ECE 100 years

IOWA STATE UNIVERSITY

CONNECTIONS

The Department of Electrical and Computer Engineering Newsletter for Alumni and Friends | Spring 2009

Robot Cuts Ribbon at Building Dedication Ceremony

Prof. Wins NSF CAREER Award

Researchers Secure $2 Million NSF Grant for Energy Infrastructure Project

MORE NEWS:

- Alumni, Faculty Member Named IEEE Fellows
- Students Win Cyber Security Contest
- Department Hosts Centennial Gala Celebration April 24

Letter from the Chair

Dear alumni and friends,

As our department nears the end of our yearlong centennial celebration, we look back at the past in awe of the achievements our students, faculty, and alumni have made, and look to the future with confidence that our current and next generations will continue to innovate and accomplish great things.

In our last 100 years, our innovators have created the world's first electronic digital computer, invented the first hand-held scientific calculator, led the team that created the world's first portable phone, helped develop 3-D graphics machines that launched the "world of virtual reality," received the National Medal of Technology, and more.

In our next 100 years, we expect this tradition of excellence to continue to thrive. To do this, we have initiated several new energy projects. An interdisciplinary team led by Professor **James McCalley** recently received $2 million from the National Science Foundation (NSF) to study national energy and transportation infrastructure solutions (page 8). Assistant Professor **Dionysios Aliprantis** received an NSF CAREER award for his research to revolutionize electric machine technology (page 5). In addition, Professor **Vikram Dalal** received $1.69 million from the Iowa Power Fund to improve solar cell technology (see more on this in our Fall 2009 issue). Our VLSI research program is stronger than ever, too, with the addition of two recent hires—**Nathan Neihart** and **Ayman Fayed**—and the expertise of our established faculty in that area, including **Morris Chang**, **Degang Chen**, **Chris Chu**, **Randall Geiger**, and **Robert Weber**.

We also have added a new coursework-only Master of Engineering degree in both electrical and computer engineering to our curriculum. This program was added due to demand from industry and should attract new students to our distance education programs (page 6).

Additionally, our faculty and alumni continue to receive top recognition in their fields. One professor and two alumni were named fellows of the Institute of Electrical and Electronics Engineers and an alumnus was elected to the National Academy of Engineering (page 15). Our student groups also won top honors at a national cyber security competition and placed in the top tier at a regional programming contest (page 12).

And despite tough economic times, our alumni still continue to support us. One alumnus recently established a professorship, chair, and scholarships for our students and faculty (page 3). Students soon will call alumni for the annual giving campaign. We hope you will take a minute to talk with them and learn about how you can help the department. We are extremely grateful for the support our alumni have provided to us in the past and during the current campaign.

We are excited to see what the next 100 years bring.

Arun K. Somani
Department Chair
Anson Marston Distinguished Professor
Jerry R. Junkins Endowed Chair

IOWA STATE UNIVERSITY
ECpE years
Electrical and Computer Engineering

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Photo courtesy of Craig Carroll Photography.

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Cover photo: Robot designed and built by Alexander Stoytchev.

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.

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Alumnus Establishes Endowed Professorship, Chair, and Scholarships

A recent $1.8 million estate gift from **Kirby Gray** (BSEE '45), established an endowed chair, professorship, and scholarships in the College of Engineering (CoE).

"This is an incredibly generous gift from Kirby Gray," says Keith Fortmann, assistant vice president of development for the CoE. "We didn't know about this gift in advance, but through his estate, Gray will help key audiences who make up the base of the university: students and faculty. It's very exciting."

The gift will establish the following endowments:

■ **Kirby Gray Chair in Engineering:** The chair will be awarded to a leading faculty member in electrical, computer, or industrial engineering. The recipient will be recruited to Iowa State because of his or her success at creating knowledge or discoveries that will lead to new businesses and jobs in Iowa. The Iowa legislature shares these goals and has matched Gray's funds with an additional $500,000.

■ **John Ryder Professorship in Engineering:** This professorship honors John D. "Jack" Ryder (PhDEE '44), a former electrical engineering faculty member who was influential in Gray's life. The professorship will be awarded to a faculty member in electrical, computer, or industrial engineering.

■ **Kirby Gray Scholarships:** This gift is an endowment to support merit scholarships for engineering students of any discipline. The first scholarship likely will be selected this spring and awarded in fall 2009.

Gray entered Iowa State in 1942 and joined the wartime Navy V-12 program the following year. After completing midshipman training at Columbia University and graduating from Iowa State, he served in the Navy. Gray later continued pursuing education, earning his business administration degree at Morningside College, attending the Iowa State graduate college in general engineering, and studying accounting at Northwestern University.

Gray's career was varied, reflecting his extensive educational experiences. He held positions in industrial engineering, cost accounting, financial reporting, and quality control; worked with administrative, manual, and machine business systems; and audited financial and computer information systems. He retired in 1986 and traveled for 10 years before joining the Green Hills retirement community in Ames, Iowa. He passed away in August 2008. ■

John D. Ryder (left), for whom the John Ryder Professorship in Engineering is named, was instrumental in creating the department's AC network analyzer in 1949 and designing Coover Hall. Above, Ryder shows students a cathode ray tube for use in an oscilloscope.

Ryder photo courtesy of University Archives, Iowa State University Library.

Dalal Named an IEEE Fellow

Vikram Dalal, the Thomas M. Whitney Professor of Electrical and Computer Engineering, recently was named a fellow of the Institute of Electrical and Electronics Engineers (IEEE) for his contributions to thin-film solar photovoltaic energy conversion materials and devices. This honor recognizes outstanding IEEE members for their significant accomplishments in the advancement or application of engineering, science, or technology and for their contributions to the mission of IEEE.

Vikram Dalal

Dalal, who holds degrees in both engineering and public policy (major in economics) from Princeton University, has focused his research on developing practical photovoltaic devices that can capture solar energy and help reduce dependence on fossil fuels. Dalal was one of the first researchers to suggest using multiple junction solar cells in both amorphous and polycrystalline silicon-based materials to produce solar cells with higher conversion efficiency. These concepts have been adopted widely by the solar cell industry and Dalal is recognized worldwide as a technical leader in the area of thin-film photovoltaic devices.

Dalal has authored or coauthored more than 140 refereed publications in scholarly journals and conference proceedings. He also holds 11 U.S. patents.

Dalal joins eight other professors in the department—including **Venkataramana Ajjarapu**, **Randall L. Geiger**, **Ratnesh Kumar**, **Mark J. Kushner**, **Chen-Ching Liu**, **James McCalley**, **Arun K. Somani**, and **Robert Weber**—to receive this prestigious distinction. ■

Centennial Year: Did You Know?

Of the ECpE department's more than 11,000 alumni, only a select few have the honor of being the first to graduate in one of the department's majors. The following are the alumni who were "firsts" to receive bachelor's degrees in electrical, computer, and software engineering from Iowa State. For information on first master's and PhD degree awardees, visit *www.ece.iastate.edu/centennial/department-timeline.*

Rueben B. Benjamin, **Charles C. Deering**, **Fred S. Phelps**—awarded university's first Bachelor of Science degrees in electrical engineering in 1892 (17 years before the department formed)

Stephen C. Beilby, **Stanley D. Smith**, **Glenn M. Stark**, and **Michael A. Warner**—awarded first Bachelor of Science degrees in computer engineering in 1978

Jared Eakins and **Matt Herbst**—will be awarded first Bachelor of Science degrees in software engineering in May 2009 ■

Department Chair Arun K. Somani (left), and (from far right to left) President Gregory Geoffroy, Interim Dean Jim Bernard, Board of Regents President David Miles, and Assistant Professor Alexander Stoytchev watch as the robot cuts the ribbon.

Professor-, Student-Built Robot Cuts Ribbon at Building Dedication Ceremony

When a team of ISU Foundation staff was brainstorming ideas for the Department of Electrical and Computer Engineering's (ECpE) Building Addition: Phase I dedication ceremony in October, one staffer said, "Wouldn't it be cool if we could have a robot cut the ribbon?"

Little did she know that Assistant Professor **Alexander Stoytchev** is an expert in robotics.

"On August 1, I received a call and was told the department wanted to do something 'spectacularly electric' for the dedication ceremony on October 2," Stoytchev says. "They wanted the robot to cut the red ribbon during the ceremony. It was an offer I could not refuse."

Stoytchev drafted a design and then gathered 10 undergraduate and graduate students from the electrical and computer engineering, aerospace engineering, mechanical engineering, and computer science departments, as well as the Virtual Reality Applications Center and Human Computer Interaction program, to help him create an upper-torso humanoid robot from scratch in just a couple of months.

"I had plans to build an upper-torso humanoid robot even before I joined the ECpE department in January 2008. I had ordered two arms in February, which arrived in April and June, respectively," Stoytchev says. "My students and I designed the body of the robot, the steel fixture, the head, the plastic covers for the robot's body, and the software just in time for the ceremony. Signing up to do the ribbon-cutting ceremony greatly accelerated the production schedule."

Down to the wire

Stoytchev and his team worked right up to the day of the ceremony to perfect the robot.

"Everything was finished just in time for the ceremony. I got the last two plastic pieces from the 3-D printer three hours before the ceremony. The robot's head was finished two hours before. There was no room for error," he says.

Designing and building the robot wasn't exactly easy. A month before the ceremony an arm broke and one of its embedded motor controllers had to be fixed. Then, two days before the dress rehearsal the robot broke three fingers.

"From the very beginning, the biggest challenge we faced was how to make the proportions of the robot look right. Engineers are good at drawing designs with straight lines and corners, but they don't look visually appealing," Stoytchev says. "Luckily, we found Izaak Moody, an undergraduate artist in the College of Design who had a passion for drawing robots. The robot would not have looked as nice without his help. His design didn't have a single straight line, which made it very difficult to model using traditional CAD programs, but it was definitely worth it."

In the end, the ribbon cutting and robot were a success.

"If you closely watch the video from the ceremony (at *www.ece.iastate.edu/who-we-are/ecpe-building-dedication-video*), you can see that I was a bit nervous," Stoytchev says. "It took me two seconds after the robot cut the ribbon to realize everything that went well and I could relax."

The robot will now be used as a research platform in Stoytchev's Developmental Robotics Laboratory. ■

Photo by Bob Elbert.

Robots of the Future

Assistant Professor **Alexander Stoytchev** has a lofty goal for robots of the future and for his Developmental Robotics Laboratory. He wants to make robots more intelligent and adaptive than today's robots.

"We believe that in the near future robots will work side-by-side with humans in environments such as homes, hospitals, and universities. When, not if, this vision of the future is achieved, it has the potential to revolutionize the global economy similar to the way the personal computer did over the last 25 years," he says.

Stoytchev approaches this challenge by looking for insights and inspiration in the developmental learning patterns of humans and animals.

"Infants explore and learn about the external world using their intense curiosity drive," he says. "Robots should learn in the same way!" ■

Aliprantis Wins NSF CAREER Award to Optimize Electric Machine Performance

Electric machines as they currently exist may never be the same again if Assistant Professor **Dionysios Aliprantis** has his say about it.

Aliprantis recently won a National Science Foundation CAREER Award to research methods to decrease the weight and size of motors and generators, as well as improve their efficiency and cost-effectiveness.

"The vast majority of electric machines rotate in a single direction over their lifetime," Aliprantis says. "This fact is not currently taken into account during the design process, which is essentially based on century-old concepts. Improved designs will lead to enhanced performance for the preferred direction of rotation. My research will initiate the systematic study of unidirectionally rotating electric machines."

Aliprantis hopes to achieve improved performance of these machines by precisely sculpting the stator and rotor surfaces, thus affecting the electromagnetic field in the machine's air gap. This will increase the production of electromechanical torque without compromising the machine's electrical operational characteristics.

For comparison, think about how a ceiling fan operates. A ceiling fan's blades are angled slightly so that as the fan rotates around in the same direction, the air is pushed down where you want it. In electric machines, Aliprantis seeks to alter the shape of the teeth in the stator and rotor to one that creates the best performance possible as the machine rotates in the same direction throughout its entire life.

Dionysios Aliprantis

Aliprantis' methodology would allow wind turbine engineers to modify their generator designs to handle the most power possible using the least amount of materials. Similar design techniques also could be applied to machines in hybrid-electric vehicles, hybrid trains, aircraft, and ships.

"In particular, electric vehicles will benefit tremendously from this since they will be able to carry more lightweight motors on board, improving their fuel efficiency," Aliprantis says.

Previous studies by European and U.S. researchers estimate that the use of high-efficiency motors in motor-driven systems—like the electric machines Aliprantis aims to develop—can lead to billions of dollars in overall economic operational savings and millions of tons of carbon dioxide emissions reductions worldwide.

And what's especially unique about Aliprantis' work is that he is developing a framework to find optimal designs that can be applied to nearly any rotating electric machine type.

"I'm trying to revitalize education and research in electric machines, which have seen a decline in interest in recent years," Aliprantis says. "This is timely and important because electric vehicles use electric motors and wind turbines use electric generators, and the industry is desperately trying to recruit engineers with the appropriate skill set to design those machines."

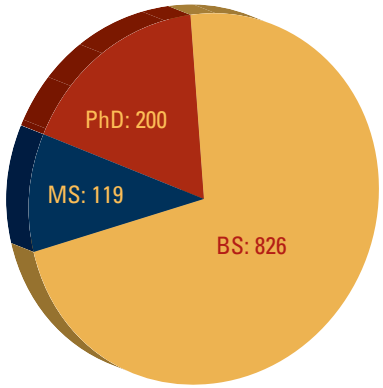
As part of his research project, Aliprantis also will reach out to local high school students and become a mentor for kids interested in becoming engineers. Additionally, he plans to create a college course on electric machine operation and optimization, as well as establish virtual communities about power engineering careers on social networking sites such as Facebook and MySpace.

ECpE Enrollment Increases in Fall 2008

The student population in Iowa State University's ECpE department increased by about 3 percent last fall. The department enrolls 826 undergraduate students and 319 master's degree and PhD students. In the past few years, enrollment in electrical and computer engineering programs nationwide and at Iowa State was in a decline. This is the first increase in Iowa State's undergraduate ECpE student population since 2001 and the second consecutive year in which Iowa State's ECpE graduate programs have seen an increase.

"We are pleased to see our enrollment numbers on the upswing," says **Arun K. Somani**, ECpE department chair. "The past few years have been challenging nationwide for enrollment in electrical, computer, and software engineering programs and we are happy to see renewed interest in our programs due to the College of Engineering's and department's recruitment efforts."

Vicky Thorland-Oster, manager of ECpE Student Services, says students are choosing electrical, computer, and software engineering because they see how critical electrical, computer, and software engineers are to society and maintaining our infrastructure, such as the nation's power grid and computer security. They also see the high-demand for our graduates every year at the College of Engineering's fall Engineering Career Fair, which routinely brings more than 300 employers to campus to recruit engineers.



Total Fall 2008 student enrollment by degree sought

"Students see that they can make a difference in peoples' lives as an electrical, computer, or software engineer," Thorland-Oster says.

Calendar of Events

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

April 17-19
VEISEHA
ISU Campus, event times and locations vary

April 20-21
IT-Olympics
Hilton Coliseum; See *www.it-adventures.org* for event details.

April 21
Iowa State University Undergraduate Research Symposium
Pioneer Room, Memorial Union, 8 a.m. to 5 p.m.

April 24
ECpE Spring External Advisory Board Meeting
3041 ECpE Bldg. Addition, times vary

April 24
ECpE Centennial Gala & Awards Ceremony
Scheman Building, 5 to 8:30p.m.

May 8
Graduate Commencement
C.Y. Stephen's Auditorium, 8 p.m.

May 9
Undergraduate Commencement
Hilton Coliseum, 1:30 p.m.

May 14-16
Alumni Days 2009
Various locations and event times: See *www.isualum.org* (click on Events) for details.

September 22
Fall Engineering Career Fair
Hilton Coliseum, 12 to 6 p.m.

Visit *www.ece.iastate.edu* for additional details and up-to-the minute information on departmental events and seminars.

For additional information on ECpE Centennial Gala and Awards Ceremony events, see page 16 or go to *www.ece.iastate.edu/centennial/gala*.

ECpE Offers New Coursework-only Master's Degrees

The ECpE department is introducing two new master's degree programs: a Master of Engineering in electrical engineering and a Master of Engineering in computer engineering. These two programs require coursework only and do not require an oral examination, thesis, or creative component. The new programs answer a need from industry because they will allow professionals more flexibility to earn master's degrees through Engineering Distance Education (EDE; *www.ede.iastate.edu*) and the ECpE department at Iowa State.

"A Master of Engineering degree allows students to do more in-depth study in electrical or computer engineering without having a research component that would require on-campus time. This program is a good alternative for distance education students because it is course-based and requires breadth and depth, as does the Master of Science program the department already offers," says **Vicky Thorland-Oster**, manager of ECpE Student Services. "If students take just one course each semester, they can graduate within five years."

Professor and ECpE Director of Graduate Education **Akhilesh Tyagi** says the department created this degree because of industry's demand for a professional, coursework-only degree program.

"We conducted a survey with our distance education students asking if they would prefer a coursework-only Master of Engineering degree, a Master of Science with a thesis, or a Master of Science with a creative component," Tyagi says. "Seventy-one percent preferred coursework only."

The department routinely enrolls up to 50 students who are employed full-time in industry in its Master of Science programs. Those students currently take their courses through EDE and travel to campus for their final exam and oral presentation. The new programs would eliminate the need to travel to campus. The department expects enrollment in its EDE programs to increase and degrees awarded per year to jump from about nine to more than 20.

The new Master of Engineering program is directed toward students who do not wish to pursue a research-based career. It requires students to earn at least 30 credit hours of coursework. A minimum 24 of the required credit hours must be in electrical or computer engineering (with 12 of those credits in a single academic area of concentration within electrical or computer engineering) and an additional six credits must be from courses outside the area of concentration.

Admissions standards for the Master of Engineering programs are similar to the Master of Science program, except that relevant work experience is considered. Applicants with at least two years of experience or an undergraduate grade point average of 3.0 are not required to submit GRE test scores. ■

Tracey photo courtesy of Engineering Communications and Marketing.

Distinguished Faculty and Alumni Participate in

The ECpE department hosted two seminar series this year: the iCUBE Distinguished Lecture Series and Centennial Distinguished Alumni Seminar Series. The centennial series was initiated to celebrate the department's 100th year. The following lectures were given as part of both series:

Distinguished Lecture Series

■ "Competition and Collaboration in Wireless Networks," by Vincent Poor, University Professor of Electrical Engineering and Dean of the School of Engineering and Applied Sciences, Princeton University

■ "Lessons Learned from the Internet Project," by Douglas Comer, Vice President of Research Collaboration at Cisco Systems and Distinguished Professor of Computer Science, Purdue University

■ "Problems in Biological Imaging: Opportunities for Signal Processing," by Jelena Kovacevic, Professor of Biomedical Engineering and Electrical Engineering, and Director of the Center for Bioimage Informatics, Carnegie Mellon University

■ "Software Engineering Research

Faculty Receive Patents, Best Paper Awards, and Other Prestigious Honors

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

■ Associate Professor **Nicola Bowler** received a U.S. patent. The patent is number 7,443,177 and is titled "Characterization of Conductor by Alternating Current Potential-Drop Method with a Four-Point Probe."

■ Courtesy Assistant Professor **Soon-Jo Chung** received an Air Force Young Investigator Award to develop a new kind of micro aerial vehicle. He was one of 39 scientists and engineers across the country to receive this award, which is sponsored by the Air Force Office of Scientific Research.

■ Professor **Ahmed Kamal** and his PhD student **Osameh Al-Kofahi** won the Best Paper Award at the Institute of Electrical and Electronics Engineers' (IEEE) 2008 Global Communications Conference in December. Their paper was titled "Scalable Redundancy for Sensors-to-sink Communications."

■ Professor **James McCalley** received the Regents Award for Faculty Excellence. The award, presented by the Board of Regents, State of Iowa, recognizes faculty who are outstanding university citizens and who have rendered significant service to their institution and/or the state of Iowa.

■ Assistant Professor **Tien Nguyen** was awarded the Litton Industries Professorship. The professorship supports young faculty who exhibit a potential for leadership in electrical engineering research, have a recognized commitment to excellence in teaching, and share his or her talents by collaborating with industry.

■ Department Chair **Arun K. Somani** and Professor **Ahmed Kamal** both were named the *Computer Networks* Editor of the Year for 2008 for their exemplary, diligent, timely, and dedicated work on the organization's journal. *Computer Networks* is an international journal of computer and telecommunications networking.

■ Assistant Professor **Alexander Stoytchev** and computer science graduate student **Matt Miller** received the Best Paper Award at the 7th IEEE International Conference on Development and Learning in August for their paper, "Hierarchical Voting Experts: An Unsupervised Algorithm for Hierarchical Sequence Segmentation."

■ Assistant professors **Namrata Vaswani** and **Daji Qiao** received the Harpole-Pentair Developing Faculty Award. The award provides funds for supplemental support and enrichment opportunities for assistant professors and graduate students working under assistant professors. ■

Assistant Professor Tien Nguyen (right) assists students in his computer engineering class. He holds the Litton Industries Professorship.

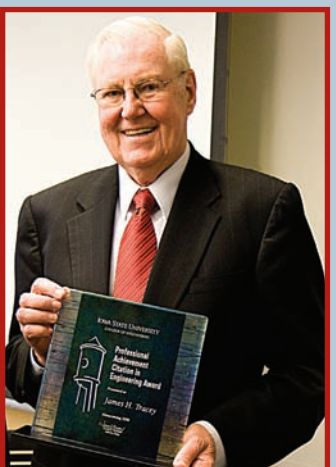
Iowa State Hosts IT-Olympics Student Contest for 2nd Year

For the second year, Iowa State University is hosting the IT-Olympics competition April 20-21. At the event, nearly 400 students from 40 Iowa high schools will battle in cyber defense, robotics, and video game design activities to showcase the information technology (IT) knowledge they have gained throughout the past year as part of the IT-Adventures *(www.it-adventures.org)* program. Winners of this year's contest will be featured in an Iowa Communications Network program filmed by Iowa Public Television.

IT-Adventures is an innovative program that engages high school students in exploration and experimentation with IT through content delivery, competitive events, and service learning projects. It is a partnership among Iowa State's Information Assurance Center, the Iowa Department of Economic Development, Technology Association of Iowa, Iowa Math and Science Education Partnership, and other local Iowa businesses. ■

ECpE Department's Seminar Series

and the Influence of Group Think," by David Notkin, Bradley Chair and Professor of Computer Science and Engineering, University of Washington



After Jim Tracey's Centennial Distinguished Alumni Seminar, the College of Engineering presented him with its Professional Achievement Citation in Engineering award.

Centennial Distinguished Alumni Seminar Series

■ "Building New Programs in Science and Engineering," **Jim Tracey** (BSEE '60; MSEE '61; PhDEE '64), Retired Engineering School Dean

■ "Managing Energy Better with Smart Grids," by **David Slump** (BSEE '91), Senior Vice President of Business Development, Landis+Gyr Holdings

■ "The Saga of Electronic Memories," by **Arthur V. Pohm** (MS Physics '53; PhD Physics '54), Emeritus Anson Marston Distinguished Professor of Engineering, Iowa State University

■ "U.S. Patent 3,777,066: How to Earn $36 Million in Royalties for ISU and Get to Be a Cardboard Cutout at the Iowa State Fair," by **David C. Nicholas** (BSEE '67; MSEE '68; PhDEE '71), Principal Engineer, Rockwell Collins ■

ECpE Researchers Receive $2 Million NSF Grant to Develop National Energy and Transportation Model and Plan

By Mike Krapfl, ISU News Service

Professor **James McCalley** likens the task ahead to a major machinery rebuild.

You're starting with working equipment full of expensive parts. So you don't want to throw away everything and start over. You want to put together just the right combination of existing parts and new pieces to make the most cost-effective, sustainable, and resilient machine possible.

In this case, the machine is the country's energy and transportation infrastructure.

McCalley, the Murray J. and Ruth Harpole Professor in Electrical and Computer Engineering, is leading a research team that will develop new and better infrastructure designs for the country's energy and transportation systems. They will do that by developing computer models of the country's and the state's energy and transportation systems. They will use the models to help develop a 40-year national plan to optimize those systems in terms of future power technologies, energy transport and storage, and hybrid power systems while balancing cost, sustainability, and resiliency.

The project—nicknamed NETSCORE-21 (short for "The 21st Century National Energy and Transportation Infrastructures Balancing Sustainability, Costs, and Resiliency Research Project")—is supported by a four-year, $2 million National Science Foundation grant.

The project's research team will consider all of America's energy options, including biofuels, wind, hydro, tidal, geothermal, nuclear, coal, hydrogen, solar, biomass, natural gas, and petroleum, together with new and old freight and passenger transportation technologies.

"Our intent is to say, 'We don't think there's a single silver bullet here,'" McCalley says. "We need all of these. What we need to decide is how much of each and when."

The Iowa State research team working to advance those decisions includes Department Chair **Arun K. Somani**; Assistant Professor **Dionysios Aliprantis**; **Lizhi Wang**, an assistant professor of industrial and manufacturing systems engineering, and courtesy professor in electrical and computer engineering; Konstantina Gkritza, an assistant professor of civil, construction and environmental engineering; and Robert C. Brown, the Gary and Donna Hoover Chair in Mechanical Engineering and Anson Marston Distinguished Professor. The project also will include more than 50 Iowa State students and 22 project advisers from across the country.

"We looked around and said, 'Who's looking at national energy and transportation infrastructures from a systematic view?'" McCalley explains. "There are not many models out there."

The model created by the Iowa State researchers will highlight the growing interdependencies of the country's energy and transportation systems.

"The country's most heavy users of energy are the electric and transportation systems," McCalley says. "Now with hybrid-electric vehicles and hybrid-electric trains, these two historically independent energy systems are gradually coming together."

The NETSCORE-21 project is designed to help leaders understand the implications of the new technologies and new interdependencies.

McCalley says the research could provide Congress, the U.S. Department of Energy, the Environmental Protection Agency, industries, and other decision makers with a national blueprint for better energy and transportation infrastructures. And that could help drive federal policy, research, and investment over the next 40 years. ■

National Energy & Transportation Sustainability, Cost, & Resiliency
NETSCORE21
Research Project

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

ECpE would like to hear from you!

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 *schmidtd@iastate.edu* (subject line: Newsletter).

Name: _____ Graduation Year(s): _____

Address: _____

City: _____ State: _____ Zip: _____ Country: _____

Home Phone: _____ Business Phone: _____

E-mail Address: _____

News I'd Like to Share: _____

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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 $ _____

Notice to Alumni Living Abroad:

Due to budget constraints and increasing postage costs, the ECpE department temporarily will not be sending this *ECpE Connections* newsletter to alumni with international mailing addresses beginning with our Fall 2009 issue. The latest editions of the newsletter always are online at *www.ece.iastate.edu/news/ecpe-connections*. New issues are posted in October and April each year. ■

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

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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.

ECpE's Kumar Develops Wireless Soil Sensors to Improve Farming

By Mike Krapfl, ISU News Service

Professor **Ratnesh Kumar** keeps his prototype soil sensors buried in a box under his desk. He hopes that one day farmers will be burying the devices under their crops.

Kumar is leading an Iowa State University research team that is developing transceivers and sensors designed to collect and send data about soil moisture within a field. Eventually the researchers are hoping the sensors also will collect data about soil temperature and nutrient content.

A major goal is to build small sensors (the prototypes are about 2 inches wide, 4 inches long, and less than an inch thick) that can do their work entirely underground. The sensors won't need wires or above-ground antennas, so farmers could work right over the top of them. The sensors also would be able to report their locations. That would make it easy to find sensors if a plow were to move them or when batteries need to be replaced.

Researchers display equipment for wireless soil sensor project.

Photo by Bob Elbert.

Kumar says the sensors are designed to be buried about a foot deep in a grid pattern 80 to 160 feet apart. The sensors would relay data along the grid to a central computer that would record information for researchers and farmers.

The sensors could help researchers understand precisely how water moves through a field. They could help them develop better models to predict crop growth and yield. And they could help them understand the carbon and nitrogen cycles within soils.

And those sensors could help farmers manage their nutrient and water resources, maximizing yields and profits. It also could minimize environmental impacts.

"If nutrients are in excess of what's needed, it doesn't help the yield," Kumar says. "Those resources drain into the environment."

Stuart Birrell, an associate professor of agricultural and biosystems engineering and a part of the sensor research team, says the project will provide the kind of real-time, high-resolution data that researchers and producers have been looking for.

"A challenge of precision agriculture is collecting data at a high enough resolution that you can make good decisions," Birrell says. "These sensors would provide very high resolution data for producers and researchers. They would give us another data layer to explain differences in yield and help us make management decisions."

Kumar says the sensors have worked underground in preliminary, point-to-point tests. A network of multiple sensors were buried in a research field late last fall for more testing and development.

Also working on the project are **Ahmed Kamal** and **Robert Weber**, professors of electrical and computer engineering; Amy Kaleita, an assistant professor of agricultural and biosystems engineering; and graduate students Candace Batts, Giorgi Chighladze, Jing Huang, and **Herman Sahota**.

The project is supported by a three-year, $239,999 National Science Foundation grant.

"The goal is to hopefully have these sensors in production agriculture," Kumar says. "But first we need to develop them and answer more questions about how cost-effective they could be." ■

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New Lab Facilities Offer Innovative Research Opportunities

Since the ECpE Building Addition: Phase I opened last year, researchers in the ECpE department have witnessed firsthand the positive effect a new facility can have on research.

Researchers in the emerging field of bioengineering, as well as professors in more traditional fields like VLSI, are experiencing the impact.

New is good

"Before the new building opened, we didn't have a dedicated lab space for bioengineering," says Assistant Professor **Santosh Pandey**. "We only had a shared space in the Carver High-Speed Communications Laboratory in the old Coover Hall, which primarily had electronic measurement equipment."

Now Pandey and his bioengineering colleagues, including assistant professors **Liang Dong**, **Sumit Chaudhary**, and **Jaeyoun Kim**, have the lab of their dreams. It's equipped with three high-powered microscopes (including a new atomic force microscope that can study nanoengineered materials and single molecules), furnace, high-precision electrical instruments, heater, chemical and biological safety hoods, distilled water tank, carbon dioxide incubator for growing biological specimens, and a centrifuge.

Pandey finds the new equipment integral to successfully completing his current research project, understanding the behaviors of parasitic nematodes that destroy soybean crops. Pandey's team fabricates microscale fluidic devices for experiments to understand nematode behavior and the relationship between its behavior and its genetic composition. He says the U.S. Army and Department of Defense are interested in this research area because the ability to understand biological intelligence could be mimicked in devices such as search and navigation tools that use artificial intelligence.

"Our new microscopic tools allow us to take real-time images and capture events at a very high resolution," Pandey says.

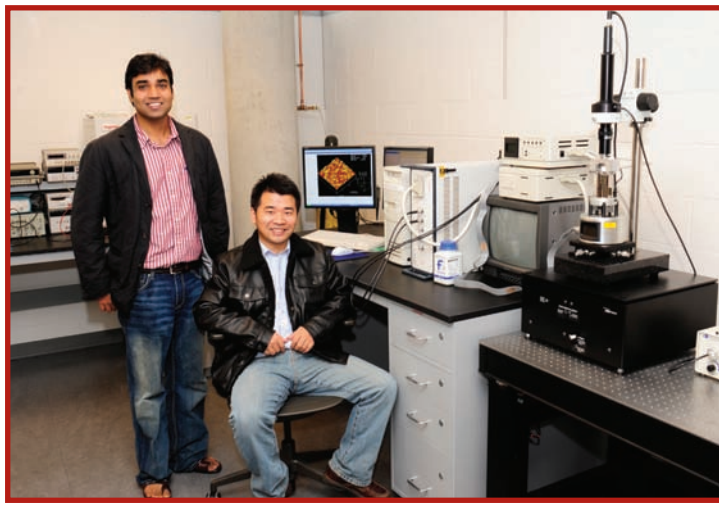
A biological safety hood in the new lab

Photos by Bob Elbert.

Draw for graduate students

Dong, who arrived at Iowa State in 2007, says he had almost no research space when he started. He and his graduate students are enjoying the new lab.

"Now we've brought in almost all the equipment we want," Dong says. "Our graduate students especially enjoy using the equipment."



Assistant Professors Santosh Pandey and Liang Dong with the lab's atomic force microscope

The new equipment allows Dong and his students to dig into two main research projects: Building an implantable electronic device—similar to a pacemaker for the ear—to replace the inner ear vestibular organ that helps people keep their balance; and miniaturizing a lab setting and putting it on a single chip, so researchers can use it as a tool to detect biological agents.

Because all of Dong's research is conducted on the micro- or nanoscale, the microscopes and other equipment provided in the new lab space are essential. It also could make his research more economical in the long run, saving him $1,000 to $2,000 per experiment to get the cell cultures he needs for his research.

Efficiency in combining labs

Researchers in the department's bioengineering area aren't the only ones benefiting from the new facilities. Professors in the Very Large Scale Integrated (VLSI) circuits, microwave and radio frequency (RF) areas also are seeing positive changes.

Professor **Robert Weber** says the new lab space for RF, microwave, and VLSI will enhance the research of such faculty, including **John Bowler**, **Degang Chen**, **Ayman Fayed**, **Randall L. Geiger**, **Mani Mina**, **Nathan Neihart**, and **Jiming Song**.

"The new space is larger and brings the equipment together in one place," Weber says.

Before the new addition was built, the RF, microwave, and VLSI labs were spread throughout the Durham Center and Coover Hall and many laboratories were operated separately, depending on the funding source or principal investigator. Now, all of the labs, including the Carver High-Speed Communications Laboratory, have been combined to better support research efforts of VLSI faculty.

New directions for research

Faculty agree the new facilities will allow them to recruit better graduate students and faculty candidates, as well as provide a great space for collaboration and innovative, interdisciplinary research. The College of Engineering's new bioengineering minor will bring students who never would have considered electrical engineering careers into the ECpE department's new bioengineering lab.

The new facility also opens the door for Iowa State to compete with top universities that already have bioengineering programs.

Perhaps the strongest evidence of the building's impact is when it motivates faculty to explore new, cutting-edge research avenues, as seen in Pandey's work.

"Having the new facility and equipment has made me think of research avenues beyond conventional electrical engineering. I have found a new research direction that addresses key questions in the field of plant pathology. It's difficult, but it's interesting and futuristic," he says. ■

Undergraduate and Graduate Students Receive Awards

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

■ Seniors **Cory Kleinheksel** and **Aaron Logan** received the William L. Everitt Award, which honors outstanding seniors in electrical and computer engineering with an interest in communications and computers.

■ **Alex Lee**, junior in electrical engineering, received the College of Engineering's Dean's Student Leadership Award. The award is presented to three engineering junior or senior students who demonstrate outstanding leadership in major college-wide, university, community, or professional organizations.

■ Graduate students **Jiang Lin**, **Harold Salazar**, and **Linfeng 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.

■ **Amit Pande**, a computer engineering PhD student, won third place at the 22nd Annual International Design Conference on VLSI Design. His entry was named "Novel Polymorphic Reconfigurable Hardware Support for Discrete Wavelet Transform." Pande received a plaque and cash prize.

■ **Julie Rursch**, a computer engineering PhD student, received the Technology Association of Iowa's Collegian Innovation and Leadership Award at the association's first annual Iowa Women of Innovation Awards Ceremony. Rursch was recognized for her work as the assistant director of IT-Adventures (see more about IT-Adventures on page 7).

■ **Vinod Shukla**, a former master's degree student, received the Iowa State Midwestern Association of Graduate Schools' Distinguished Master's Thesis Award. ■

Left: Graduate student Amit Pande (right) receives his award at the International Design Conference on VLSI Design. Right: PhD student Julie Rursch displays her Women of Innovation award trophy.

Pande photo courtesy Joseph Zambreno. Rursch photo courtesy of Doug Jacobson.

Two Undergraduate Students Earn National CRA Honorable Mentions

Two computer engineering seniors—**Tycho Andersen** and **Cory Simon**—received honorable mentions in the 2009 Computing Research Association's (CRA) Outstanding Undergraduate Award competition. The award recognizes students at North American universities who show outstanding research potential in a computing research area.

Cory Simon

Tycho Andersen

Andersen was part of a team that built a prototype evacuation system for emergencies such as fires.

"We designed the system to inform evacuees about which escape routes were the best based on real-time temperature data collected from wireless sensors placed throughout the building," Andersen says. "The goal of the project was to increase the overall safety of the evacuation system by collecting more information used to indicate exits."

Simon conducted his research during a co-op at NASA's Johnson Space Center in Texas, a research internship at Alaska's Arctic Region Supercomputing Center, and an undergraduate research project at Iowa State.

"At NASA, I joined a small group of engineers developing a prototype device for astronauts to monitor and control multiple robots while in a space suit," Simon says. "At the supercomputing center, I assisted a researcher who was developing a tool to investigate the accuracy of various solar wind prediction models. And at Iowa State, I helped Dr. Manimaran investigate potential opportunities for pervasive computing and eventually developed a bus tracking system that incorporated wireless sensor networks and other technologies." ■

Software Engineering Students Place in Top 10 at Regional Contest

A team of Iowa State software engineering students placed 7th out of 202 teams at the Association for Computing Machinery's (ACM) North Central America Regional Programming Contest in November. The team, named Oracle, comprised software engineering junior **Connor Schenck**, software engineering sophomore **Adrian Jagdeo**, and computer science senior Michael Fulker.

The competition challenges students to solve real-world problems using open technology and advanced computing methods. During the contest, students on three-person teams had five hours to solve six programming problems. Five other teams with students from the ECpE department participated in the contest and placed 17th, 62th, 68th, 96th, and 123rd.

Students from universities in Iowa, Kansas, Michigan, Minnesota, Nebraska, North Dakota, South Dakota, Wisconsin, and Western Ontario and Manitoba in Canada participated in the contest, which was sponsored by IBM. The top teams from the regional competition will advance to the 33rd annual ACM International Collegiate Programming Contest world finals April 22, 2009, in Stockholm, Sweden.

ECpE Students Win Hardware Hacking Cyber Security Contest

A group called the Orange Army is creating an electronic decoding (aka cryptographic) device that you believe is part of their long-term plan to destroy the human race. You work at the plant they've hired to fabricate their device and can stop their malicious plans, but only if you can place a Trojan—an undetectable piece of code—in their hardware.

That scenario may seem far-fetched, but it's exactly the situation five Iowa State University ECpE students faced when they competed in and won a national cyber security competition at the Polytechnic Institute of New York University (an affiliate of NYU, formerly called Brooklyn Polytechnic) in mid October.

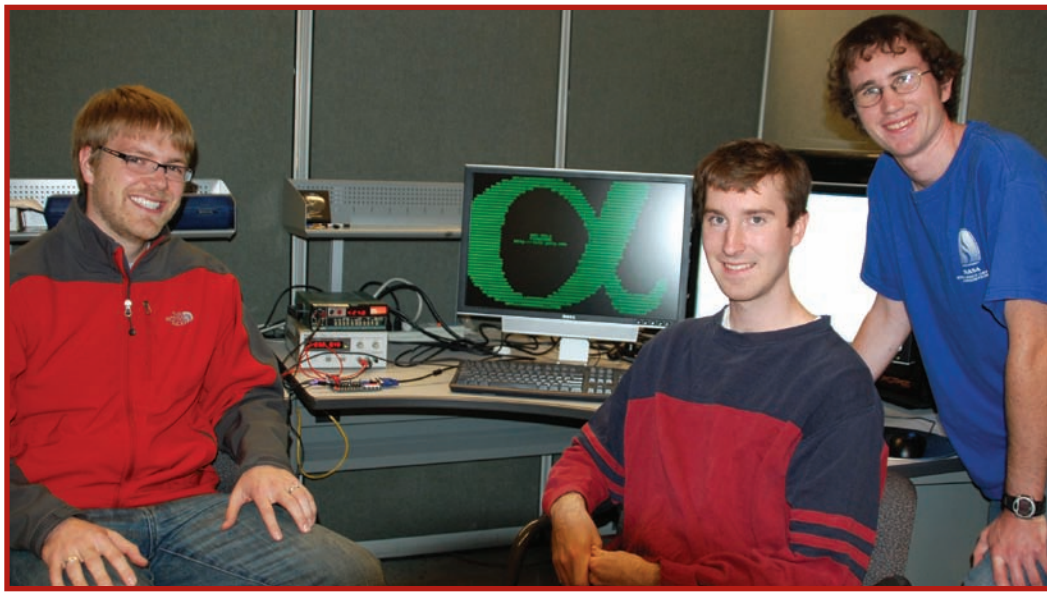
Gathering the hackers

The group's faculty adviser, Assistant Professor **Joseph Zambreno**, who is researching secure hardware and software platforms, says the contest's scenario of directly embedding a Trojan in hardware is sort of "James Bond-like," but securing hardware is becoming a hot topic for researchers and the U.S. Department of Defense (DoD). Because the electronic chips in devices the DoD uses are no longer all made on American soil, the DoD increasingly is becoming interested in learning about Trojans in hardware, not just in traditional software-based Trojans. In fact, according to an article in the Institute of Electrical and Electronics Engineers' (IEEE) trade publication, *IEEE Spectrum*, the DoD even began implementing a certification process at commercial chip plants in the United States in 2004 to create a network of trusted foundries for producing electronics that go into the military's equipment, helping reduce the risk of having a Trojan embedded into their devices.

"The goal of the competition's project was somewhat 'spy-related.' The Trojan circuit is intended to look innocuous, but can be designed to secretly leak information, function incorrectly, or stop the device from working altogether," Zambreno says. "It says a lot about the strength of our program here at Iowa State that our team was able to come out on top."

Several weeks before the competition started, Zambreno set out to find what he calls a group of "mad scientist types" who were willing to creatively attack the problem. The five students Zambreno found included three on-campus—**Alex Baumgarten**, **Michael Steffen**, and **Matt Clausman**—and two distance education graduate students.

"We started meeting once a week, throwing crazy ideas against the wall," Zambreno says. "A couple weeks before the competition, we took the top ideas and implemented them. The team had a breadth of attacks, and a great write-up and presentation."



Alex Baumgarten, Michael Steffen, and Matt Clausman show off the FPGA board they used when creating their hardware hacking attacks for the national cyber security competition.

Testing and implementing attacks

Steffen says although the team considered several ways to leak private information from a hardware design, the team designed eight Trojans to implement at the competition.

Clausman says the team had to be very covert with its attacks, since the Trojans couldn't be detected by a typical end user, which is why two of their attacks relied on AM radio frequency and LED lights.

"We modulated a pin located on the FPGA board [the target device contest organizers provided] in such a way that it would create audible beeps when listened to on a specific AM frequency," says Baumgarten. "Under normal operations, a user wouldn't detect anything abnormal."

The group's Trojan was successful, allowing the device to function as expected until an AM radio tuned to a specific frequency was brought into the room. When tuned to the right frequency, a set of beeps similar to Morse code leaked the secret encryption key.

For the LED light Trojan, the student team fashioned an LED light that flickered faster than the eye could see on the FPGA.

"This meant that the LED appeared to be on or lit up, but was actually turning on and off thousands of times a second," Baumgarten says. "By varying the speed between two different rates that are faster than the eye can perceive, we could convey bits of the secret key using a special circuit we created."

In the end, the team's weeks of work preparing for the competition paid off. The Iowa State team beat teams from Carnegie Mellon University, Hoftstra University, the Rochester Institute of Technology, University of Arkansas, University of Illinois at Urbana-Champaign, Virginia Tech, and Yale University, among others, to secure a win at the competition. ■

CENTENNIAL ALUMNI SPOTLIGHT:

Catching Up With an Iowa State Innovator

David R. Ditzel

Since 1914 when alumnus Paul Spencer Clapp served as an engineer on the first transcontinental telephone line, ECpE alumni across the world have spent their careers developing and implementing technological innovations that greatly impact industry and society. One of those many innovators is **David R. Ditzel** (BSEE '78; BSComS '78), who is best known for coauthoring "The Case for the Reduced Instruction Set Computer (RISC)" and founding Transmeta Corporation. In the following Q&A, Ditzel reflects on his time at Iowa State, career achievements, and impact on industry.

Question: Who was your favorite professor at Iowa State?
Answer: My favorite professor was **Roy Zingg** (BSEE '58; MSEE '61; PhDEE '68) because he introduced me to the world of computer architecture research and took a chance on me early in my career. I had always wanted to build computers, and Professor Zingg hired me to work as a programmer on the SYMBOL computer research project in the Cyclone Computer Laboratory. SYMBOL fascinated me, as it implemented a full multiuser computer, its operating system, compiler, and even a text editor, all in hardwired logic gates using 20,000 individual chip packages. I worked on the project throughout my undergraduate education, spending every spare hour in the lab.

Q: How did your 1980 paper "The Case for RISC" come about and what effect did it have on industry?
A: The SYMBOL computer project was an example of a Complex Instruction Set Computer with individual computer instructions that could each carry out complex tasks with thousands of steps. SYMBOL was intended to reduce the cost of software, but had the unintended consequence of being so complicated it took years to debug, and instead made it clear that it was possible to make the hardware too complicated. I wrote several papers on SYMBOL for technical conferences, but ended up joining forces with colleagues looking at simplifying computers as a better path. I was fortunate to coauthor "The Case for RISC" with Professor David Patterson at the University of California, Berkeley. The idea caught on and nearly every major computer company ended up using microprocessors with the RISC techniques.

Q: What other achievements in your career are you proud of?
A: I am most proud of founding Transmeta in 1995. I was the CEO through its successful initial public offering in 2000. Transmeta used software as part of the microprocessor as a way to lower the power requirements of the microprocessor and extend battery life for notebook PCs. Helping build the team of engineers to take on this joint hardware and software co-design was one of the most exciting aspects of my career.

Q: What is your current job title and company?
A: I am currently a vice president in the Digital Enterprise Group and chief architect for Hybrid Parallel Computing at Intel Corporation. What that means is that I'm

You Said It —We Listened

The department has received your feedback—good and bad—about our centennial history book that was mailed to all alumni last July. Here is a glimpse of the comments we heard:

"I thought the book was very nicely done."

"Thank you very much for sending me the copy of your department's pictorial history book. The photographs are fantastic."

"The book did a nice job except for one major and glaring exception—the omission of any mention of the EE students from the Navy V-12 unit which kept the department alive during the World War II years. I can't believe photos from that period are nonexistent or department records didn't show the major presence of the Navy unit during this time."

"I enjoyed reading the book since I spent two and a half years at Iowa State during World War II. I enlisted in the Navy in 1944, after which I received orders to report to Iowa State College for V-12 officer's training. We were given one of four choices: electrical, mechanical, aeronautical, or civil engineering. I chose electrical engineering ... When I read the book, I had hoped to see a few photos of the EE labs during the war years, but unfortunately they didn't exist or didn't make the cut. In any event, thank you for what must have been a huge task in assembling all that material and sending a copy of your publication."

"The book was a very well-prepared and documented history of the school, as well as was extremely interesting. I recall my husband's tales of his years at Iowa State and how valuable he felt his education was in preparing him for his field of patent law. Our children went on to become engineers and some even went into patent law as well."

Editor's note: We did include some information on the Navy students who attended Iowa State during World War II on page 7 of the book. If you have photos of this time period—or any other period from the department's history—that you want to share, please mail a copy of the photograph to ECpE History Book, Department of Electrical and Computer Engineering, 2215 Coover Hall, Ames, IA 50011, or e-mail a high-resolution scan of the photo to schmidtd@iastate.edu.

If you did not receive your book yet, or would like to order additional copies, go to *www.ece.iastate.edu/centennial/ecpe-centennial-history-book* to download an order form. ■

Image inspired by an ECpE alum.

David R. Ditzel sits in the Cyclone Computer Lab in 1977 next to an 8-bit personal computer he designed and built from scavenged computer parts. It read programs from paper tape. All the chips were wired together by hand, and the software largely was written from scratch.

Photos courtesy of David R. Ditzel.

helping Intel look at the kind of microprocessors that might be used in the future.

Q: What was it like to be a student at Iowa State in the 1970s?
A: Students who I knew were very serious about their classes, and because of my job in the Cyclone Computer Lab, I knew more graduate students than undergraduates. The honors program was one of the few activities I participated in at Iowa State. In one particular event, the students were organized in teams in a scavenger hunt to find "the biggest and best thing on the Iowa State campus." One team brought back a canoe. I recall that I led our team into the dean of engineering's office, and without an appointment, we got a three minute audience, sufficient to have the dean sign a note declaring that "this note, for purposes of the scavenger hunt, is the biggest and best thing on the Iowa State campus." No one could argue with that.

Q: Is there anything else you'd like to share about yourself or your career with other alumni?
A: Iowa State is a particularly great place to be an undergraduate because the opportunities are limited only by your own initiative. I learned that lesson at Iowa State, and it came in useful during the rest of my career. ■

More Alumni Innovators Online

Read about more ECpE alumni innovators on our centennial Web site at *www.ece.iastate.edu/centennial*.

Class Notes

Find out what your classmates are doing today!

1980s

Daniel Essig (BSEE '80) of Cardiff by the Sea, California, has joined the Christie, Parker, and Hale intellectual property law firm. He specializes in patents in the electrical, electronic, and software fields. During his career, he has received seven patents for his work in data processing. After Iowa State, he did graduate work at the University of Houston and Boston University, and earned a law degree from California Western School of Law.

1990s

David Kilzer (BSCpE '96) moved to Cupertino, California, in March 2007 to work for Apple on the MobileSafari/WebKit team. He is an iPhone software engineer.

Ann Grimm (BSEE '96) of Cedar Rapids, Iowa, recently was promoted to principal systems engineer at Wabtec Railway Electronics. She has been working on positive train control systems for the last 10 years.

Ryan O'Hara (BSCpE '98) of Hugo, Minnesota, received a Master of Science degree in computer science from the University of Minnesota in December 2008. He currently is employed at Red Hat, where he works as a senior software engineer in the company's Linux Clustering and Storage Group. He has been with the company for three years.

Michael Olson (BSEE '98) of Ankeny, Iowa, worked at Affiliated Engineers in Madison, Wisconsin, starting in 1999, and recently accepted a new job at KJWW Engineering Consultants in Des Moines, Iowa. He became a licensed professional engineer in 2006.

See page 9 to learn how you can submit your Class Notes. ■

Alumni Named IEEE Fellows, Elected to NAE, and More

The ECpE department congratulates the following alumni (and honorary alumna) on their recent achievements:

■ **Paul M. Anderson** (BSEE '49; MSEE '58; PhDEE '61) was elected to the National Academy of Engineering (NAE) for his contributions that have advanced the analysis and control of electric power systems worldwide. Election to the NAE is among the highest professional distinctions awarded to an engineer.

■ **Fredric Ham** (BSEE '76; MSEE '79; PhDEE '80) and **James L. Knighten** (PhDEE '76) both were named fellows of the Institute of Electrical and Electronics Engineers. Ham was named a fellow for his leadership in neural network education, research, and applications. He currently is a professor at the Florida Institute of Technology in Melbourne, Florida. Knighten was named a fellow for his contributions to understanding electromagnetic noise coupling paths for product compliance with regulatory standards. He is employed by the Teradata division of NCP Corporation in San Diego, California.

■ **Donald Linder** (BSEE '65) has been awarded the ISU Alumni Association's (ISUAA) 2009 Distinguished Alumni Award. This award is the highest honor given to alumni by Iowa State University through the ISUAA. It honors Iowa State alumni who are nationally and/or internationally recognized for preeminent contributions to their professions or life's work. Linder is a retired corporate vice president of technical staff at Motorola.

■ **Donna Whitney**, wife of the late Thomas M. Whitney (BSEE '61; MSEE '62; PhDEE '64), received the ISUAA's Honorary Alumni Award. The award is the highest honor given by Iowa State through the ISUAA to individuals who are not Iowa State graduates and who have made significant contributions to Iowa State's welfare, reputation, prestige, and pursuit of excellence. Donna established the Thomas M. Whitney Professorship in Electrical and Computer Engineering in memory of her late husband in 1999. ■

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- **Welcome Reception:** Devour some delectable hors d'oeuvres and mingle with students, faculty, and fellow alumni.
- **Gala Dinner:** Enjoy fine dining while catching up with current students, faculty, and alumni.
- **Scholarship & Awards Ceremony:** Recognize students, faculty, and alumni as they receive honors for their great accomplishments.
- **Gala Special Entertainment:** Be prepared to laugh as nationally known comedian **Don McMillan**, a former electrical engineer and 1993 "Star Search" Grand Champion, performs his hilarious routine.

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Tickets are $40 per person.* Festivities begin at 5 p.m. at the Scheman Building on Iowa State University's campus.

*Scholarship award winners receive one complimentary ticket. All tickets are nonrefundable.

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