

ECpE CONNECTIONS

The Department of Electrical and Computer Engineering Newsletter for Alumni and Friends | Spring 2010

Atanasoff-Berry Computer Replica Moves to Computer History Museum



MORE NEWS:

- Three Faculty Receive NSF CAREER Awards
- Scholarships Impact Students' Lives
- Alumni Raise Funds to Honor Emeritus Professor

Letter from the Chair

Dear alumni and friends,

As you may have heard, I will be stepping down as chair of Iowa State's Department of Electrical and Computer Engineering (ECpE) on June 30. It has been a great honor to serve as the department's chair for the past seven years, and expand upon the foundation that previous chairs, including my predecessor, Mani Venkata, established.

During my tenure as chair, I have aimed to lead the department in a direction that allows it to grow in multiple directions. We created a new strategic plan for the department in 2003-04 and identified five strategic research areas—bioengineering, cyber infrastructure, distributed sensing and decision making, energy infrastructure, and small-scale technology. We have used these areas to strategically grow the department and its infrastructure, and recruit 18 new faculty. Our research expenditures increased from about \$5.7 million per year to more than \$10 million per year during this time.

We also have improved the department's research and teaching facilities. A new addition to the building, which opened in 2008, has provided space for three new bioengineering labs, a VLSI and RF circuits lab complex, a developmental robotics lab, a controls lab, a high-performance computing lab, and a sensors lab, as well as provided four new classrooms and new teaching lab rooms to support our undergraduate programs.

In the past few years, we have greatly expanded our educational offerings to our students, too. For example, in 2006 we established a software engineering degree program in partnership with Iowa State's Department of Computer Science, and this year we are in the process of creating a new Bachelor of Engineering Technology degree. By taking the lead to establish this new degree, we are allowing Iowa State to fill a gap in technology education in the state of Iowa. Additionally, I am fortunate that during my time as chair, I have been able to continue to find the time to work with students by teaching one graduate student seminar every semester and six undergraduate sections in the past seven years.

Last year our department celebrated its 100th anniversary. And if one history lesson is most important as I step down as chair, it is that the department always will continue to find a way to thrive and serve our mission. The department will undergo a transition period this year, like it has several times before me, when the new chair arrives in July; however, I believe we have provided a solid foundation to build on. As the transition occurs, I look forward to resuming my previous role as a faculty member in the department.

Best wishes for continued success!



Arun K. Somani

Department Chair

Anson Marston Distinguished Professor

Jerry R. Junkins Endowed Chair



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Cover photo: Replica of the Atanasoff-Berry Computer. Photo by Bob Elbert.

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New Scholarship Program Helps Iowa State Train Cyber Warriors

By Mike Krapfl, ISU News Service

In an increasingly high tech society, it is imperative to have individuals highly skilled in information assurance to keep up with the growing number of attacks on computer security. And Iowa State University is helping to train those professionals through the Scholarships for Service (SFS) program from the National Science Foundation (NSF) that provides 24 full-ride scholarships for students to receive a master's degree in information assurance.

The NSF Scholarships for Service program distributes funds through scholarships in educating information assurance and computer security professionals. The funding to ISU includes all tuition, room, board, books, and fees, as well as a \$12,000 annual stipend.

Five students were admitted into Iowa State's Cyber Corps Scholarship program last fall. The scholarship recipients have varying backgrounds in computer engineering,

mathematics, and computer science.

"Our program is open to a more diverse group of students," says **Doug Jacobson**, university professor and director of the Information Assurance Center.

Scholarship recipients will take information assurance courses, along with their regular degree requirements. Participants must complete a service commitment consisting of two years of employment at a federal agency and a paid summer internship. They also will participate in academic and social activities as part of the SFS program.

"We have a very robust program, with a good mixture of theory and practice," Jacobson says.

According to Jacobson, graduates of the program can end up in exciting jobs with the federal government. "A lot of our graduates can't even tell me what they are working on because of secret or top-secret clearances."

Jacobson reports that there is job security in the field of information assurance. He says graduates of the Iowa State program will work for the federal government, where they're also immune to outsourcing. And there are plenty of jobs with the number of attacks on computer security increasing with advancing technology.

"Unfortunately for the public, the need for computer security is only going to increase," Jacobson says.

Ten students will be admitted into the program in each of the next two falls. Graduate applicants should possess an undergraduate degree in a relevant field, with a grade point average of at least 3.2 (on a 4.0 scale). Jacobson also explains that applicants must have a strong desire to work for the government and be able to accept the confidential nature that comes with it. Find more information at www.iac.iastate.edu/cybercorp. ■

Faculty and Staff Receive University, National Recognition

The ECpE department congratulates the following faculty and staff for the recent recognitions they have received:

■ Associate Professor **Degang Chen** and Professor **Randall L. Geiger** received a U.S. patent entitled, "Method for Testing Analog and Mixed-Signal Circuits Using Dynamic Element Matching for Source Linearization" (no. 7,587, 647).

■ Assistant professors **Liang Dong**, **Jaeyoun Kim**, and **Lei Ying** all received 2010 National Science Foundation CAREER awards. (See page 6 for details.)

■ Professor **Suresh Kothari** was recognized at an annual banquet in March for his 25 years of service to Iowa State.

■ Academic Adviser **Deb Martin** received the university's P&S CYtation, an award given semiannually by the Professional and Scientific (P&S) Council to recognize P&S staff who have demonstrated a commitment to excellence. ■

Department Manages Through Budget Cuts

During the past several months, the university received a \$24.5 million reduction in state funding due to statewide across-the-board budget cuts, which impacted business across campus, including the ECpE department.

The department has felt staff cuts, and faculty and staff are taking furloughs/leave without pay (between four and six days, depending on compensation level) in order to operate within the confines of the new budget. Retirement benefits for faculty and staff also have temporarily been reduced.

Additionally, the department has been innovative in finding ways to save, including participating in the university-wide partial shutdown during the semester break to save utility costs.

"This has been a challenging time for all departments across the university," says **Arun K. Somani**, ECpE department chair. "But our faculty, staff, and students have demonstrated resiliency through this tough time, and we are continuing to deliver an outstanding academic experience to our students in spite of the cuts." ■

Department Chair Search Update

After a national search for a new ECpE department chair, the search committee has reviewed the applications and brought in four candidates to interview, deliver seminars, and meet with faculty and staff in March and April. It is expected that the new department chair will begin his appointment on July 1.

Check the ECpE department website at www.ece.iastate.edu for the latest news on the department chair search. ■

Aluru, Biswas Named IEEE, APS Fellow

Two ECpE faculty were recently named fellows of their fields' major professional organizations:



Srinivas Aluru

Srinivas Aluru, the Ross Martin Mehl and Marylyne Munas Mehl Professor of Computer Engineering, was named a fellow of the Institute of Electrical and Electronics Engineers (IEEE) for his extraordinary contributions to the field of computational biology.

Aluru's work to sequence the maize genome recently was featured in *Science* magazine, and he was named a 2007 finalist for the Computerworld Honors Program's 21st Century Achievement Award. He conducts research in high-performance computing, algorithms and systems for large-scale applications, bioinformatics and systems biology, combinatorial scientific computing, and applied algorithms. In addition, he has published two books and more than 100 technical papers in journals and peer-reviewed conference publications, and led 29 externally funded research projects.



Rana Biswas

Rana Biswas, an adjunct associate professor of electrical and computer engineering and physicist at the U.S. Department of Energy's Ames Laboratory, was named a fellow of the American Physical Society for his theoretical contributions to the dynamics of semiconductors, solar materials, and photonic crystals.

Before coming to Ames Laboratory in 1986, Biswas was a consultant to the Xerox Palo Alto Research Center and the Exxon Research and Engineering Company, and was a postdoctoral associate at AT&T Bell Laboratories. His research interests include calculations of the properties of bulk materials and surfaces, thin-film semiconductors and electronic materials, photonic crystals, subwavelength arrays, electromagnetic simulations, sensors, and atomistic modeling of microelectronic processes. He has co-organized three Materials Research Society symposia. ■

Iowa State Hosts Third Annual Community College Cyber Defense Contest

Nearly 90 students participated in the third annual Community College Cyber Defense Competition (CCCDC) December 4-5 at Iowa State's Internet-Scale Event and Attack Generation Environment research facility. Des Moines Area Community College Team #1 from Ankeny took first place, the Kirkwood Eagles from Kirkwood Community College in Cedar Rapids placed second, and the IWCC Defenders from Iowa Western Community College in Council Bluffs took third place. Nineteen teams representing 10 of the 15 community colleges in Iowa registered for the competition.

The cyber defense competition gives students the opportunity to take what they have learned in their courses and apply those concepts to create a fully functional computer network to imitate a real-world experience. Students are given a short narrative story detailing the network services they have to implement, as well as their network address space. The community college team's job is to implement services such as e-mail, a programming environment, web hosting, and remote desktop capabilities ahead of the competition. They also are encouraged to implement a firewall to help protect their networks.

During the competition, the students defend their networks from attacks from



Participants from the Community College Cyber Defense Competition in December 2009

intruders (played by Iowa State graduate students and information technology professionals), as well as respond to end user requests for services.

In addition to being a fun learning event for the community college students, the event also helps community colleges prepare to mentor local high school teams in their area to participate in the year-long IT-Adventures program and the two-day IT-Olympics competition (see more in box below).

The top two community college teams earned a spot to compete at the fifth annual national cyber defense competition of four-year colleges held at Iowa State in March.

The CCCDC is part of the Iowa State's Information Assurance Center under the direction of University Professor **Doug Jacobson**. The Internet-Scale Event and Attack Generation Environment (ISEAGE) research test bed is the backbone on which all Iowa State-hosted cyber defense competitions are run. ■

Iowa State Hosts IT-Olympics High School Contest for Third Year

For the third year, Iowa State University is hosting the IT-Olympics competition April 23-24 at Hilton Coliseum. At the two-day event, nearly 500 students from more than 45 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.

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 professionals in the students' local communities mentor the students and their teachers throughout the year. The goal of the program is to interest high school students to pursue IT-related careers. In 2009-10, nearly 80 students who had participated in the IT-Adventures program (or related previous programs) were enrolled at Iowa State University in IT-related areas, including 31 students who enrolled in electrical, computer, or software engineering. ■

Photo courtesy of the Information Assurance Center.

Iowa State Replica of First Electronic Digital Computer to be Displayed at Computer History Museum

By Mike Krapfl, ISU News Service

Iowa State University's full-scale, working replica of the Atanasoff-Berry Computer, a groundbreaking machine built on the Iowa State campus from 1939 to 1942, will be part of a major new exhibition at the Computer History Museum in Mountain View, California.

The replica of the Atanasoff-Berry Computer (ABC), the first electronic digital computer, will be part of the museum's multimillion-dollar, 25,000-square-foot exhibition opening in the fall of 2010. The exhibition will present more than 1,000 artifacts to tell the story of computing history and provide insights into how computing innovations have influenced everyday lives and will continue to make a significant impact on the global community.

The ABC replica, which was on display in the lobby of Iowa State's Durham Center, was recently moved to the museum. It will be on display for 10 years with the possibility of an additional five years. A display about the development and history of the ABC—including replicas of several vacuum tubes and one of the machine's rotating drums—will remain in the Durham Center.

About the Atanasoff-Berry Computer Replica

The replica was completed and demonstrated in 1997 as a tribute to the late inventors of the ABC, John Vincent Atanasoff, a former Iowa State professor of physics and mathematics, and **Clifford Berry**, a former physics

graduate student and ISU electrical engineering undergraduate. It took a team of researchers, engineers, faculty members, retired faculty, and students from Iowa State and the U.S. Department of Energy's Ames Laboratory four years and \$350,000 to build the replica ABC. The original was dismantled during the late 1940s and almost entirely discarded.

The ABC looks nothing like today's computers: It's the size of a big desk, weighs 750 pounds, and features rotating drums for memory, glowing vacuum tubes, and a read/write system that recorded numbers by scorching marks on cards.

But, the machine was also the first to use several innovations that are still a part of today's computers: a binary system of arithmetic, separate memory and computing functions, regenerative memory, parallel processing, electronic amplifiers as on-off switches, circuits for logical addition and subtraction, clocked control of electronic operations, and a modular design.

"John Vincent Atanasoff and Clifford Berry were true pioneers in electronic digital computing," says Iowa State President Gregory Geoffroy. "As part of the new exhibition, the Computer History Museum can tell the story of their innovations to hundreds of thousands of museum visitors and millions of online visitors every year. And so we're pleased Iowa State's working replica of the ABC will be part of the museum's ambitious exhibit. The ABC deserves a prominent place in the history of computing."

ABC's Controversial History

The ABC's place in computer history has been the subject of debate and even a federal court case. When World War II interrupted work on the ABC, Atanasoff and



Iowa State University's working replica of the Atanasoff-Berry Computer is moving to the Computer History Museum.

Berry moved on to other jobs and projects. J. Presper Eckert and John Mauchly, developers of the ENIAC machine at the University of Pennsylvania, were the first to patent an electronic digital computer. In 1973, however, U.S. District Judge Earl R. Larson overturned the ENIAC patents, writing, "Eckert and Mauchly did not themselves first invent the automatic electronic digital computer, but instead derived that subject matter from one Dr. John Vincent Atanasoff."

"Exhibiting the replica will greatly enhance the discussion of the ABC's significance," says Leonard J. Shustek, the chairman of the board for the Computer History Museum. "This is a controversial part of computing history, however, the museum is committed to telling the Atanasoff story in a way that fairly reflects its technical, historical, and legal significance."

The museum's new exhibition is designed to celebrate the significant milestones of computing over 2,000 years. It will feature 1,000 artifacts, explanatory films, pioneering story videos, interactive exhibits, dioramas, audio tours, and more.

"Who invented the computer is one of the most important and basic questions the exhibition discusses," Shustek says, "and one in which the ABC plays an important part of that discussion." ■

About the Computer History Museum

The Computer History Museum in Mountain View, California, is a nonprofit organization with a four-decade history. The museum is dedicated to the preservation and celebration of computer history, and is home to the largest international collection of computing artifacts in the world, encompassing computer hardware, software, documentation, ephemera, photographs, and moving images. For more information, visit www.computerhistory.org or call (650) 810-1010.

Calendar of Events

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

April 12-18

VEISHEA

ECpE demonstrations, April 17, Coover Hall/ECpE Building Addition, 12 to 3 p.m.; for other VEISHEA activities, see details at www.veishea.iastate.edu

April 15-16

Spring External Advisory Board (EAB)

Coover Hall/ECpE Building Addition, event times vary

April 16

EAB Special Lecture – Robert Brayton

Howe Hall, Alliant Energy-Lee Liu Auditorium, 1:10 p.m.

April 20

ISU Undergraduate Research Symposium

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

April 22

ECpE Scholarship and Awards Banquet

Scheman Building, 5:30 p.m.

April 23-24

IT-Olympics

Hilton Coliseum, see details at www.it-adventures.org/itolympics.html

May 7

Graduate Commencement

C.Y. Stephen's Auditorium, 7:30 p.m.

May 8

Undergraduate Commencement

Hilton Coliseum, 1:30 p.m.

May 13-15

ISU Alumni Days

Event locations and times vary; see www.isualum.org/en/events for details

September 21

Fall Engineering Career Fair

Hilton Coliseum, 12 to 6 p.m.

October 30

2010 Homecoming

See www.isualum.org/en/events for details

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

Three ECpE Faculty Receive NSF CAREER Awards

Three electrical and computer engineering professors at Iowa State University have received prestigious National Science Foundation (NSF) CAREER Awards this year. Assistant professors **Liang Dong**, **Jaeyoun Kim**, and **Lei Ying** each will receive \$400,000 over a five-year period to fund their research and educational efforts in photonic circuits, optical micro-electro-mechanical systems (MEMS), and wireless network technologies, respectively.

Photonic Circuits for Smart Sensor Technology

Dong's research focuses on developing a state-of-the-art, universal photonic circuit platform that will advance smart sensor applications in fields such as photonic computing, optical communication, environmental monitoring, biochemical defense, and lab-on-a-chip technology.

"The main objective of my research is to create a platform that will allow engineers and scientists to dynamically configure/reconfigure, tune/detune, and erase/rewrite various high-speed photonic circuits on a single photonic chip upon demand and then use the new platform to improve smart sensor technology," Dong says.

High-speed photonic circuits are likely candidates to replace standard electrical integrated circuits used in many electronic devices today, Dong adds. The new circuits could help reduce production costs, as well as the size, weight, and power consumption, enabling lower-cost, smaller, and more energy-efficient electronic devices to be designed.

MEMS Technologies to Improve Artificial Eyes

Kim plans to create an ultra-wide field-of-view imaging system inspired by biological systems. He explains that researchers have been trying for years to mimic the compound eye structure of insects and crustaceans because of their naturally wide field-of-view, which is enabled by large curvatures in their eye. The biggest challenge to mimicking the natural eye and its wide field-of-view is developing curvatures in optical elements to replicate ones in natural eyes. Kim plans to address this challenge by developing a new optical MEMS interface structure and



Liang Dong



Jaeyoun Kim

polymer techniques.

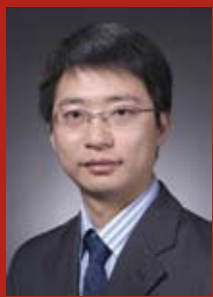
"My research aims to achieve a dynamically tunable, truly hemispherical vision using inspirations from the eye structure of deep-sea amphipods," Kim says. "I propose to eliminate the curvature problem, rather than bypassing it, to enhance field-of-view. In a sense, my research is bio-inspired, not just biomimetic, since my artificial eyes will eventually be able to do more things than their natural counterparts."

Kim's research could advance technology that doctors use for endoscopic imaging and the military and other organizations use for safety monitoring, as well as technologies in the areas of robotics and automation. Eventually, the technology could create a foundation for developing an artificial eye for humans or be used for assistive devices such as sensors to help guide individuals who are visually impaired.

Improvements to Wireless Networks for Mission-Critical Applications

Ying is establishing a new approach for building wireless networks for mission-critical applications, including wireless mesh networks that are used for emergency response and public safety, wireless sensor networks used for medical technologies and unmanned surveillance of U.S. borders, vehicular networks that use accident warning technology, and in cellular networks for users who use many forms of real-time streaming media. His research will help address and provide solutions for three long-standing weaknesses of wireless communication: bandwidth, channel fading, and interference. >

> Continued from previous page



Lei Ying

For example, in cellular networks, the new technology Ying develops could improve the delivery and viewer experience for people who watch TV on their cell phones.

Past wireless network research harnesses

the power of both optimization and stochastic network theories for network design and focus on optimizing long-term throughput of networks. But this focus on throughput could cause unacceptably large delays that significantly degrade performance, explains Ying.

“My research will break away from the throughput-first mentality to design networks to meet delay constraints, leading to new network algorithms that can be used

to improve networks used in public safety, homeland security, health care, and multi-media communications,” Ying says.

The NSF CAREER award is the most prestigious award offered by the National Science Foundation in support of early career development activities of teacher-scholars who most effectively integrate research and education within the context of their organization’s mission. ■

ECpE Profs Use ARRA Funding to Improve Electronics Reliability, Lifetime

How old is your PC (or Mac)? According to Associate Professor **Degang Chen**, a decade ago, researchers and consumers expected the life of a computer to be about 10 years, and because of this, a computer rarely would fail. Today, most computers have a life of about three years, and the expected life is becoming shorter and shorter.

The reason new computers are failing faster than their predecessors is due to the temperature inside the computers. Because of the density of electronic circuits in the computer, the power density in the computer’s microprocessor becomes extremely high, increasing the computer’s internal temperature and decreasing the quality of its circuits, ultimately leading to its failure to perform.

Chen and Professor **Randall L. Geiger** are using American Recovery and Reinvestment Act of 2009 funding through the National Science Foundation, along with funds from Semiconductor Research Corporation, to solve the temperature problem in computers and improve their lifetime reliability.

“The ultimate goal is to help extend the reliable use life of electronic circuits used in

computers, cell phones, and iPods,” Chen says. “We will provide the enabling technology for either extending the reliable use life or getting more performance out of the device for a given targeted life.”

Chen and Geiger want to put hundreds of tiny temperature sensors in computers so the computer can monitor its own temperature. Some temperature sensors are used in computers today, but Chen says they are too big and bulky to be easily embedded into computer chips and because one degree dramatically can impact a computer’s life, they are not accurate enough since they only can measure a temperature within a range of 7 to 8 degrees.

“We believe we have come across some new ideas and new techniques that we can design to make temperature sensors be orders of magnitude smaller, but then also achieve temperature measurement accuracies in the ½ degree of error range,” Chen says. “Once we make the sensors orders of magnitude smaller, we can then afford to embed not only one or two, but hundreds of temperature sensors in the chip.”

Chen and Geiger’s research could have a huge impact on the electronics industry, particularly for multi-core computers used in large data centers across the country. These multi-core computers, which can have 64 CPUs running on one computer chip, could have a temperature sensor placed on each CPU and in its memory. The computer could then monitor the local temperature and identify hot spots. Next, a management circuit could

use that information and put more of the tasks on other CPUs to balance the temperature and make sure no area gets overheated.

This would help extend the multi-core computers’ reliable life or increase its performance over a specified period of time, meaning that instead of replacing computers every two or three years, companies and data centers could use the computers for five years.

And when companies use computers for a longer period of time, it not only helps their bottom line, but it also helps the environment because it will decrease the non-biodegradable computer waste that goes into landfills. Because the computers would operate at lower temperatures, the energy efficiency of the chip would be improved, too.

For consumers, Chen and Geiger’s research could mean that the 2.5 GHz computer you bought could run at its highest speed most of the time, rather than only some of the time.

“The power density in computers is too high, so when you clock it fast, the temperature goes up really fast. So nowadays, when you buy a 2.5 GHz computer, it’s not running at that speed most of the time because as it heats up, it slows the clock down,” Chen says. “You may have paid money for a 2.5 GHz CPU, but you are maybe only running it at 1.5 GHz to prevent heating.”

In the end, Chen and Geiger’s main purpose is to improve reliability of large electronic circuits and implement accurate temperature monitoring to extend the life of electronics you use every day. ■



Degang Chen



Randall L. Geiger

Two New VLSI Faculty Advance Circuits, Switching Power Regulator Research

Although they come from two different backgrounds—one just received his PhD from the University of Washington in 2008 and the other came to Iowa State after working for eight years at Texas Instruments in Dallas—both **Nathan Neihart** and **Ayman Fayed** are achieving early success as assistant professors in the ECpE department's VLSI research group.

Cognitive radio research

Neihart is focusing his research efforts on designing circuits for cognitive radios, a new type of reconfigurable radio, and recently received a National Science Foundation Broadening Participation Research Initiation Grant in Engineering to support his research.

"A cognitive radio is one that is not confined to operate in a small fixed band of frequencies as is the case for traditional wireless systems," Neihart says. "A cognitive radio can, instead, choose its operating frequency and bandwidth as long as those frequencies are not being used by another system."

The problem of an apparent spectrum shortage and today's increasing reliance on and development of new wireless communication devices that can operate in the 1 to 10 GHz frequency bands sparked Neihart's interest in this area.

"Recent measurements have shown that even though nearly 100 percent of the 1 to 10 GHz band is licensed, approximately only 18 percent is being used at any given time," Neihart explains. "If we could build radios that could find unused frequencies and borrow them on a temporary basis, such as the length of data transmission, then the apparent spectrum shortage would disappear."

The biggest challenge Neihart is trying to overcome in his research is to design circuits and radio sub-blocks capable of operating over ultra-wide bandwidths. Stringent performance requirements for today's radios also are a challenge.

"We are trying to address these issues by looking outside the field of radio frequency circuit design for inspiration," Neihart says. "We have found that by using nonstandard circuits and new configurations of traditional circuits, we are potentially capable

of achieving wide band operation, as well as good performance in terms of linearity, power consumption, and noise."

The impact of Neihart's research on industry and society could be significant. For example, by allowing radios to self-govern themselves, overall network congestion could be reduced and overall data rates and network reliability could be increased. The research also has applications in emergency response when normal channels of communication are disrupted by large disasters such as earthquakes, hurricanes, and floods, as well as in military communication to improve communication security, coordination, and safety of military personnel.

Improving VLSI power management design

Fayed's research focuses on the design of switching power regulators for mixed-signal System-on-Chip (SoC) and is motivated by his past experience as an analog and mixed-signal designer at Texas Instruments.

"Switching noise at the output of switching regulators and coupling between different loads sharing the same regulator were always major reasons for performance degradation of analog/RF circuits in SoCs," Fayed says. "The typical solution had been to use power-inefficient post regulation and expensive filtering to mitigate this issue. I always thought that there must be a way to resolve this problem within the regulator itself."

Fayed's research has two main goals: to power noise-sensitive analog and RF circuits directly from energy-efficient switching regulators without the need for filtering or linear regulation, and to enable diverse types of load circuits to share the same switching regulator by manipulating the coupling and interference mechanisms between different loads to mitigate their impact on each other.

"The most challenging part of the research has been importing many spread-spectrum concepts into the design of switching regulators," Fayed says. "Those concepts have proven very successful in communication systems, but have not been explored for noise control in power converters. I have been deeply studying these concepts from communications and signal processing and trying to

apply them to switching regulator design."

Fayed hopes his research can have a great impact on the power efficiency and implementation cost of power-restricted electronic devices such as battery-operated devices, implantable biomedical devices, and remotely deployed sensor grids. He also is



Nathan Neihart



Ayman Fayed

trying to tie in his research with his teaching by developing a new graduate course in power management and conversion for VLSI systems to better prepare students who want to work in industry.

"I focus on basic circuit- and system-level concepts of linear/switching power converters in this course," Fayed says. "This area is rarely addressed in universities, despite its crucial importance to the semiconductor industry, which is causing a serious shortage of engineers graduating with any knowledge of this subject."

A bright future

With the early successes of these two VLSI assistant professors, it is clear they have positioned themselves for long-term career success and already have learned a lot from their early research and teaching experiences. For example, Neihart says he's learned that the key to solving big problems can come from anywhere, and Fayed says he's learned that delegation is a key to success in academia and that students are often good at helping experienced researchers think outside the box to make innovations.

"I also have learned that perseverance is important," Neihart says. "You can't give up the first time something doesn't work. As Thomas Edison said, 'When I have eliminated the ways that will not work, I will find the way that will work.'" ■

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).

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¹For more information on the funds, contact Ben Barnhart, Director of Development, College of Engineering (515-294-0934 or barnhart@iastate.edu).

Notice to Alumni Living Abroad:
 Due to budget constraints and increasing postage costs, the ECpE department temporarily will not be sending the *ECpE Connections* newsletter to alumni with international mailing addresses. 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. ■

Thank You!

07 EC0:03

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.

ISU Researchers Assist European Space Agency with Remote Sensing Satellite Project

Researchers at Iowa State University watched a November 1 launch of the European Space Agency's Soil Moisture and Ocean Salinity (SMOS) satellite with great interest. Why? Because the information the satellite will gather is an important part of their research efforts.

SMOS is the world's first soil moisture remote sensing satellite. It will generate global maps of soil moisture every two to three days for at least the next three years. The satellite also will map the salinity of the world's oceans.

"These data will help us better under-

stand Earth's weather and climate," says **Brian Hornbuckle**, ECpE courtesy associate professor and associate professor of agronomy.

Hornbuckle and his research group are official members of the SMOS Validation and Retrieval Team. Team members will develop models that translate the raw remote sensing signal measured by SMOS in space to soil moisture and ocean salinity. They also will perform ground experiments to verify that the measurements from the satellite match what is happening on the ground.

"Our group will be active in both activities," Hornbuckle says. "We will assess the effect of dew and precipitation intercepted by crops on the satellite's ability to measure soil moisture. We also will compare our ground measurements of soil moisture with the SMOS measurements."

Hornbuckle's group is responsible for the U.S. Midwest region. The ground measurements they are collecting are on 200 acres of Iowa

An illustration of the Soil Moisture and Ocean Salinity (SMOS) satellite in orbit

State research farmland south of campus. On-site equipment measures soil moisture, precipitation, radiation, and evapotranspiration. Remote sensing equipment is taken to the field once a year, to see if data from the on-site monitoring matches data from the remote monitoring.

Hornbuckle is principal investigator for the project, which also involves researchers from the University of Iowa and the USDA National Laboratory for Agriculture and the Environment at Iowa State. It is funded by a \$1.3 million, five-year grant from NASA.

Hornbuckle has made three trips to Europe to report on the work at Iowa State.

"Our participation in the SMOS mission will help us prepare for a more active role in a similar soil moisture mission being planned by NASA that is scheduled for launch in 2014," he says.

"The ultimate goal is to someday use this type of information in conjunction with models to forecast soil moisture conditions, the weather, and to detect climate change," he says.

To learn more about SMOS, visit www.esa.int/SPECIALS/smos. ■

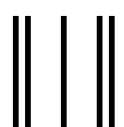


Image courtesy of European Space Agency/AOFES Medialab.



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Students Share How Scholarships Impact Their Lives and Education

For students, especially in these difficult economic times, a scholarship can mean the difference between attending college or having to drop out, or having to choose between spending time studying and preparing for exams or working to earn tuition money.

Each year, corporate and individual donors help alleviate this stress on students—and their parents—by providing an average of more than \$250,000 to Iowa State's ECpE department to award to deserving students. As tuition rises every year, the scholarships become even more important to students and their families.

The following are the stories of three students and how the scholarships they earned impacted their lives.



Betty Nguyen

Betty Nguyen, a junior in computer engineering from Council Bluffs, Iowa, is an outreach leader for Minds of Tomorrow (an engineering outreach program for K-12

Betty Nguyen

students) and is also a member of the Society of Women Engineers and Eta Kappa Nu (HKN). She has done internships as a software engineer at Kingland Systems and as an electrical engineer at Rockwell Collins. These experiences she's had during college are ones she is thankful to have, and have been made possible because of the Wallace C. Caldwell Scholarship she received this past year.

Nguyen says she is grateful for the Caldwell scholarship because it has eased stress on her and her family, especially her parents who have already made many sacrifices to send Nguyen to college.

"My parents have made a lot of sacrifices for my college degree. When I was five or six years old, they left their home country, Vietnam, and their way of life in hope of providing me a better education in America," Nguyen says. "They both have worked very hard doing laborious jobs as custodians to get me where I am today. I am thankful and

want to fulfill their wishes."

Nguyen adds that the Caldwell scholarship, as well as Iowa State's MVP scholarship, have helped her focus more on her school work rather than worrying about meeting college financial demands.

"Life in general feels a little less stressful with the added help of this scholarship."



Nathan Schares

Like Nguyen's parents, **Nathan Schares'** parents also have had to make many sacrifices to send him to college. Schares, a senior in electrical engineering from Jesup, Iowa,

Nathan Schares

comes from a middle class family and his parents are currently trying to help both him and his sister with their college tuition.

"My mother teaches first grade at my hometown public school, and my father is an engine mechanic for John Deere. My father is eligible for retirement, but is continuing to work to help support our family," Schares says.

To pay for college, Schares also contributes money he has saved from three engineering summer internships he's held at PricewaterhouseCoopers in Chicago, John Deere Power Systems in Waterloo, Iowa, and C2 Development in Ames. He also works whenever he can during breaks from school.

Last spring, Schares, who is currently the IEEE student chapter president and a member of the Tau Beta Pi honor society and Critical Tinkers student group, received the Lester and Delilah Buechler Scholarship from the ECpE department.

"Receiving the Buechler scholarship has improved my life and college experience by

helping reduce the stress of financial burden," Schares says. "As a young engineer entering the workforce during an economic recession, it is relieving to have some of my student loan debt mitigated by scholarships such as the Buechler scholarship."



Harsh Goel

Harsh Goel, a junior in computer engineering and computer science from Meerut, India, echoes the sentiments of Nguyen and Schares in being grateful for the scholarship he has received:

Harsh Goel

the Garmin ECE Scholarship.

"Receiving the Garmin scholarship has helped me immensely to enhance my college experience," Goel says. "It is because of this scholarship that I can worry less about paying tuition bills and concentrate on academic and learning experiences. I can now work shorter hours in part-time jobs and pursue leadership and research activities."

Some of the activities Goel has pursued since receiving the scholarship include participating on Freshman Council, the International Student Council, Indian Student Association, Cyclone Aides, and HKN, as well as serving as a community adviser in the residence halls. Goel also completed a summer internship for Cerner Corporation in Kansas City, Missouri, and is currently doing a software development co-op with IBM in Durham, North Carolina.

The experiences of Nguyen, Schares, and Goel are just a snapshot of the impact scholarships have on students and their families. All scholarships—whether they cover \$100 to full tuition—can make a difference in a student's life. ■

How You Can Help Students

To learn about how you can contribute to ECpE scholarship funds, or to establish a new scholarship in the department, contact the ISU Foundation at (515) 294-2416 or djb@iastate.edu, or fill out the reply form on page 9.

Engineering Students Build Robot to Fight in National BattleBots Competition

About once every two years robotics enthusiasts from around the country gather together to show off their own creations—complete with wireless remote control capabilities, hydraulic and pneumatic systems, and weapons—and to destroy their nemesis' newest creations. This year, a team of more than 30 Iowa State students are joining in the fun by designing and building their own robot to compete in the national BattleBots Collegiate Championship April 6-11 in San Francisco.

Derek Joseph, sophomore in mechanical engineering and project manager of the BattleBots team, organized the ISU team this year with the goal of giving students an opportunity to explore their interests and provide them with a way to learn outside of the classroom. The BattleBots team is part of the ISU Robotics Club.

"BattleBots is a robot combat competition," Joseph says. "In a BattleBots event, competitors build and design remote-controlled, armored, and weaponed machines that they put in an arena to fight in a tournament. The purpose of the fight is for one robot to dominate, overpower, or disable the other. If your opponent is not disabled in a three-minute match, the winner is determined by a judge's decision based on aggression, control, damage, and strategy."

Electrical engineering senior **Jimmy Skadal** is also a member of the BattleBots team. Last semester, he joined the team's



Student Derek Joseph designed this BattleBot as a high school student. This year's ISU BattleBots team is building a robot with a pneumatic launching arm designed to throw its competitors across the contest arena.

power and controls group, which designs batteries, chargers, wires, speed controllers for motors, relays, a radio receiver and transmitter, and lighting.

"The power and controls team is what will give the robot life," Skadal says. "My group has to decide how the system is wired, what battery and battery charger system to use, and incorporate the remote controls with the motors and speed controllers."

Also on the team's power and controls group are electrical engineering students **Jennifer Grubb, Darin Cleveland, Justin Landsgard, Adriana Ceylan, and Jonathan Driggs**, as well as computer engineering student **Andy Nelson** and mechanical engineering student **Aren Hill**.

Skadal says the robot's intricate system

must be durable enough to take pounding hits from another robot in a three-minute match. The power and controls team must make important decisions to ensure all the mechanical parts move together efficiently.

In addition to a power and controls group, the BattleBots team has three other groups of students working on the project in the areas of drive—anything dealing with motors, gearboxes, timing belts, pulleys, axles, wheels, and bearings; weapons—designing the pneumatic systems, air storage tank, and pneumatic piston; and frame and armor—the outside casing of the robot. Computer engineering student **Michael Potter** is part of the frame and armor group. The other groups largely consist of mechanical, aerospace, and industrial engineering students.

The team currently is finishing the design for their 120-pound robot. The robot has a "flipper" design, which involves a pneumatic launching arm weapon system. It is designed to get underneath the opponent and then throw it across the arena.

The ISU Robotics Club, which meets weekly to discuss current robotic projects and new technologies and listen to speakers talk about different robotics topics, allows students to get more experience with robotics and new technology.

"I love this club because I get to have fun with the background that my electrical engineering classes have given me, and there is nothing better than that," Skadal says. ■

Department Engages Students with Wii-mote and Rock Band Projects

CprE 185 and CprE 186, the department's two introductory computer engineering and problem solving courses, aren't what they used to be. Assistant Professor **Tom Daniels** has revamped the courses to engage first-year students and show them how what they learn in many of their general education classes such as physics and mathematics can be applied in practical computer engineering applications.

In 2007, Daniels developed a set of exercises based on Nintendo Wii-motes for freshmen to do. Last fall, he added a Wii-mote Football Drop exercise. The students packed their Wii-motes in a foam football to protect them, and dropped them from the top of the grand staircase in the ECpE Building Addition's atrium to measure how far and fast they drop.

"When students do their work in the lab, it'll work fine, but when they get out in the real-world and drop the Wii-motes

from the staircase where air resistance is important, it doesn't work. It forces them into a problem-solving mode where they have to work out issues they didn't think about before to solve this real-world problem."

Daniels says that many students create contraptions where they "slap a little of this, and a little of that together." By the end of the project, the students realize that if they had spent more time writing down a coherent plan or simplifying their design it could have saved them a lot of time and improved their final product.

"The goal is for students to do real-world problems and get them to understand why they need to understand physics in the future. Then, when they get into their physics or advanced mathematics classes, they can see the reason why they need to be there in order to be a computer engineer." ■



Students participate in the Wii-mote Football Drop.

Students Receive Research, Academic Honors

Congratulations to the following undergraduate and graduate student award winners:

■ Graduate students **Osameh Al-Kofahi** and **Bojian Xu** both received the university's Fall 2009 Research Excellence Award. The awards are given each semester to recognize graduate students at the time of their graduation for outstanding research accomplishments as documented in their theses or dissertations.

■ Last fall, **Kang Kang** and **Madeline Oglesby**, both seniors in electrical engineering, received the annual International Engineering Consortium's William L. Everitt Student Award of Excellence for 2008-2009.



Madeline Oglesby (left) and Kang Kang (right) received their awards during an ECpE faculty and staff meeting last fall.

The award honors outstanding seniors who have demonstrated an interest in the communications field. ■

CprE Senior Recognized by Alliant Energy

In May, **Emmanuel Owusu**, a senior in computer engineering from Ames, will be awarded the Errol B. Davis Alliant Energy Award. The award recognizes achievement, leadership, and service by a graduating senior in business or engineering from one of the three Iowa Board of Regents' institutions.

Owusu says he was thrilled when he heard the news that he had won the award.

"You never know how you compare to the rest of the applicant pool when you apply for scholarships, so this was a nice surprise," he says.

Owusu decided to study computer engineering because he wanted to join a challenging field and always had an interest in computers and technology.

"I was particularly interested in computer engineering because it has a strong focus on both hardware and software concepts and is applicable to variety of industries," Owusu says.

What he likes most about the computer engineering program at Iowa State is the hands-on experiences he gets.

"I learn the most from hands-on experiences so I really like that many of the courses

have lab and project components," he says.

But succeeding in computer engineering hasn't always been easy for Owusu.

"I had a tough time adjusting to the time management and organization demands during my first year," Owusu says. "I was able to improve those skills with guidance of mentors."



Emmanuel Owusu

Owusu overcame the early challenges of his college career, and has now had two internships. His first internship was at Monsanto in Ankeny, Iowa, in 2007.

"I worked on an application that allows crop breeding researchers to monitor and control the various stages of a crop DNA fingerprinting process," he says. "In addition to software development, I spent time becoming familiar with the lab information management systems and the crop breeding processes."

More recently, Owusu interned in a quality assurance engineering role at Adobe with its InDesign group in Seattle, Washington, in the summer of 2009.

"My main task for the summer was to develop a mobile application for the hosted service my group developed," he says. "I was

ISU Solar Decathlon Team Places 12th in National Competition

Iowa State's Solar Decathlon team finished in 12th place overall in the 2009 U.S. Department of Energy's Solar Decathlon in October.

Iowa State was one of 20 select student teams from four countries that competed to design, construct, and operate highly energy-efficient, completely solar-powered houses. After the houses were built on their respective campuses, they were dismantled, transported to Washington, D.C., and reassembled for the competition and public tours.

The teams were judged in 10 competitions. Iowa State placed 3rd in marketability/livability/buildability, 4th in communications, 5th in engineering, and 6th in net metering (the house was 6th best in producing more energy than it consumed). Iowa State's house was the only one in the competition that was entirely ADA accessible, employing universal design concepts.

The Iowa Department of Natural Resources purchased the 800-square-foot, energy-efficient, solar-powered Interlock House in October for use as an interpretive center at Honey Creek State Park. Iowa State also will have access to the building for energy performance monitoring. The DNR plans to host an open house during Earth Week, April 18-24. ■

involved with all phases of design for the mobile application, including user experience design, software development, and software testing. This was a great learning experience for me because I was exposed to the aggressive scheduling and task management demands of collaborating on large software projects."

Owusu hopes to one day have in a job where he can work on technical problems that have a great impact on society.

"I aspire to advance research on technologies that can be easily adopted by developing countries," Owusu says.

Currently, Owusu doesn't know what he will do after he graduates, but he is keeping his options open by applying to graduate schools and looking for a full-time engineering position. ■

Alumni Get Involved in Senior Design Program

Each year ECpE seniors work with industry professionals to create the capstone project of their engineering education. And each semester ECpE alumni return to campus to give lectures during the senior design course, work with students on projects, and participate on the Industry Review Panel that evaluates the students' final projects.

Recently, alumnus **Bob Dearth** (BSEE '81), who has worked at Honeywell for nearly 29 years and is currently a principal engineer, has become involved with the department's senior design program.

"I had done other projects with the University of Missouri, Rolla, and Kansas State, but newer ISU alumni engineers at our company got me more excited than ever about giving back to ISU," Dearth says.

Dearth has made presentations to the senior design class about engineering projects

he has worked on at Honeywell, and has served on the Industry Review Panel. He says his experience as a member of the Industry Review Panel, and his career experience at Honeywell, have helped him realize what an excellent education he received at Iowa State.

"For me it has not always been what I learned, but that I *can* learn, continue to learn, and adapt," Dearth says. "ISU also encouraged me to work with others. It is very seldom that you work alone on anything, and that is one of the great experiences I've noticed in the senior design projects I have witnessed to date. I saw great problems to solve, tough deadlines, tight budgets, and three to four individuals working it out. It is very practical."

Dearth says some of his favorite senior design projects have dealt with robotics and automation, and each semester the students impress him with their projects.



Each semester students present their senior design projects to an Industry Review Panel, which includes some ECpE alumni.

"When I watched my first set of presentations, I was very impressed by the students' abilities to present and really be knowledgeable about their projects," Dearth says. "I am amazed at the experience and exposure the students in engineering are getting these days. They are witnessing and experiencing real-life problems and issues in the projects they have to manage and complete."

Alumni other than Dearth also are involved with the ECpE department's senior design program. And by being involved with the program, those alumni can impact their companies and work projects, as well as the department's curriculum.

For example, Dearth says his involvement with the senior design program helps him recruit future employees to work at Honeywell, gives him and his company a chance to bring problems to the students to work on for future senior design projects, and lets him assist the department in updating and reviewing the senior design course curriculum to ensure it remains a valuable experience for students. ■

How You Can Get Involved with ECpE Senior Design

To get involved with the senior design program in any of the following ways, please contact Associate Professor **Manimaran Govindarasu** at gmani@iastate.edu or (515) 294-9175.

Propose a Project: The ECpE department is always looking for new, real-world electrical, computer, and software engineering projects to give to students. To see details on current and past projects, visit <http://seniord.ece.iastate.edu>.

Give a talk: Each semester industry professionals come into the class and tell students about the engineering projects they have worked on. The department and senior design program coordinators always want to hear more about what our alumni are doing and expose the students to new, innovative engineering projects happening in industry.

Volunteer for the Industry Review Panel: Industry representatives come to campus once per semester to evaluate student senior design projects and watch their final presentations.

ECpE Alumni Honored for their Career Success

Congratulations to the following alumni on their recent awards:

Robert K. Brayton (BSEE '56) and **Sehat Sutardja** (BSEE '83) are receiving the ISU Alumni Association's (ISUAA) Distinguished Alumni Award on April 16. The award is the highest honor given to alumni by Iowa State University through the ISUAA. This award honors Iowa State alumni who are nationally and/or internationally recognized for preminent contributions to

their professions or life's work.

Brayton currently is the Cadence Distinguished Professor at the University of California, Berkeley's Department of Electrical Engineering and Computer Science. Sutardja is the co-founder of Marvell Technology Group, a leading worldwide provider of semiconductor chips, and currently serves as the company's president and CEO.

Jerry Doorenbos (BSEE '88) is receiving the College of Engineering's

Professional Progress in Engineering Award in April. The award recognizes outstanding professional progress and personal development in an engineering field. Doorenbos is a Distinguished Member of the Technical Staff at Texas Instruments in Tucson, Arizona, a design enter for analog and mixed-signal integrated circuits.

Edward Perkins (BSEE '81) won the 2009 Honeywell Outstanding Engineer of the Year Award. He is a principal engineer at Honeywell. ■

Alumni to Establish Scholarship to Honor Prof. Emeritus Edwin C. Jones

Did you ever have a professor who challenged you, guided you, and pushed you to succeed? For many ECpE alumni, **Edwin C. Jones, Jr.**, a university professor emeritus, was that professor. He has mentored many students at Iowa State since 1966, and now the students he mentored want to honor the person who helped shape them into the professionals they are today by establishing an endowed scholarship in his name.

“Ed was always more than your typical adviser helping you choose classes,” says one of Jones’ former students. “He really got to know you as a person. He then provided real guidance and advice about all sorts of career decisions, much beyond simply what classes you needed to take to graduate. He put a human face and concern on an institution that could easily become overwhelming.”

In talking with Jones, it’s clear he truly enjoyed mentoring students.

“Advising, I think, was the best part of my job,” Jones says. “Some of my favorite memories are seeing the students who have gone off in the world who are doing great

things—and there are a bunch of them. There are some who are tenured faculty members at major universities, and one even invented a microphone that’s in cell phones and also used in hearing aids.”

Jones says some students had abilities, but weren’t sure what they wanted to do, and so he tried to help them figure that out.

In addition to his advising activities at Iowa State, Jones also developed several courses, participated on an advisory board to establish an engineering program at Qatar University in the Middle East, and served (and continues to serve) in various roles for the Accreditation Board for Engineering and Technology. He says a conversation with a student was instrumental in providing the impetus to develop the computer engineering program in the 1970s. Jones also extended his reach beyond Iowa State’s campus through the off-campus graduate program.

“I started teaching in the off-campus program in the late 1960s. At that time, we drove to Cedar Rapids and taught class and drove back,” Jones says.

Since he retired in 2001, Jones hasn’t slowed down. He and his wife, Ruth, moved to Minnesota to be closer to family, and Jones began working as an adjunct faculty member at the University of St. Thomas to develop new engineering programs and, of course, mentor students. He also has worked with universities in Oman, the United Arab Emirates, and Saudi Arabia to give seminars and help develop their programs to meet international standards.



Edwin C. Jones, Jr.

When Jones learned ECpE alumni wanted to establish a scholarship in his name, he says his first thought was, “What is going on here?” He also adds that it was a pleasant surprise.

“What’s really interesting is there is a scholarship at West Virginia University in my father’s name, and one at Northern Virginia Community College in my sister’s name. So it’s family tradition I guess,” Jones jokes.

Jones also wants to extend his gratitude to the alumni establishing the scholarship.

“I want to thank all of those who are involved. The university is very proud of your accomplishments and contributions to the world. I wish you continued success,” Jones says. “I am also grateful to you for giving back to ISU, and for helping future students. Scholarships will be ever more important in years to come.”

ECpE alumni want thank Jones through creating the scholarship in his honor.

“We hope that students who receive the scholarship will wonder who this guy Ed was and why people would be motivated to recognize him in this way. We’d like people to remember what an important part of ISU’s ECpE department he has been over the years, and how many students he advised in his career would not be where they are now if he had not been a part of their lives,” says a former student. ■

Class Notes

Find out what your classmates are doing today!

1940s

Arnold M. Bucksbaum (BSEE '48) of Cedar Rapids, Iowa, says when he was at Iowa State, he especially liked the courses in ultra-high frequency engineering and principles of radio. In his career, Bucksbaum was project manager on several pieces of Apollo Communication equipment at Collins Radio (now Rockwell Collins). When he worked for Amana Appliances, he invented the microwave oven door seal (the oven was called a Radarange), which he says are now used in every microwave oven manufactured today. The door seal keeps the energy from leaking out without generating heat or burning up. It also, of course, protects the microwave oven user from the energy generated in the oven.

1980s

Mark Law (BScpE '81) was recently promoted to Associate Dean for Academic Affairs at the University of Florida’s College of Engineering.

David Mueller (BScpE '83) of Colleyville, Texas, is a Fellow of Technical Staff at Motorola.

1990s

Paul Speicher (BSEE '95) of Chicago, has left the engineering field to become an actuary. He says he misses the field from time to time. While in industry, he worked in automotive electronics, and then in RF design for high-speed Internet infrastructure. “I am impressed with the modern state of the department. I am proud to say I came from ISU EE/CprE,” he says.

See page 9 or visit www.ece.iastate.edu/alumni to submit your Class Notes. ■

How to Contribute

If you would like to donate or help raise funds to establish this scholarship in honor of University Professor Emeritus Edwin C. Jones, Jr., contact the ISU Foundation at (515) 294-2416 or djb@iastate.edu.

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EE Alumnus Honored for Calling Attention to Iowa State's Place in Computing History

Electrical engineering alumnus **Richard "R. K." Richards** (BSEE '43) returned to campus October 16 to receive Iowa State University's Professional Achievement Citation in Engineering award for helping secure Iowa State's place in computing history and impacting the computing field.

Richards, who worked in industry for only seven years and earned 28 U.S. patents before switching careers to become a farmer, says he was flabbergasted at winning the award. "I didn't think what I had done was that fancy," Richards says.

Richards was a pioneer in computer arithmetic, the electronic processing of numbers. He wrote the first textbook on computer arithmetic, a subject that scholars considered "chaotic" at the time. The book was reprinted 10 times, educating a generation of engineers on an innovative subject.

Richards also wrote four other books, including one called *Electronic Digital Systems*, which played a pivotal role in a 1972 court case involving Honeywell and Sperry-Rand that determined who invented the world's first electronic digital computer. Richard's statement in *Electronic Digital Systems* that "the ancestry of all electronic digital systems appears to be traceable to ... the Atanasoff-Berry Computer" helped to validate the claim that Iowa State University's John Vincent Atanasoff, a professor of physics, and **Clifford Berry**, an electrical



Richard "R. K." Richards stands next to the Atanasoff-Berry Computer replica in Durham Center. The replica is going to be on exhibit at the Computer History Museum in California (see page 5).

engineering student, invented the first digital computer. The court decision brought important recognition to Iowa State.

"At the time, I was aware of an argument about who invented radio. I wanted to settle the argument before it started on who invented the computer," Richards says. "The main reason for the book was to call attention to the Atanasoff computer. ISU is appreciative that I called attention to it."

After Richards graduated from Iowa State, he served three years in the U.S. Army, and then attended the Massachusetts Institute of Technology to obtain a PhD. He worked for IBM for seven years before doing some consulting work and authoring books about computers. He returned to Iowa in 1962 and later began farming. ■