

ECpE CONNECTIONS

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

Students Prepare for National Solar Decathlon



MORE NEWS:

- Department Initiates New Alumni Awards
- Power Fund Supports Solar Cell Research
- New Bioengineering Research Area Introduced

Cystorm is here!

Letter from the Chair

Dear alumni and friends,

As we enter the fall 2009 semester, our Department of Electrical and Computer Engineering (ECpE) says 'goodbye' to our centennial year, and 'hello' to the next 100 years. Our ECpE Centennial Gala and Awards Ceremony last spring was a huge success—attracting more students and alumni than ever before to our spring awards celebration. And this fall, our graduate and undergraduate enrollment numbers are up (see chart), bringing total enrollment to its highest numbers in recent years.

Additionally, several of our faculty have earned new recognition for their work by being named to departmental endowed professorships (see pages 4 and 5). They also are receiving recognition and funding for new research opportunities in the areas of solar cell technology (page 6), supercomputing (page 8), and computing and networking systems (page 10). Our alumni are experiencing success in their careers, too (page 13).

The start of a new century for our department comes with a couple changes. First, our department will start to raise funds for Phase II of our Coover Hall Building Project. Phase II will involve renovations to Coover Hall and a second addition to our building to ensure our current and future students will continue to learn and research in state-of-the-art facilities and with leading-edge equipment. And despite today's difficult economic times, we know our alumni and friends of the department will continue to give us their full-fledged support, and I sincerely thank them for that.

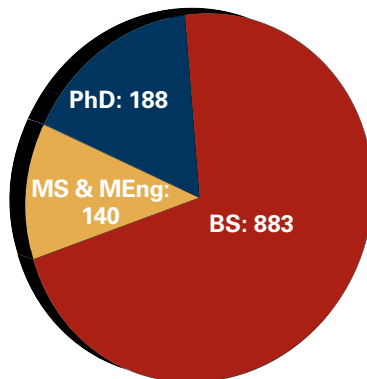
Second, I am voluntarily stepping down from my position as ECpE department chair at the end of this academic year. The search for my replacement is currently underway, and the department welcomes any suggestions you may have for who should lead the department into its next century. It has been my pleasure to lead this great department for the last several years.

Best wishes for a happy fall and winter.



Arun K. Somani

Department Chair
Anson Marston Distinguished Professor
Jerry R. Junkins Endowed Chair



Graduate and undergraduate enrollment increased this fall.

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Photo courtesy of Craig Carroll Photography.

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Department Chair: Arun K. Somani
Newsletter Editor: Dana McCullough

Cover photo: Students install solar panels on the ISU Solar Decathlon house's roof; Photo by Bob Elbert.

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Diagram courtesy of Architects Smith Metzger.

Department Launches Phase II of Building Project

With Phase I of the Coover Hall Building Project complete, the department is beginning efforts for Phase II of the project.

Phase II will include a new building addition to replace the old high-bay area and single-floor portions of the building, as well as renovations to the original Coover Hall. The new addition and renovations will create 43,000 square feet of new space for:

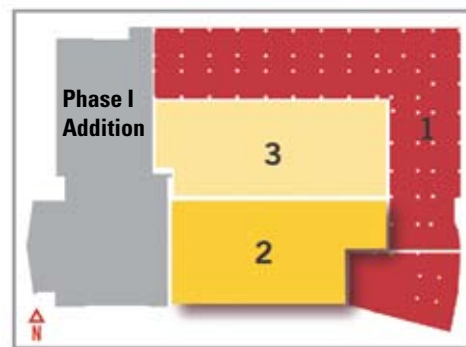
- faculty, staff, graduate student, and teaching assistant offices;
- research labs, including labs for high-speed circuits, wireless communication, and the Internet-Scale Attack and Generation Environment;

- teaching labs for the Electric Power and Energy Systems group, computer forensics, and more;
- classrooms and a permanent home for the senior design program; and
- an atrium to serve as a central gathering space for students and faculty.

The auditorium in Coover Hall also will be upgraded with new finishings and furniture, and the north and east wings will get a total makeover. The north and east wings' makeover includes gutting and remodeling to bring the space up to current building code and accessibility standards, and making it more energy efficient by installing double-paned windows and a central heating and cooling system.

The cost for Phase II is expected to be more than \$24 million, and will be funded by state funds and private donors.

"We are grateful to our alumni and industry supporters who were very generous during Phase I of our building project, and we hope those alumni and



Part 1 involves renovation of the original Coover Hall, Part 2 will be a new building addition, and Part 3 shows where the current courtyard will be enclosed to create an atrium.

other new alumni will support us in our endeavor to provide state-of-the-art classrooms, teaching labs, specialized research labs, and offices to our students, faculty, and staff," says Department Chair **Arun K. Somani**.

To contribute to the Coover Hall Building Project Fund, simply fill out and mail the form on page 9 (with the "building project" fund box checked), or contact the ISU Foundation's Ben Barnhart at (515) 294-0934 or barnhart@iastate.edu. ■



Coover Hall's northeast, east, and southeast portion will undergo renovations in Phase II.

Be Part of ECpE's Alumni & Friends Corridor

Last summer, the ECpE department sent each alumnus/a of the department of photographic history book in celebration of the department's centennial year. Along with the book, the department also initiated a campaign to challenge our alumni to raise \$1 million to help the department, faculty, and students conduct research, teach, and learn by creating an Alumni & Friends Corridor in the ECpE Building Addition.

So far, more than 30 alumni have signed up to be included in our Alumni & Friends Corridor, which will provide a place for the department to permanently recognize and remember our alumni, faculty, and friends. The corridor will include a wall with nameplates that honor those individuals.

"We appreciate the enthusiasm and support of our alumni who already have signed up to be part of our Alumni & Friends Corridor, and we continue with

our challenge to alumni to raise \$1 million through this effort," says Department Chair **Arun K. Somani**.

There is still time to sign up to be part of the Alumni & Friends Corridor.

To be included in this corridor and be permanently recognized and remembered—or to honor a favorite professor or colleagues who are Iowa State University electrical or computer engineering alumni—download and fill out the department's online Alumni & Friends Corridor form at www.ece.iastate.edu/alumni. A minimum donation of \$500 per nameplate is required for inclusion in the exclusive Alumni & Friends Corridor. ■

Sign Up Now!

To become part of the ECpE department's exclusive Alumni & Friends Corridor, visit www.ece.iastate.edu/alumni to download and fill out the PDF form.

Follow ECpE on Facebook, Twitter

The Department of Electrical and Computer Engineering (ECpE) is now on Facebook and Twitter. You can become a fan of ECpE on Facebook and stay up-to-date on department's happenings. Plus, you can get involved and network through our page by posting pictures and videos, commenting on departmental postings, and more. On Twitter, you can see what's going on daily in the department.

Come check out our Facebook and Twitter pages: Visit www.ece.iastate.edu to get connected. ■



Calendar of Events

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

September 21

Distinguished Lecture: "Emotional Intelligence Technology and Autism"

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

October 15

Distinguished Lecture: "The Seven Wonders of Computer Arithmetic"

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

October 15 & 16

ECpE Fall External Advisory Board Meeting

3041 ECpE Bldg., 10 a.m. to 4 p.m.

November 16

Distinguished Lecture: "Wind and Energy Markets—A Case Study of Texas"

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

December 18

Graduate Commencement

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

December 19

Undergraduate Commencement

Hilton Coliseum, 1:30 p.m.

February 9

Spring Engineering Career Fair

Hilton Coliseum, 12 to 6 p.m.

February 12

Distinguished Lecture: "Towards a System Theoretic Foundation for Control Over Networks"

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

March 12

Distinguished Lecture: "Better Architectures and New Security Applications for Coarse Network Monitoring"

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

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



Left: Assistant Professor Alexander Stoytchev holds an award presented to him by Interim Dean Jim Bernard. Middle: Associate Professor Manimaran Govindarasu rides in the 2009 VEISHEA parade after receiving a VEISHEA award. Right: Bernard hands staff member Sara K. Harris her departmental award.

Faculty and Staff Receive Accolades

Several faculty and staff members recently have received recognition. The following are some of those recent award winners:

- Associate Scientist **Maneesha Aluru** was awarded the 2009 P&S Outstanding New Professional Award for demonstrating innovative, creative, or original ways to accomplish job responsibilities; exhibiting service to Iowa State University, and more.

- Professor **Venkataramana Ajjarapu** was appointed to the David C. Nicholas Professorship of Electrical Engineering.

- Assistant Professor **Dionysios Aliprantis** was appointed to the Litton Industries Professorship.

- Five faculty were recognized with the department's 2009 Warren B. Boast Undergraduate Teaching Award—associate professors **Degang Chen** and **Sang Kim**, and assistant professors **Tom Daniels**, **Alexander Stoytchev**, and **Joseph Zambreno**. The annual award, named for former Department Head Warren B. Boast, recognizes outstanding faculty in the ECpE department.

- Assistant professors **Jaeyoun Kim** and **Aditya Ramamoorthy** received the Harpole-Pentair Developing Faculty Award, which provides supplemental support and enrichment opportunities to young assistant professors.

- **Brian Hornbuckle**, **Sang Kim**, and **Zhao Zhang** were promoted from assistant professor to associate professor with tenure.

- **Mani Mina** and **Robert J. Weber** were awarded a U.S. patent (no. 7,555,177) for an *All Fiber Magneto-Optic On-Off Switch*

for *Networking Applications* (see page 7).

- Associate professors **Manimaran Govindarasu** and **Nicola Elia** both received the VEISHEA Outstanding Faculty Award. The award is bestowed to faculty receiving the most student votes each year.

- Three faculty and staff members were awarded the Mervin S. Coover Distinguished Service Award, including **Manimaran Govindarasu**, Assistant to the Chair **Sara K. Harris**, and Communications Specialist **Dana (Schmidt) McCullough**. The annual award, named in honor of former Department Head Mervin S. Coover, is given to faculty and staff for their extraordinary service to the department.

- Senior Lecturer **Mani Mina** received the VEISHEA College of Engineering Faculty Recognition Award. Students in the College of Engineering nominate and vote for faculty to receive this award each year.

- **Dana McCullough** received the university's P&S CYtation, an award given semi-annually by the Professional and Scientific (P&S) Council to recognize P&S staff at the university who have demonstrated a commitment to excellence.

- Department Chair **Arun K. Somani** received a U.S. patent (no. 7,536,477) for *Access Mechanisms for Efficient Sharing in a Network*.

- Assistant Professor **Lei Ying** won the Defense Threat Reduction Agency's Young Investigator Award to conduct research on combating threats to networks. He is one of 15 people nationwide to receive this award. ■

New Bioengineering Core Area Established

The ECpE department is establishing a new core area of research and graduate study: bioengineering. This is the 10th core area the department offers.

“This new core area will broaden the engineering skills of our students. The integration of various engineering streams and basic life sciences will be key for future breakthroughs in science and technology,” says Assistant Professor **Santosh Pandey**, the research group’s chair.

Pandey also adds that the new area will bring together faculty conducting research in bio-optics, bio-electromechanical systems, biomedical imaging, bio-signal processing, bioinformatics, and other areas of bioengineering under one umbrella, helping them to identify common goals and challenges in creating a new student workforce adept in both engineering skills and life sciences.

For graduate students, this new core area of graduate study will allow them to



Assistant Professor Timothy Bigelow (right) and a graduate student conduct research for using ultrasound technology to treat cancer. Bigelow is part of the new bioengineering research group.

take courses in three broad areas: bio-signal processing, bioinformatics, and bio-micro-systems. Courses in those areas would cover topics such as ultrasound imaging, low-noise VLSI circuit design, computational molecular biology, functional genomics, microelectronics, microfluidics, and sensors and actuators.

More information about the bioengineering core research group is online at www.ece.iastate.edu/research/bioengineering. ■

New Faculty, Staff Welcomed

The department welcomed one new staff member and two faculty members last spring and fall:

■ **George Amariuca** joined the department as an adjunct assistant professor this fall. Amariuca holds a PhD from Louisiana State University and bachelor’s and master’s degrees in electrical engineering from the University Politehnica of Bucharest, Romania. His research interests include information theory, wireless communications, and signal processing. At Iowa State, he will join the communications and signal processing research group and assist in the operation of the department’s senior design program.

■ **Lindsay Diers** is an academic adviser. She advises electrical and computer

engineering students on academic requirements, course schedules, academic resources, and policies, as well as teaches an orientation course. She has an associate’s degree from DMACC, bachelor’s degree in mass communication from Grand View College, and master’s degree in higher education from Iowa State.

■ **Ayman Fayed** started as an assistant professor in January. He joined the department after working for eight years at Texas Instruments as an analog and mixed-signal integrated circuits designer, specializing in implementations in nanometer CMOS technologies. Fayed holds a master’s degree and PhD degree from The Ohio State University and a bachelor’s degree from Cairo University in Egypt.

His current research interests include energy harvesting and embedded power management integrated circuit design for portable electronics. Fayed is part of the ECpE department’s VLSI research group. ■



George Amariuca



Lindsay Diers



Ayman Fayed

Inaugural Mehl Professor in Computer Engineering Named

Professor **Srinivas Aluru** has been appointed the inaugural recipient of the Ross Martin Mehl and Marylyne Munas Mehl Professorship of Computer Engineering. This endowed professorship was established in 2008 to support research and related activities of an Iowa State University computer engineering professor.



Srinivas Aluru

Aluru conducts research in high-performance computing, algorithms and systems for large-scale applications, bioinformatics and systems biology, combinatorial scientific computing, and applied algorithms. He has published two books and more than 100 technical papers in journals and at peer-reviewed conferences. Additionally, Aluru has led 29 externally funded projects.

Previously, Aluru served as the College of Engineering’s Richard Stanley Chair in Interdisciplinary Engineering (2006 to 2009). He currently serves as a faculty member in the interdepartmental bioinformatics and computational biology graduate program, which he chaired from 2005 to 2007.

Throughout his career Aluru has received many prestigious awards, including an NSF CAREER award (1997), IBM Faculty Award (2002), ISU Foundation Mid-career Achievement in Research Award (2006), Warren B. Boast Undergraduate Teaching Award (2005), and Government of India’s Swarnajayanti Fellowship (2008). He also has received two Best Paper Awards at the 2006 IEEE International Parallel and Distributed Processing Symposium and IEEE Computer Society’s 2005 Computational Systems Bioinformatics Conference, as well as two Best Paper Finalist Recognitions at the 2007 and 2002 Software Composition conferences. Additionally, Aluru is co-chair of an annual workshop in High Performance Computational Biology, and has edited the *Handbook on Computational Molecular Biology* (2006). ■

Iowa Power Fund Advances Researcher's Long Quest for Efficient Solar Power

By Mike Krapfl, ISU News Service

In **Vikram Dalal's** 37 years of researching solar technology, the efficiency of thin-film solar cells for homes and buildings has improved from 1 percent to about 7 percent.

Dalal, the Thomas M. Whitney Professor of Electrical and Computer Engineering and director of the university's Microelectronics Research Center, is hoping his latest multi-disciplinary research project could boost that efficiency to about 10 percent.

That would mean better solar cell technology that could be patented and licensed by Iowa State, a competitive edge for an Ames-based company collaborating on the project, and clean, green energy for all of us.

The three-year research project is supported by a \$1.69 million grant from the Iowa Power Fund, a state program to support energy innovation and independence. The project supports the work of Dalal and six other Iowa State University faculty members plus eight graduate students. The Iowa Energy Center is also supporting some of Dalal's solar research and he expects that work to contribute to the power fund project.

"We are very excited about this project," Dalal says. "We want to help Iowa become a major producer of solar products that can be sold all over the world. That's what I want to do too. I want to help Iowa companies become world-class producers of solar technology."

The project has three primary goals:

- Study, characterize, and optimize new silicon alloys that can be used in photovoltaic cells that convert sunlight directly

into electricity. Dalal says as new materials are developed, researchers have to figure out how they can be used in solar applications.

- Develop new solar cell structures that optimize the performance of the new materials. Dalal says there is no universal design for solar devices and so new materials mean new structures.

- And, study how semiconductors based on organic molecules can be used in solar applications. Dalal says organic molecules—substances that are found in living things and that contain carbon-hydrogen bonds—are very good at absorbing light and could be the future of solar technology.

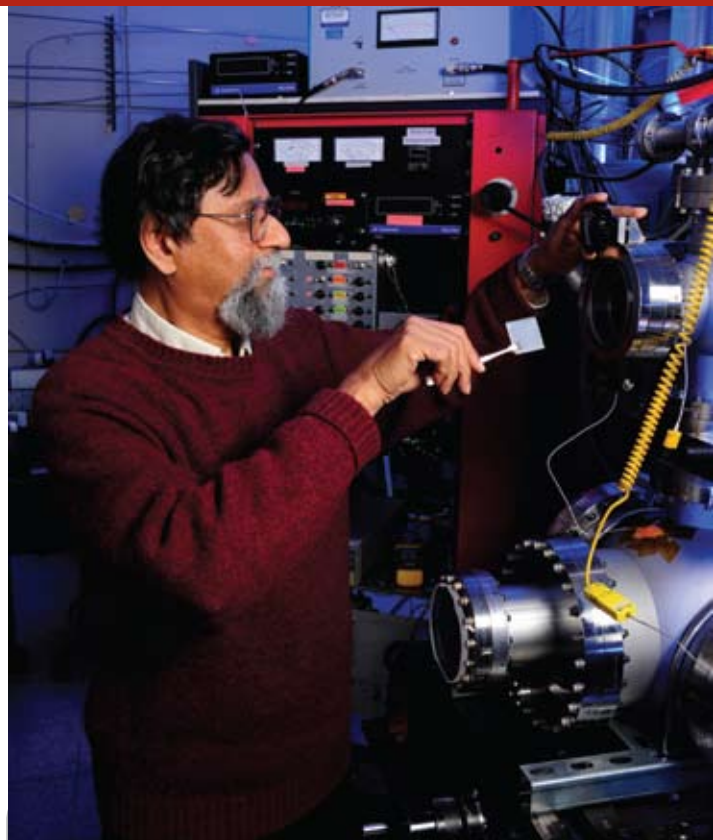
Working with Dalal on the project are five ECpE faculty members—**Rana Biswas**, an adjunct associate professor; **Sumit Chaudhary**, an assistant professor; **Jaeyoun Kim**, an assistant professor; **Joseph Shinar**, adjunct professor and chair of physics and astronomy; and **Ruth Shinar**, an adjunct professor. Malika Jeffries-EL, an assistant professor of chemistry, is also working on the project.

The researchers are collaborating with PowerFilm of Ames and Micron Technology of Boise, Idaho.

The project includes work in the maturing field of thin-film silicon-based photovoltaic technology. And it includes work in the emerging field of organic semiconductors.

Dalal says Iowa State has hired the people and is developing the expertise to make it a leader in the research and development of the new technology.

"Looking 20 years out it's very clear that organic semiconductors will be a major player in photovoltaic technology," he says. "The technology is in its infancy, and if we don't nurture a technology in its infancy, how



Professor Vikram Dalal works in his research lab at Iowa State's Microelectronics Research Center.

do we grow a mature technology? I'm hoping Iowa State can become a leader in this field and help make a smooth transition from our current technology."

That current technology has been a booming business. The Solar Energy Industries Association based in Washington, D.C., reported that the photovoltaic market in the United States grew by more than 48 percent in 2007 and U.S. solar manufacturing grew by 74 percent in 2007. The United States currently ranks fourth in the world for installed solar power (behind Germany, Japan, and Spain). Solarbuzz, an international solar energy research and consulting company based in San Francisco, reports the photovoltaic industry generated \$17.2 billion in global revenues in 2007.

Dalal is hoping the research at Iowa State can contribute to the continued growth of solar energy, making it a major energy option for the future.

"Our whole objective is to achieve greater solar efficiency without sacrificing cost," he says. "We want to do this better and cheaper. Only then can solar penetrate the large-scale utility market." ■

Micron Extends Support for Dalal's Research

Micron Technology has committed research support to Professor **Vikram Dalal**. The support will provide Dalal with \$75,000 each year throughout the next five years. Dalal plans to use the funds to engage graduate and undergraduate students in research at his research lab in the Microelectronics Research Center at Iowa State University.

ECpE Professors Receive Patent for New Optical Switching Technology

Technology developed by Professor **Robert J. Weber**, Senior Lecturer **Mani Mina**, and their graduate students could make communication via fiber-optics networks faster, more cost effective, and more reliable than ever before.

Weber and Mina recently were awarded a U.S. patent for developing a new switch for light used in fiber-optics networks. Their device enables all switching to be done optically, rather than requiring voice and data information to be taken from a light carrier, placed on an electrical carrier, switched, and then placed back on a light carrier in order to get the message from the sender to the recipient.

“The device changes the routing of the light from one fiber to another,” Weber says. “The device uses the interaction of light with a specific magnetic material. The magnetic material modifies the way light progresses through it. The difference in the effective speed of light in the material is used to change the path of the light through the total device.”

Weber and Mina’s technology is the fastest magneto-optic fiber-based switch suited for fiber optics applications.

“The fastest switching is based on electro-optic phenomena,” Mina says. “We have researched and continue to research ways and implementations for getting faster and smaller switches based on magneto-optic phenomena to compete with electro-optic switches.”

Weber and Mina are hoping to interest communications companies and their suppliers in the technology they have patented. The primary application of the technology is in information transmission switching over large fiber networks, or even networks within a building, vehicle, or neighborhood, Weber says. It could be used for both data and communication networks.

“The main purpose of the switch was to be used for node reconfiguration for high-volume fiber-optic connections called light trails,” Mina adds. “One of our current research activities is to utilize the unique properties of magneto-optic media that will enable the switch to be used as a modulator. This capability will allow the user to have a higher capacity of communication.”

Weber and Mina’s research was supported by a Computer and Information Science and Engineering grant from the National Science Foundation, and was conducted in Iowa State University’s new High-Speed Systems Engineering Laboratory. Their patent is number 7,555,177 and it is named *All Fiber Magneto-Optic On-Off Switch for Networking Applications*.

Former graduate student **Rashmi Bahuguna** (PhdEE ’07) contributed to the research and is listed on the patent. Two other electrical engineering doctoral students, **Sasha Kemmet** and **Jin-Wei Tioh**, are helping Weber and Mina continue to advance the technology. ■

Professor Robert J. Weber sits in one of the new VLSI/RF design labs in the ECpE Building Addition. Weber and Senior Lecturer Mani Mina’s research was conducted in Iowa State University’s new High-Speed Systems Engineering Laboratory.



Professor Chu Improves Integrated Circuit Designs

Figuring out how to meet the computing challenges of the future is a tough task for engineers, and it requires researching and developing solutions no one has tried before. One Iowa State computer engineer, Associate Professor **Chris Chu**, is conducting innovative research to improve integrated circuit (IC) designs used in computers and other electronic devices. Chu’s research could result in increasing performance and decreasing the cost of circuits used in everything from computers and MP3 players to video game consoles and digital cameras. It also could minimize turnaround time for engineers during the design process.

Chu’s research is supported by a 2009 IBM Faculty Award he received last summer.

Chu says because of the prevalence of intellectual property reuse (aka using old designs in creating new ones) and hierarchical computer design methodology in recent years, there is a need for better layout tools for mixed-size IC designs. He says the traditional layout algorithms perform very poorly, so the main goal of his research is to develop an efficient and high-quality placement tool targeting mixed-size IC design.

“The main idea is to improve a state-of-the-art analytical placer with the guidance of fixed-outline floorplanning at the full-chip level,” Chu says. “Effective integration of a fixed-outline floorplanner with an analytical placer has never been done before.”

If successful, Chu’s design will improve circuit performance and power, decrease circuit size, and reduce turnaround time for engineers designing new circuits, thus reducing the number of designers needed on projects and creating more affordable electronics for consumers.

Chu’s recent IBM Faculty Award will help him support graduate students to participate in this research project. The students include computer engineering PhD students **Zijun Yan** and **Yanheng Zhang**.

For more information about Chu’s IBM Faculty Award, visit www.ece.iastate.edu/news/recent-news. ■

Professor Srinivas Aluru and Systems Support Specialist Steve Nystrom stand next to Iowa State's new supercomputer, Cystorm.



New Iowa State Supercomputer, Cystorm, Unleashes 28.16 Trillion Calculations Per Second

By Mike Krapfl, ISU News Service

Srinivas Aluru recently stepped between the two rows of six tall metal racks, opened up the silver doors, and showed off the 3,200 computer processor cores that power Cystorm, Iowa State University's second supercomputer. And there's a lot of raw power in those racks.

Cystorm, a Sun Microsystems machine, boasts a peak performance of 28.16 trillion calculations per second. That's five times the peak of CyBlue, an IBM Blue Gene/L supercomputer that's been on campus since early 2006 and uses 2,048 processors to do 5.7 trillion calculations per second.

Aluru, the Ross Martin Mehl and Marylyne Munas Mehl Professor of Computer Engineering and the leader of the Cystorm project, says the new machine also scores high on a more realistic test of a supercomputer's actual performance: 15.44 trillion calculations per second compared to CyBlue's 4.7 trillion per second. That measure makes Cystorm 3.3 times more powerful than CyBlue.

Those performance numbers, however, do not earn Cystorm a spot on the TOP500 list of the world's fastest supercomputers.

(When CyBlue went online three years ago, it was the 99th most powerful supercomputer on the list.)

"Cystorm is going to be very good for data-intensive research projects," Aluru says. "The capabilities of Cystorm will help Iowa State researchers do new, pioneering research in their fields."

Interdisciplinary research prowess

The supercomputer is targeted for work in materials science, power systems, and systems biology.

Aluru says materials scientists will use the supercomputer to analyze data from the university's Local Electrode Atom Probe microscope, an instrument that can gather data and produce images at the atomic scale of billionths of a meter. Systems biologists will use the supercomputer to build gene networks that will help researchers understand how thousands of genes interact with each other. Power systems researchers will use the supercomputer to study the security, reliability, and efficiency of the country's energy infrastructure. And computer engineers will use the supercomputer to build a software

infrastructure that helps users make decisions by identifying relevant information sources.

"These research efforts will lead to significant advances in the penetration of high performance computing technology," says a summary of the Cystorm project. "The project will bring together multiple departments and research centers at Iowa State University and further enrich interdisciplinary culture and training opportunities."

Joining Aluru on the Cystorm project are five Iowa State researchers: **James McCalley**, the Harpole

Professor in Electrical Engineering; **Arun K. Somani**, ECpE department chair; **Maneesha Aluru**, an associate scientist in ECpE and genetics, development, and cell biology; **Baskar Ganapathysubramanian**, an ECpE courtesy assistant professor and William March Scholar in Mechanical Engineering; and Krishna Rajan, a professor of materials science and engineering and a Stanley Chair in Interdisciplinary Engineering. **Steve Nystrom**, an ECpE systems support specialist, is Cystorm's system administrator.

The researchers purchased the computer with a \$719,000 grant from the National Science Foundation; \$400,000 from Iowa State colleges, departments, and researchers; and a \$200,000 equipment donation from Sun Microsystems.

Center of excellence

Because of Cystorm, the computer company will designate Iowa State a Sun Microsystems Center of Excellence for Engineering Informatics and Systems Biology.

While Cystorm is much more powerful than CyBlue, Aluru says Iowa State's first supercomputer will still be used by researchers across campus.

"CyBlue will still be around," Aluru says. "Researchers will use both systems to solve problems. Both systems enhance the research capabilities of Iowa State." ■

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: _____

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
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Other Fund¹ _____

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

Payment Type:

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

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

Expiration Date: _____ Cardholder Signature: _____

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

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 this *ECpE Connections* newsletter to alumni with international mailing addresses beginning with this 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. ■

Thank You!

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.

Computer and Networking Systems Faculty Start New NSF Research Projects

ECpE faculty were part of nearly \$16.5 million in newly funded research proposals during the last fiscal year from July 2008 to June 2009. About \$8.7 million of those research grants came from the National Science Foundation, and nearly half of those were awarded to faculty in the department's computer and networking systems research group. Here are highlights for a few of the new research projects:

Fault-Tolerant Cooperative Communication in Large-Scale Wireless Networks

Associate Professor **Sang Kim** is working to develop what he calls a "fundamentally new cooperative communication architecture that is inherently self-scalable, robust when transmission errors and malicious attacks occur, and allows decentralized network operation with flexibility for topology changes in large-scale wireless networks with noisy channels." Kim's research could improve the design and operation of embedded, wireless sensor, ad hoc, mesh, and cellular networks.

Detecting Click Fraud in Pay-Per-Click Online Advertising Networks

Currently, the online advertising market reports that 14.6 percent, or about \$2.8 billion,

of pay-per-click ad revenue results from click fraud, where individuals or rival companies generate false clicks. Associate Professor **Yong Guan** is trying to eliminate this fraud by developing a new framework to verify clicks and define the quality of clicks. He also is developing filtering-based tools to validate and weed out suspicious clicks, promoting transparency between advertisers and online ad businesses. Guan's research could save online marketers billions of dollars every year.

Memory Thermal Management for Multi-core Systems

With the increasing demand on memory performance by multi-core processors, the memory subsystem, processor, and hard disk drive are becoming more and more vulnerable to overheating. In Associate Professor **Zhao Zhang's** research project, he plans to study coordinated thermal management schemes, as well as develop, evaluate, and implement a thermal-aware page allocation to avoid unbalanced overheating from some memory chips by considering the location of each chip and memory access demand of each application. Zhang's research could ensure safe system operations of multi-core computer systems, as well as improve overall system performance, reduce system manufacturing cost, and



Associate Professor Zhao Zhang is one of several faculty who were awarded new National Science Foundation research grants this past year.

improve system power efficiency.

Attack Detection and Recovery at the Hardware/Software Interface

Assistant Professor **Joseph Zambreno's** research focuses on using hardware features to improve the security of software systems. According to Zambreno, his goal is to create technology to rapidly detect and recover from attacks that improperly access memory or take over a CPU. The technology he is developing could enable systems to return to normal operation after attacks and protect systems during the recovery process. It also provides systems with the ability to thwart a large class of attacks and develop more robust software systems in the future. ■



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IOWA STATE UNIVERSITY

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Computer Engineering Students Win NSF Graduate Research Fellowship

Two computer engineering students—**Shane Griffith** and **Cory Kleinheksel**—were awarded a National Science Foundation (NSF) Graduate Research Fellowship this year. A third student, **Cory Simon**, received an honorable mention for the award. The NSF Graduate Research Fellowship Program funds three years of study—up to \$121,500—in master’s or doctoral degrees focusing on research in science, technology, engineering, and mathematics. This year, 950 students nationwide received fellowship awards.

Griffith is studying developmental robotics and hopes to play a role in research to create robots that can help humans do laborious tasks such as help people assemble large structures, prepare food for the elderly and disabled, and clean and organize homes.

“Developmental robotics is an embodied approach to creating artificial intelligence that suggests robots may be capable of learning as human infants learn,” Griffith says.

“More specifically, I study how robots could learn to identify and use what humans call containers.”

Griffith says that in order for robots to work alongside humans in the future, they must have the capacity to learn about and identify containers, but programming a robot with knowledge of all containers would be a laborious and menial task.

“The goal of my research is to identify several developmental trajectories that may enable a robot to learn and identify containers.”

Kleinheksel is pursuing a PhD in embedded and sensor systems at Iowa State.

“My proposed research is for a middleware system that emphasizes modular concepts for improved integration of sensor node data and high-level applications that would use the data,” he says.

Specifically, Kleinheksel will develop a system to improve precision farming by increasing information available to farmers



Shane Griffith



Cory Kleinheksel

so they can make informed decisions to reduce costs, increase production, and reduce the environmental impacts of farming. After graduate school, he plans to pursue a career as a professor.

Griffith and Kleinheksel join two other current ECpE students who have received NSF Graduate Research Fellowships: **Sasha Kemmet**, a PhD student in electrical engineering; and **Mike Steffen**, a PhD student in computer engineering. ■

Students Receive Departmental, University Recognition

Congratulations to the following undergraduate and graduate student award winners:

■ Six graduate students—**Osameh Al-Kofahi**, **Benjamin Jackson**, **Licheng Jin**, **Sasha Kemmet**, **Jin-Wei Tioh**, and **Bojian Xu**—each won the ECpE Graduate Research Innovation and Progress Award (GRIP). GRIP awardees are evaluated on their research productivity and nominated by ECpE faculty throughout the calendar year. This is the second year for these awards.

■ Graduate students **Matthew Clausman**, **Mark Tannian**, and **Jonathan Watson** all received the university’s Teaching

Excellence Award. The award honors and encourages outstanding achievement by graduate students in teaching.

■ Graduates students **Sudha Anil Kumar Gathala**, **Atul Madhavan**, **Edward “Jason” Stanek**, **Natarajan Viswanathan**, and **Zhen Yu** all received the university’s Spring or Summer 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 and dissertations.

■ Graduate students **Viswanathan Subramanian** and **Prem Kumar Ramesh**,

along with Professor **Arun K. Somani**, received Second International Conference on Dependability’s Best Paper Award in June. Their paper was titled “Managing the Impact of On-Chip Temperature on the Lifetime Reliability of Reliably Overclocked Systems.”

■ **Daniel Stone**, a senior in electrical engineering, won the Student Alumni Leadership Council’s Student Leadership Recognition Award last spring. Stone graduated in May 2009.

■ **Shan Zhou**, a PhD student in computer engineering, received the College of Engineering’s Schafer 2050 Challenge Graduate Fellowship. ■

(From left to right) Edward “Jason” Stanek, Atul Madhavan, Osameh Al-Kofahi, Jin-Wei Tioh, and Bojian Xu, were among the students recognized at the ECpE Scholarship and Awards Ceremony last spring.



Griffith photo courtesy of Shane Griffith.

Students install the solar panels on the roof of the ISU Solar Decathlon's Interlock House.



Students Make Final Preparations for National Solar Decathlon Competition

After 18 months of hard work, Iowa State University's Solar Decathlon team showed off their achievement—the solar-powered Interlock House—at an August open house. The team designed and built the house for the U.S. Department of Energy's Solar Decathlon in Washington, D.C., which takes place in October.

The house, which is expected to produce more energy than it consumes, features:

- Rooftop solar panels (photovoltaic modules) that generate electricity to power all electrical devices inside the house
- A solar thermal evacuated tube system used to heat and cool the interior space, and provide domestic hot water
- Radiant floor heating
- Liquid desiccant dehumidifier
- Passive heating and cooling features, such as a sun porch and ventilation
- Energy-efficient construction techniques, including R-12 windows, R-48 wall and roof insulation, and airtight construction
- Energy-efficient appliances and lighting
- Universal design, ADA accessible
- Furniture, lighting fixtures, and ceramics created by Iowa State students; cabinetry created by Des Moines Area Community College students

Several electrical engineering students worked on the house, including graduate students **Molly Reid** and **Jason Jirak**.

Reida and Jirak helped the team choose the house's solar energy system, and set up and perform basic solar cell characterization measurements.

"I did market research on the solar panels and inverters for house's photovoltaic system," Reid says. "We figured out the total area we needed to cover in photovoltaics on the house and surveyed the various products out there; compared prices, efficiency, and aesthetics; and reported our findings to the project leader."

An ECpE senior design team, including **Michael Anderson, Jamasen Partham, Shawn Merselis, Jesse Erickson, Matthew Bray,** and **Louis Landphair,** also served as consultants on the house last spring. And ECpE Professor **Vikram Dalal** served as one of 18 faculty advisers for the interdisciplinary team.

"The teamwork on the house was excellent. All the decathlon students helped each other and put together an excellent final house," Dalal says.

"The house is very attractive, as opposed to previous designs, and has used significant innovative designs in both the architecture of the house and

the selection of solar and HVAC systems. It should do well in the competition."

Iowa State is one of 20 teams worldwide that was selected to compete in the 2009 Solar Decathlon. The 20 houses will be open for public tours, as part of the Department of Energy's Solar Village on the National Mall, October 8-18. To get the house to the nation's capital, the house will be disassembled, trucked to Washington, D.C., and reassembled.

At the competition, students will compete in 10 areas: architecture, market viability, engineering, lighting design, communications, comfort zone, hot water, appliances, home entertainment, and net metering. Juries of professionals and industry experts will judge the contests.

More information about the project is online at www.solard.iastate.edu. ■

—*Teddi Barron from ISU News Service contributed to this article.*

An artist's rendering of the ISU Solar Decathlon house



Department Initiates New Awards Program to Recognize Alumni

At last spring's 2009 ECpE Centennial Gala and Awards Ceremony marking the culmination of the department's 100-year celebration, the department initiated four new awards to annually recognize the achievements of our alumni and service of friends. The inaugural award recipients also were announced:

ECpE Distinguished Career Achievement Award

Sehat Sutardja (BSEE '83), **Tunc Doluca** (BSEE '79), **Richard K. Richards** (BSEE '43), **R. Grover Brown** (BSEE '48; MSEE '51; PhDEE '56), and **Arend Sandbulte** (BSEE '59) each received the ECpE Distinguished Career Achievement Award. This award recognizes top ECpE alumni who have demonstrated exemplary career achievements in the fields of electrical, computer, or software engineering that have made a major impact on society, the field, the profession, or industry, based on scholarly contributions, professional leadership, or leadership in industry, government or academia.

Sutardja received this award to recognize his contributions to the field of analog and mixed-signal integrated circuit design and for industrial entrepreneurship and leadership; Doluca for his contributions to the field of analog integrated circuit design and for leadership in the semiconductor industry; Richards for contributions to the development of fundamental computer concepts and for dissemination of these concepts through seminal textbooks in computer arithmetic, computer design, and digital systems; Brown for scholarly contributions in the areas of statistical communications, Kalman filtering, and global positioning systems; and Sandbulte for leadership in the development and evolution of the power industry.

ECpE Engineering Impact Award

Glenn Hillesland (BSEE '47), **Tracy (Kness) Summers** (BSEE '94), and **Er-Xuan Ping** (PhDEE '95) all received the ECpE Engineering Impact Award. This award recognizes ECpE alumni who have demonstrated distinctive accomplishments in the fields of

electrical, computer, or software engineering that have made or are making a significant impact on society, the field, the profession, or industry, based on scholarly contributions, professional leadership, or leadership in industry, government, or academia.

Hillesland was recognized for his administrative leadership in the utility industry and contributions to engineering extension education; Summers for her contributions to semiconductor processing in the biomedical electronics field; and Ping for his contribution in the development of semiconductor processes that support non-volatile memory products.

ECpE Exemplary Service Award

Tom Scott, an emeritus ECpE professor, was awarded the ECpE Exemplary Service Award. This honor recognizes demonstrated extraordinary service to the department by individuals who are not members of the department's current faculty or staff. Scott received this award to recognize his extraordinary service to the department and its alumni through continued voluntary efforts to identify faculty, staff, and alumni who have distinguished themselves in their careers.

ECpE Early Career Impact Award

No winners were named for the ECpE Early Career Impact Award this year, but in the future this award will recognize an alumnus/a who has demonstrated significant early career accomplishments in electrical, computer, or software engineering that distinguish the recipient from his or her peers in the field. These accomplishments should be evidenced by technical accomplishments, leadership, or other activities that have made, are making, or show considerable promise for making a significant impact on society, the field, the profession, or industry. ■

Nominate a Classmate!

For more complete biographical information on this year's winners, or to nominate a former classmate for next year's award, visit www.ece.iastate.edu/alumni/ecpe-alumni-awards.

In Memoriam

The ECpE department recognizes our alumni who passed away this past year. This list includes alumni who died between September 12, 2008 and August 12, 2009. Every effort was made to ensure the accuracy of this list.

1930s

- **Chester G. Sorflaten** (BSEE '39)

1940s

- **Albert J. Bianco** (BSEE '43)
- **Clyde C. Blinn** (BSEE '47)
- **Edwin F. Buckley** (BSEE '48)
- **Henry R. Cramer** (BSEE '40)
- **Arthur M. Dutton** (BSEE '45; PhD Stat '51)
- **Richard K. Evenson** (BSEE '47)
- **Donald R. Gibbs** (BSEE '46)
- **Ted R. Hayes** (BSEE '45)
- **Francis L. Jones** (BSEE '48)
- **George O. Pickens** (BSEE '48)
- **William M. Seneff** (BSEE '45)
- **George F. Stastny** (BSEE '48)
- **Edward P. Walsh** (BSEE '49)
- **Walter W. Wilson** (BSEE '41)

1950s

- **Ian S. Chiang** (BSEE and BSME '53)
- **Stanley M. Clasen** (BSEE '50)
- **Robert E. Derby** (BSEE '50)
- **Milton B. Hoover** (BSEE '55)
- **C. J. Jameson** (BSEE '58)
- **Arthur L. Prudhom** (BSEE '59)
- **Harold D. Skank** (BSEE '59)
- **Dennis E. Tschudi** (BSEE '59)
- **Warren E. Wilke** (BSEE '51)

1960s

- **Ronald J. Griffith** (BSEE '63)
- **William L. Jasper** (BSEE '63)
- **Robert E. Mentzer** (BSEE '63)
- **James W. Neiers** (BSEE '63)
- **Ted F. Riley** (BSEE '68)
- **Thomas M. Robinson** (BSEE '64)
- **Denton C. Rowe** (BSEE '60)

1970s

- **Charles M. Cousins** (BSEE '70)
- **Mark B. Durschmidt** (BSEE '79; MSEE '80)

1980s

- **John W. Maass** (BSEE '86)
- **Ali Safaeinili** (BSEE '87; MSEE '89; PhDEE '93) ■



Alumnus Ali Safaeinili stands next to NASA's Mars Reconnaissance Orbiter. His radar sounder technology impacted discoveries recently made by the orbiter.

ECpE Alumnus Develops Technology to Help NASA Learn More About Mars

As a student at Iowa State University, **Ali Safaeinili** (BSEE '87; MSEE '89; PhDEE '93) worked in the lab at the Center for Nondestructive Evaluation (CNDE). Little did he know at the time, the laboratory instrumentation and measurement techniques he learned on campus would directly impact his career at NASA's Jet Propulsion Laboratory (JPL).

"Many of the techniques that I use today on the Mars projects are variations of the techniques my colleagues and I developed at the CNDE to analyze ultrasonic data and form images," Safaeinili says. "That particular experience put me in a very unique position at JPL to be a leader in this new planetary radar sounder field."

Technology to see beneath Mars' surface

Safaeinili, who is a principal engineer at the JPL, has spent the last nine years working to develop, deploy, and operate a radar sounder that can "see" beneath the surface. The radar sounders he helped develop are now orbiting around Mars.

"These are the first such instruments to ever operate around another planet," Safaeinili says.

He adds that the first one, Mars Advanced Radar for Subsurface and Ionospheric Sounding (MARIS), is an

international collaboration between NASA's JPL and the Italian Space Agency. The sounder flew to Mars onboard the European Space Agency's *Mars Express* spacecraft in June 2003. The second instrument flew on NASA's *Mars Reconnaissance Orbiter* in August 2005.

"I love discovery and working on new problems and these instrument concepts were new and full of promise to reveal secrets on Mars," Safaeinili says. "MARIS, being the first of its kind, was very risky and we didn't know how it would perform in the end since its performance depended on the property of the surface and subsurface of Mars, and even its higher atmosphere called the ionosphere. It was truly a leap into the unknown."

Discovering ice on Mars

In 2008, one of the tools Safaeinili helped develop discovered more ice on Mars than scientists previously thought existed.

"This discovery has been the highlight of my career and I believe it is probably the most significant discovery we have made on Mars in a long while," Safaeinili says.

The reason the discovery was so significant, adds Safaeinili, is not that they found a large amount of ice on Mars, but rather where they found it.

"We know there is a lot of ice in Mars'

poles, but the poles are not very hospitable places for a human or even a robot to visit," he says. "We now have confirmed the presence of ice in large quantities at latitudes similar to Detroit and New York City, which in comparison are much easier to operate from."

He adds that a robot or astronaut can melt ice into water and with electricity, he can decompose the water into hydrogen and oxygen, which is good for fuel and oxygen that human visitors could breathe.

On the same mission, the spacecraft Safaeinili helped create made another important advancement in understanding Mars. The spacecraft, which operated day and night during the mission, collected enough data to create the first 3-D map of Mars' polar region.

"As a result of the success of the two radar sounders on Mars, it is almost certain that a radar sounder will fly on the recently announced NASA outer planet flagship spacecraft to Europa, a moon of Jupiter, with the designated launch date in 2020," Safaeinili says. ■

Editor's note: During the production of this newsletter, we learned of Ali Safaeinili's untimely death in July. He kept his battle with cancer largely private, but we feel that his story is important for you to see. Our hearts go out to his family and friends.

ALUMNI Q&A

Electrical Engineering Alumnus Saves Lives—One Pacemaker at a Time

For alumnus **Joseph “Max” Cortner** (BSEE '72), saving lives is all part of a day's work. Cortner is the director of test engineering for Boston Scientific's implantable pacemakers and defibrillators, and his team is part of every new product development team at the company. He answered our questions about his career and the impact Iowa State had on him.

Q: What is the “coolest” project you've worked on in your career?

A: Developing a new built-in, self-test scheme that made high quality testing of our complex integrated circuits possible is one of the most fun projects I've worked on. The teamwork with digital chip designers and test engineers was exemplary. It's always fun to work with intelligent people and move the needle on quality.

Q: What do you enjoy most about your work?

A: By treating irregular heartbeats, our products save lives and restore quality of life to hundreds of thousands of patients every year. It's a very satisfying endeavor. It instills a passion for quality that provides its own energy for the work. We do everything we can because we must.

Q: What career achievement(s) are you most proud of, and why?

A: I am most proud of the team I have built. These engineers are world-class and contribute daily to the health of our patients. As part of molding an effective organization, I am proud to have instituted a chain of technological changes that keep them equipped and efficient. Built-in, self-test for digital circuits, printed circuit board tests that use virtual test access, statistical test data analysis to eliminate outliers from our products—these are a few of the major changes I have been

privileged to champion.

Q: How did attending Iowa State impact your career?

A: Iowa State provided me with a broad set of engineering skills. Those fundamental underpinnings have allowed me to be effective at solving problems for many types of electronics. I made the jump from testing computers to testing implantable medical devices with the confidence that I had the tools for the new job.

Q: Who was your favorite professor at Iowa State and why?

A: Chester “Chip” Comstock (MSEE '64; PhDEE '69) was my favorite professor. He taught courses about integrated circuits with enthusiasm and clarity. His skill at breaking down complex subjects to elements of learning helped me think about an approach to learning as well as the material of the course.

Q: What clubs and organizations were you involved in when you were a student?

A: I served as house president for Gilman House on the fifth floor of Wallace hall. We were the first group to live in the tower and created a house society from scratch. It was a wonderful group of guys. I was a member of Eta Kappa Nu as well. It helped me get to know my professors as well as my classmates.

Q: What else would you like to share with us?

A: I am an engineer at heart. Outside of work, I express my engineering roots in activities such as building an experimental airplane with a couple of friends. Yes, it flew.

Q: How did you first become interested in electrical engineering?

A: I always wanted to know how things worked as a child. It came down to a choice between mechanical and electrical engineering when I entered Iowa State. I think I was attracted to electrical engineering because it seemed more mysterious at the time. Visualizing the unseen is a form of intellectual ingenuity that fascinates me. ■

Alumnus Max Cortner stands next to equipment that tests the functionality of every finished device that his department at Boston Scientific ships. The system sets up test conditions and records thousands of measurements for each device. Failure of those measurements to match precise design specifications causes the device to be scrapped.

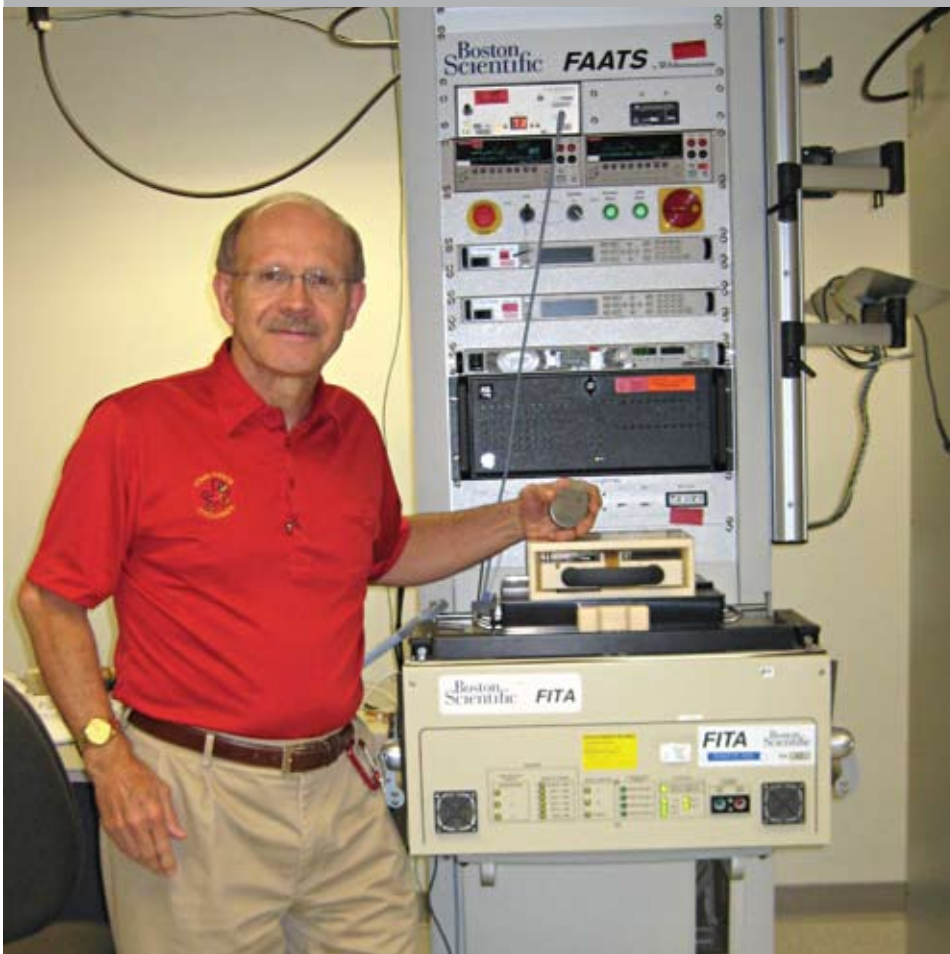


Photo courtesy of Max Cortner.

Alumni Return to Campus for Alumni Days

The ECpE department welcomed back several alumni during the ISU Alumni Association's annual Alumni Days events last May. Below, three electrical engineering alumni share their reminiscences about their time at Iowa State and their careers:

William Boeckmann (BSEE '59)

My great-grandfather bought his farm in 1875. I was the first in the family to go to college. My younger brother, Mark Boeckmann, graduated in chemical engineering in 1981. My dad sold the farm in 1975.

Lyle Morse (BSEE '44)

I remember Ben Willis in the Power Lab reciting from his favorite book, *The Education of Hyman Kaplan*. I also remember Harry and Ed tending the light on the Marston Water Tower.

Harold "Gene" Warrington (BSEE '58)

I remember my microwave courses labs. The professor was a whiz at Maxwell's equations. He would cover three chalkboards showing the applicability to show $E=IR$. I also remember AC circuits labs and playing jokes on classmates. I remember using transistors when they cost \$12 a unit.



Electrical engineering alumni toured the new ECpE Building Addition during Alumni Days. Front row: Greg Hiatt (BSEE '59), William Meek (BSEE '59), Donald Norris (BSEE '49). Middle row: Gene Warrington (BSEE '58), Ken Rubsam (BSEE '59), Arend Sandbulte (BSEE '59). Top row: William Boeckmann (BSEE '59), Jan Boeckmann, Lyle Morse (BSEE '44), John Martin (BSEE '44).

Alumnus Becomes HKN Eminent Member

At the ECpE Centennial Gala and Awards Ceremony last spring, **Gerald Posakony** (BSEE '49) received the national Eta Kappa Nu (HKN) Eminent Member recognition. The award is given to select individuals whose technical attainment and contributions to society through leadership in the fields of electrical or computer engineering have resulted in significant benefits to humankind.