook a meal for your family. How do you know you're choosing the right ingredients? Four Iowa State students—seniors **Ryan Boesch**, **Samora Mogaka**, **Sumarlin William**, and **Grant Jennings**—tried to solve this problem last fall in their senior design course.

The group worked for two semesters on a handheld, wireless device that scans product barcodes and wirelessly sends the information to a Bluetooth transmitter and receiver that generates an audio message to describe the product. The project picked up where a previous senior design group left off in 2005, and was supported by the Iowa Department of the Blind.

The students, who worked a total of 800 hours on the project, say they had to make sure the device could transmit data at least 30 feet, through rooms of a house, as well

as ensure the device was easy to use, had a battery life longer than 10 minutes, and an audio signal that sufficiently exceeded the noise—all for under \$150.

They designed and tested their device, and learned a great deal through the obstacles they encountered during the project. One obstacle, in particular, involved rewriting old software that had come with the scanner.

"I rewrote the program in Python," says Boesch.

The group also came across challenges trying to find the right parts. "It was difficult

because with a small budget, we needed to have confidence our plan would work ahead of time," says Jennings. "Final integration of the components brought challenges as well, because it was difficult to get each piece connected without harming the work we had already done."

The students say if they continued developing their product further, they could create an algorithm to quickly upload

barcode data from online resources, as well as perhaps a stationary scanning center a person could set up in his or her kitchen that could provide two lasers to more easily scan products.

The group's faculty adviser was Assistant Professor **Zhengdao Wang**.

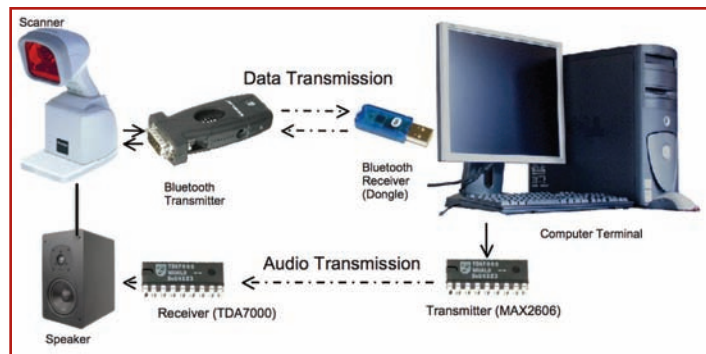
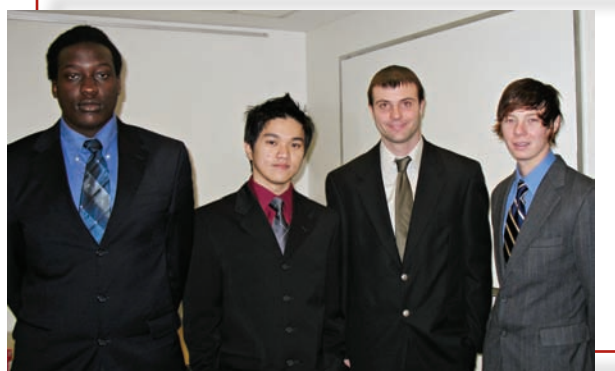
Exploring UAVs

Sixteen students from the ECpE department are currently working on an ongoing, interdisciplinary senior design project to create an unmanned aerial vehicle (UAV), a helicopter that autonomously hovers and maneuvers, as well as has navigation capabilities.

"Previous senior design students have developed a large portion of the flight control software and hardware components," says **Brandon Weber**, the project's student leader and a senior in computer engineering. "Our group is



The interdisciplinary senior design team is working on MicroCART, an unmanned aerial vehicle that can fly autonomously. The team hopes to add navigation capabilities to their model. Greg Smith (far left) is the group's faculty adviser.



Top Left: Samora Mogaka, Sumarlin William, Ryan Boesch, and Grant Jennings prepare for their final senior design presentation. Bottom Left: This diagram shows the wireless device the senior design group created.

IEEE Student Chapter Grows, Becomes More Active

By Shane Griffith, IEEE Student Chapter President

working to ensure full integration of the system and full operation.”

Weber adds that the group's primary goal is to run flight tests and make changes to the flight control software to ensure proper autonomous flight.

A key challenge the group has faced is the turnover of new members on the project, since it's an ongoing senior design project that continues from year to year.

“We had a steep learning curve of the project in addition to the difficulty of keeping the project well-documented from semester to semester,” Weber says. “We have to deal with components shorting out and are forced to rework concepts to produce a working, flying helicopter.”

But Weber says this year's group—which includes students from computer engineering, electrical engineering, and aerospace engineering—is highly skilled and has pooled its resources to solve hardware and software issues.

Weber and the group will test their UAV three times this spring and then present their final product to a panel of industry professionals and their ECpE faculty adviser in May. Lockheed Martin is funding the project. **Greg Smith**, senior design program coordinator, is the group's faculty adviser. Weber's ECpE team members include electrical engineering seniors **Minh Nguyen, Karl Svec, and Yan Zhang**, as well as computer engineering seniors **Matt Beecher, Alex Brokman, Drew Crawford, Mike Dent, Jason Funk, Andrew Laird, Matthew Peyton, Si Jun Sung, and Ehren Van Auken**.

The senior design group plans to submit the UAV to the International Aerial Robotics Competition at the University of Georgia after they successfully complete the project. ■

Throughout the academic year, the Iowa State Institute of Electrical and Electronics Engineers (IEEE) student chapter has grown in size and significance through meeting academic, industrial, and community goals. In the fall, membership increased by more than 150 students. The group also held pizza sales nearly every week to raise funds for the group, published three editions of *The Relay* (the chapter's newsletter containing interviews with professors, event schedules, and crossword puzzles), and facilitated communication between students and the department through a curriculum forum.

Additionally, the group hosted

information sessions and resume and interview tip sessions by Texas Instruments, Micron, National Instruments, and Burns & McDonnell, providing excellent opportunities for students to network with industry professionals.

IEEE also helped support the Engineering Survival Program and Society of Women Engineers' Halloween Village by providing funds earned from t-shirt sponsorships and other allocations.

In the spring semester, IEEE continued its previously established activities, such as publishing *The Relay* and hosting another curriculum forum, as well as added two new activities to its repertoire. The first

involved having Lockheed Martin representatives conduct mock interviews in February to give students a chance to perfect their interviewing skills prior to the career fair. For the second activity, the chapter is teaming up with the Information Assurance Student Group in April to run the first annual IT Olympics event for high schools (see more on IT Olympics on page 4). ■



IEEE students attend information sessions presented by companies such as Burns & McDonnell to learn about jobs in industry and network with industry professionals.

Iowa State Hosts National Cyber Defense Competition

Iowa State hosted the 2nd annual National Cyber Defense Competition in February. The event attracted college students from across the country. For the contest, the students spend three weeks setting up a network of computers, and then defend their networks against “hackers,” representatives from companies such as Principal Financial Group, Pricewaterhouse Coopers, FBL Financial, and HNI. The seven student teams participating in this year's competition came from Iowa, Illinois, Nebraska, Indiana, and North Carolina. The winning team was from the University of Northern Iowa and was led by Paul Gray. Two Iowa State teams placed second and third, and were led by liberal arts student James Musal and ECpE graduate student **Dan Harkness**. ■

Class Notes

Find out what your college classmates are doing now.

1960s

Jack H. Barmore (BSEE '62) of Clearwater, Florida, worked for Honeywell Space Systems on many of the satellites and space shuttles after he graduated. He retired in 1991. Barmore passed away September 27, 2007.

1980s

Bruce Young (BSCpE '81) of Lemars, Iowa, is the director of system architecture for Jabil Circuit. He has global responsibility for the technical aspects of Jabil's LCD TV business. E-mail: bruce@youngtogether.com

Scott Lind (BSEE '89) of Madison, Wisconsin, is currently working as a senior electrical engineer for the largest healthcare design firm in the country, HDR. The Madison office is a new one for HDR charged with doing primarily integrated design-build healthcare work. Most of his career since graduation has involved integrated design-build work in both healthcare and large indoor

waterpark resorts. On a personal note, Lind and his wife are in the final stages of a 14-year project to completely dismantle, move, and rebuild a large Victorian house and carriage house in southwest Wisconsin. They did the same with a barn in the middle of this project.



Lind's newly renovated home

2000s

Carrie Gofron (BSCpE '01) of Chicago, Illinois, worked at Motorola for six years (including her internship) and recently took a job with Pícel Technologies in software sales. Pícel Technologies creates applications for mobile phones. E-mail: cgofron@yahoo.com ■

In the Fall 2007 *ECpE Connections*, the "In Memoriam" article listed James Miller (BSEE '48) as deceased. To be precise, James H. Miller (BSEE '48) passed away and not James L. Miller (BSEE '48), who currently resides in Arizona. *ECpE* regrets the error.

ECpE Alumni Awards & Achievements

The ECpE department congratulates the following alumni on their recent prestigious career achievements:

■ **Kenneth Batchner** (BSEE '57), a professor of computer science at Kent State University, received the Seymour Cray Computer Science and Engineering Award from the Institute of Electrical and Electronics Engineers' (IEEE) Computer Society. The award recognizes innovative contributions to high performance computing systems that best exemplify the creative spirit demonstrated by Seymour Cray, a U.S. electrical engineer and supercomputer architect who founded Cray Research company.

■ **John "Jack" Cosgrove** (BSEE '56) was presented with the Anson Marston Medal at Iowa State's 2007 Homecoming celebration. The Anson Marston Medal, which was



John "Jack" Cosgrove

established in 1938, honors alumni for achievements in engineering and for professional prominence. It is the highest honor the college bestows and is named for Iowa State's first engineering dean.

Cosgrove is a retired president of Rockwell Collins in Cedar Rapids, Iowa, a world leader in commercial and military avionics and communications. Cosgrove has served advisory boards for many university units and supports many Iowa State programs.

■ **James M. Daughton** (BSEE '59; MSEE '61; PhDEE '63) has been named a 2008 co-recipient of the prestigious IEEE Daniel E. Noble Award. The award is sponsored by the Motorola Foundation and presented by IEEE. It recognizes individuals for fundamental contributions to the development of magnetoresistance devices for non-volatile, high-density, random-access memory. Daughton is the founder of NVE Corporation, holds 40 U.S. patents, and previously worked at Honeywell and IBM.

■ **James Knighten** (PhDEE '76) was awarded a Technical Achievement Award

by the IEEE Electromagnetic Compatibility Society in July 2007. The award honors outstanding contributions to the understanding of EMI noise coupling paths in high-speed digital systems including power distribution network design and differential signaling in printed circuit boards. Knighten now works for Teradata Corporation (formerly, the Teradata Division of NCR Corp.).

■ **Donald Linder** (BSEE '65) earned GlobalSpec's Great Moments in Engineering Award this year for his work on the Motorola team that developed the world's first portable phone in 1973. (See page 15 for details.)

■ **Hunter Menning** (BSEE '85) was awarded the Accrediting Commission of Career Schools and Colleges of Technology's National Teacher of the Year Award. He competed with teachers from more than 800 technical colleges for the honor.

■ **John D. Shors** (BSEE '59) received the Iowa State Bar Association's Award of Merit. The award is given annually to one

Continued on next page

Alum Receives Award for Creating First Portable Phone

When **Donald Linder** (BSEE '65) was a young research engineer at Motorola—just seven years out of college—he never imagined the impact the portable phone he and his team were developing would have on American culture and other people worldwide.

"It's difficult for people these days to imagine not having cell phones, but back then there was no wireless communication other than two-way radios and they needed channels to operate on," says Linder.

In December 1972, Motorola executives challenged its employees to create the world's first portable phone in an attempt to add competition to the telephone market, which at that time was dominated by AT&T.

Linder, who was then an assistant section manager, drew up a plan and some diagrams for how the Motorola engineers could accomplish the executives' demands. Linder's plan was approved and he immediately began leading the team in the design and construction of the portable phone.

"We built it out of parts already available, some new parts, and two custom integrated circuits not even completed at the time we started the project," says Linder. "We relied on the talent and experience of the people building each of the pieces to make it work. It was nothing like putting together a rocket to go to the moon, but it was a team effort."

Linder says the main challenges of the project were the schedule—because Motorola wanted the project completed in a hurry—as well as developing the new integrated circuits and creating a portable device that people could talk and listen to at the same time—a far cry from the two-way portable radios Motorola engineers already were developing for police departments, fire departments, taxi companies, and trucking companies.

"The integrated circuits that were going to be used to dial numbers and receive calls were completely experimental," Linder says. "The two new circuits being designed had a key position in the phone and the wafers weren't out of the diffusion furnaces until the very end. It was a high-risk project to get them to work on the first pass."

Luckily, the circuits worked on their first try. So about three months after the project's initiation, the team celebrated their success: the creation of the world's first portable phone, the DynaTAC Portable. The phone, nicknamed "The Brick," weighed nearly three pounds and was about 10 to 12 inches long, 4 inches wide, and 2 ½ inches thick.

Recently, Linder and his engineering team were awarded the Great Moments in Engineering Award from GlobalSpec, an



Donald Linder

online search service and publishing company for engineers.

"We could never at that time have anticipated having something so small that it would slide into your pocket and be lost," says Linder. "To us, portable was something you could carry and maybe strap onto your belt. We never imagined it would be something every citizen would be able to use."

He says creating the first portable phone was one of the most rewarding experiences of his career. "We did it when I was fairly young in my career and the lessons I learned in that and similar projects are what more or less formed the pattern for any future success I had."

Linder retired from Motorola as a corporate vice president and director of the cellular subscriber research department in 2001. During his career, he was named a Motorola Distinguished Innovator and was a member of Motorola's Science Advisory Board Associates. He also earned about 15 U.S. patents and received a master's degree from the Illinois Institute of Technology.

"It's actually pretty neat technology," says Linder about cell phones. "Having that type of communication capability really does change the way people live their lives." ■

Continued from previous page

member of the 8,000-member association. Shors is the past president of the Iowa State Bar Association and past chair of the ISU Foundation. Shors lives in Des Moines, Iowa.

■ Three ECpE alumni received the Iowa State College of Engineering's Professional Achievement Citation in Engineering at the 2007 Homecoming festivities. **David Lilja** (BSEE '81), **Mark Law** (BSCpE '81), and **Peter Loeppert** (BSEE '74; BSComS '74) each received the award,

which recognizes superior technical or professional accomplishments in research, development, administration, education, or other engineering activity.

Lilja is the professor and head of the electrical and computer engineering department at the University of Minnesota. He also is a fellow of the Minnesota Supercomputing Institute.

Law is a professor and department chair of electrical and computer engineering

at the University of Florida. He currently serves as co-director of the Software and Analysis of Advanced Materials Processing Center at that university. He has written more than 200 papers and advised 17 PhD students.

Loeppert is the vice president of research and development at Knowles Acoustics (formerly Knowles Electronics). He holds more than a dozen patents. ■

Calendar of Events

Upcoming events sponsored by the university, college, and ECpE department.

April 11-12

VEISHEA

Iowa State University; Visit www.veishea.iastate.edu for event details.

April 12

ECpE Centennial Celebration Kickoff

Coover Hall, 1 to 3 p.m.

April 15

Iowa State University Undergraduate Research Symposium

Memorial Union, 8 a.m. to 5 p.m.

April 17 & 18

ECpE Spring External Advisory Board Meeting

Coover Hall, Event times vary



The VEISHEA celebration is an annual spring tradition that began in 1922.

April 24

ECpE Spring Scholarships, Honors, and Awards Banquet

Scheman Building, 5:30 p.m.

April 25-26

IT Olympics

Hilton Coliseum; Visit www.it-adventures.org for event details.

May 9

Graduate Commencement

C.Y. Stephen's Auditorium, 8 p.m.

May 10

Undergraduate Commencement

Hilton Coliseum, 1:30 p.m.

May 18-20

IEEE EIT 2008 Conference

Scheman Building; Go online to www.eit-conference.org/eit2008 for program schedule and registration details.

September 19

Fall Engineering Career Fair

Hilton Coliseum, 1 to 6 p.m.

Visit our Web site at www.ece.iastate.edu for additional details and up-to-the-minute information on departmental events and seminars. For information on events sponsored by the College of Engineering, go to www.eng.iastate.edu. ■

ECpE to Host IEEE's EIT 2008 Conference

The ECpE department will host the Institute of Electrical and Electronics' Engineers (IEEE) 2008 Electro/Information Technology (EIT) Conference in Ames, Iowa, May 18-20. The conference focuses on basic/applied research results in the fields of electrical and computer engineering as they relate to information technology and its applications. The purpose of the conference is to provide a forum for researchers and industry professionals to exchange ideas and discuss developments in this growing field. In addition to technical sessions, there will be exhibits showcasing the latest electro/information technology tools and products. The conference also offers an opportunity to engage in professional development, workshops, and tutorials.

The conference is sponsored by IEEE Region 4, as well as two technical sponsors: the IEEE Power Engineering Society and IEEE Antennas and Propagation Society. Industry sponsors, who supply funding for the conference, include Lockheed Martin, Micron Technology, and Rockwell Collins.

Visit www.eit-conference.org/eit2008 for information on the program schedule, transportation, accommodations, and registration. Early registration rates end April 22. ■

IOWA STATE UNIVERSITY

Dept. of Electrical and Computer Engineering

2215 Coover Hall
Ames, IA 50011-3060

NONPROFIT ORG.
U.S. POSTAGE PAID
AMES, IA
PERMIT NO. 200