ECpE Connections
Iowa State University
The ELECTRICAL and COMPUTER ENGINEERING Alumni Newsletter
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Two new faculty join ECpE

The Department of Electrical and Computer Engineering welcomes two new faculty members this spring.

Chen-Ching Liu was named Palmer Chair Professor, an endowed chair established by **Barbara** and **James Palmer**. Liu comes to Iowa State from the University of Washington, where he served as a professor of electrical engineering for 22 years, as well as an associate dean in the College of Engineering from 2000 to 2005. He earned a PhD from the University of California, Berkeley, in 1983. His BS and MS degrees are from the National Taiwan University.

Liu looks forward to his new challenge. "Iowa State has a strong tradition of excellence in its power-engineering program," he notes. "It's an exciting opportunity for me to participate in building this program from a solid foundation and making it the envy of the nation and the world. That was the greatest attraction for me."

Power engineering is Liu's main research area. His goal is to help power grids avoid major blackouts like the one that crippled the northeastern U.S. and southern Canada in August 2003. His studies focus on the vulnerability, reliability, and economics of electric power infrastructures, including defense system technologies and applications of intelligent systems and economic methods. "I believe the broad talents available in ECpE and the strong synergy on campus will be very useful for my research, and I'm looking forward to the collaboration," Liu says.

In addition to his research activities, Liu stays extremely active in the Institute of Electrical and Electronics Engineers (IEEE). He's a member of IEEE's Fellow Committee, and he's chairperson for the Power Engineering Society Technical Committee on Power System Analysis, Computing, and Economics. In 2004 Liu received the IEEE Outstanding Power Engineering Educator Award, and in 2000 he earned a Third Millennium Medal from IEEE.

In addition to being a Fellow of IEEE, Liu is also the current president of the International Council on Intelligent System Applications to Power Systems.

This semester, Liu is teaching EE653, *Power Systems under Abnormal Operating Conditions*, a graduate class with more than 20 students. "I enjoy the interaction with students very much," Liu says.

Also joining the ECpE faculty is **Umesh Vaidya**, who earned his PhD in mechanical engineering from the University of California at Santa Barbara in 2004, where he also served as a research assistant for three years. Before that, Vaidya received degrees from the Victoria Jubilee Technical Institute in Mumbai, India, and the Indian Institute of Technology in Bombay, India.

Vaidya also spent a year at Harvard as a research assistant, where he worked on several projects, including transport dynamics in three-dimensional fluid flows and uncertainty analysis using a dynamical systems approach. Vaidya's current research focuses on using operator-theory framework to analyze and control non-equilibrium dynamics in nonlinear dynamical systems.

ECpE Associate Professor **Murti Salapaka**, who served on the committee that recommended Vaidya, says he was chosen from a select group of candidates that included applicants from MIT and Cal Tech. "He brings a background in dynamical systems that lends a complimentary perspective to the strong control-related activities on the campus," Salapaka notes. "He's poised to position himself as a future leader in some of the emerging areas of this research."

Even though he's been here only a short time, Vaidya is already impressed with the research going on in the College of Engineering, noting that scholars here are working in diverse areas that will give him an opportunity to collaborate with colleagues in central dynamics.

Vaidya is also teaching one class this semester—EE674, *Advanced Topics in Systems Engineering*. The class, he says, relates quite well with his research. "I'm teaching some of the advanced topics in the theory of order, differential equations, and classical mechanics," he says, "where more emphasis is given to the geometrical and qualitative aspects than to the theory of ordinary differential equations." ■

Check out the back cover for more information about the Palmer Chair . . .

Letter from the Chair

Welcome to the spring issue of *Connections*. Within these pages, we've tried to capture the essence of our department and the great work of our faculty, students, and staff. It's been a busy year in ECpE, and we've still got much of the spring semester to go!

The department continues to move forward in its research efforts, and we've identified five new strategic directions for recruiting and investment. Our goal is to create centers of excellence in bioengineering, distributed sensing and decision making, small-scale technologies, cyber infrastructure, and energy infrastructure. Several articles in this issue talk about those research efforts, including a story about the new sensor-networking lab operated by **Daji Qiao** and **Srikanta Tirthapura**. You'll also read about our new $1.25-million supercomputer, which is now running in the Durham Center.

ECpE is currently recruiting qualified research-oriented individuals for five faculty positions. We're looking for applicants in electrical or computer engineering, especially bioengineering (including systems biology, bioinformatics, molecular bioengineering, biosensors, and biomedical engineering). Additional areas are computer system architecture, embedded systems, power and energy engineering and systems, power electronics, and analog VLSI (including high-power). If you would like more information about our vacancies, visit the Web site at www.ece.iastate.edu/openings/.

Speaking of new faculty, two new members joined ECpE faculty this semester: **Chen-Ching Liu**, who is our new Palmer Chair Professor, and **Umesh Vaidya**, who was at the University of California at Santa Barbara. Liu's main area of research interest is in power engineering, while Vaidya is working in central dynamics. Be sure to read more about them in the feature article that begins on the front cover.

For those of you who had direct or indirect interaction with **Dick Horton**—or maybe took one or two of his classes—he reminisces about his years at Iowa State in a feature article on page 4. You can also read about the things ECpE graduates are doing now in their chosen professions, and there's a story about a senior design team that that was one of only 10 teams worldwide that qualified for the final round of the Sixth Annual Computer Society International Design Competition. This is a good example of how well our students are performing against high-quality competition.

The Coover Hall expansion project continues to move forward. Phase 1 is scheduled to begin this spring, and hopefully with the warm winter weather work can get started early. After the "Cyclone" addition—built in the 1950s on the southwest side of the original Coover building—is demolished, a new three-story building will be constructed adjacent to the existing Coover Hall. The first phase is expected to take about 18 months.

Phase 2, which will take about two years to complete, will consist of renovating the original Coover building, as well as some additional new construction. Support from alumni and donors is critical for the continued success and national reputation of the ECpE program, and that's why the development office is continuing its fund-raising efforts for the second phase. If you would like to be a naming donor for the building, that opportunity is still available.

Everyone in ECpE and all over campus, I'm sure, is looking forward to the warmer weather (although we certainly can't complain about the mild January temperatures we all enjoyed). If your travels this spring or summer bring you to campus, I hope you will stop by for a firsthand look at how we're changing and growing.

Arun Somani

Chair, Department of Electrical and Computer Engineering

ECpE Connections

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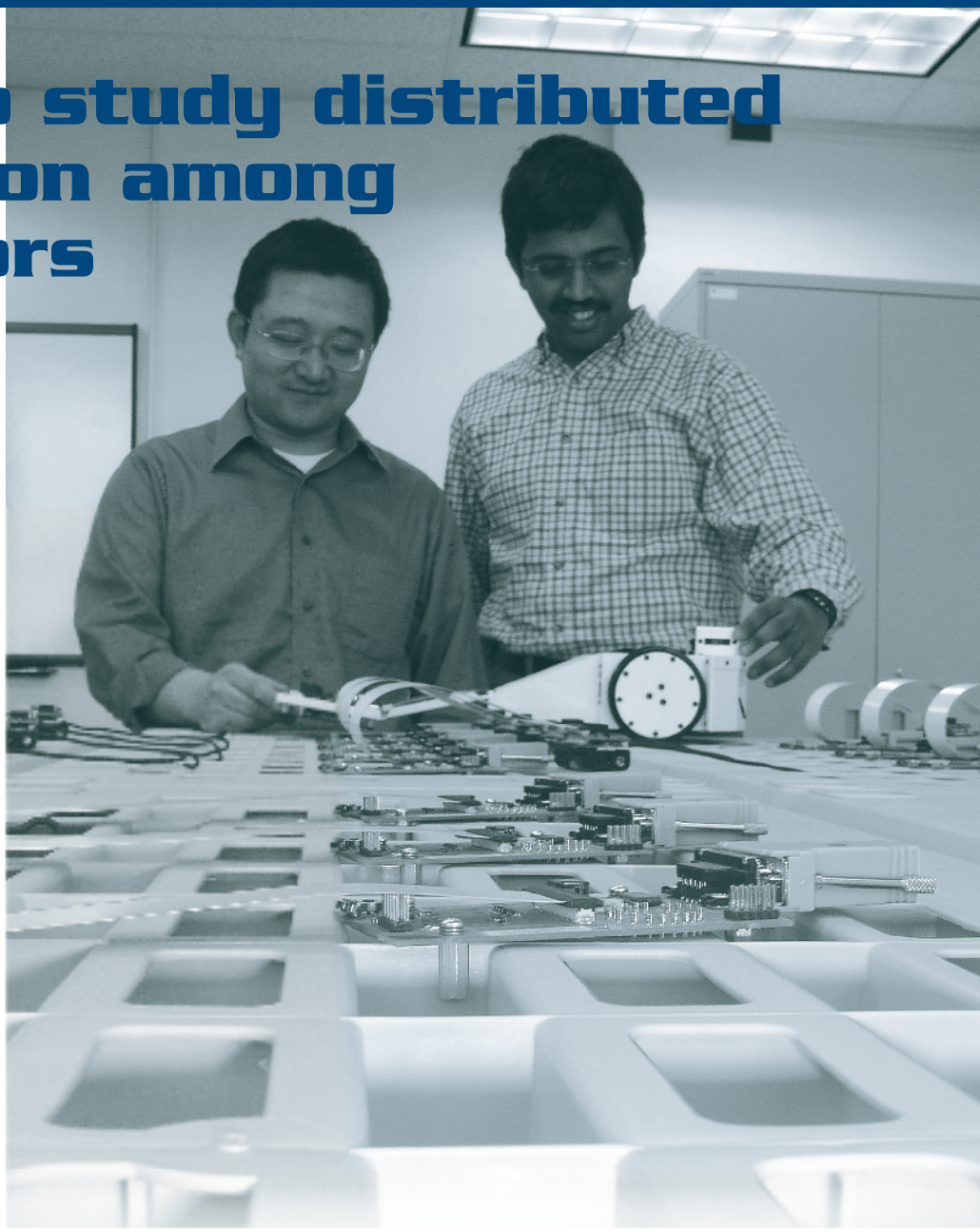
Prepared for the department by Engineering Communications and Marketing, College of Engineering 05287

New lab to study distributed coordination among tiny sensors



Assistant Professor **Daji Qiao** recently received a $200,000 grant from Iowa State's vice provost for research to build a new wireless sensor-networking lab. Now, Qiao and Assistant Professor **Srikanta Tirthapura** are developing algorithms and software in the lab for distributed coordination between tiny sensors.

The new lab helped Tirthapura secure a $320,000 grant from the National Science Foundation to fund his project that aims to design and build distributed directories to track mobile objects with the help of a wireless sensor network. Tirthapura and Qiao are working with **Costas Busch**—a professor at Rensselaer Polytechnic Institute in Troy, New York—on the project. It's not the first time that Tirthapura and Busch have combined their expertise in distributed algorithm design and analysis. They've worked together on several projects.

Qiao, who is lending his knowledge about the actual sensor systems, says that, in addition to the new lab, one of the reasons NSF chose to fund the research was because of the collaboration between the two universities.

Qiao notes that sensors have been around for quite some time, observing the physical world and tracking all sorts of information. Hospitals, for example, use sensors to monitor patients, city governments can use them to direct traffic, and they can also be thrown into a smoldering building to help firefighters measure the level of smoke and heat inside.

The question this research poses, however, is how to organize all of that information in a network. "We're not focusing on the information collection itself," Tirthapura explains. "We're looking at the coordination and how to make the best use of this information."

Traditionally, information gathered by sensors has been collected and sent to a central point of control. That method, Tirthapura observes, has two major hindrances. One, it consumes a great deal of energy, and two, it violates a fundamental principle of distributed system design called locality. "Informally, locality means information that changes frequently, such as an object's location, should only be stored at nodes that are close to the location of the change," he explains.

The distributed algorithms that Tirthapura and Qiao are developing will improve that process, they hope. "Our network will lead to more efficient use of the information that's collected," Qiao says, "meaning the total energy required to answer queries will be much smaller using our distributed approach." Less energy required translates to longer battery life and less expense.

While any experiments on this project are still a few months away, when the lab becomes fully operational, the research group will also compare different distributed and centralized directories with respect to locality, scalability, fault tolerance, and energy efficiency.

During the winter break, the lab was equipped with 100 sets of Crossbow MICA2 motes with generic and custom-made sensor boards. The motes will work with an Acroname Garcia robot (which looks sort of like a mini-race car) with an embedded Stargate processor board. A distributed directory will be loaded onto each mote, Tirthapura says, and the motes will eventually be used to navigate the Garcia robot toward objects that can be detected by the sensors—objects like other robots, magnetic fields, or even a fire.

The new lab is partially funded by the Information Infrastructure Institute (iCube), which is one of six initiatives proposed four years ago by Iowa State President Gregory Geoffroy. The initiatives were a challenge to department leaders to respond to critical needs in Iowa and the country.

Two Iowa State graduate students—**Bojian Xu** and **Wei Zhou**—are also working on the research. ■

A lifetime of good memories

"I think I'm what they call a lifer," he says with a chuckle.

Dick Horton, emeritus professor of electrical and computer engineering at Iowa State, is proud to say that. And he's right. Horton devoted nearly 50 years of his life to the university, from his freshman year on campus in 1958 to more than 40 years of employment dating back to the fall of 1963.

Horton earned three electrical engineering degrees from Iowa State—a BS in 1962, an MS in 1963, and finally his PhD in 1967. While working on his PhD, Horton was hired as an instructor in electronics technology, a two-year AAS program in the College of Engineering. Later, after finishing his doctoral work, Horton accepted the university's offer to become an assistant professor in electrical engineering.

Technology was changing rapidly at the time Horton joined the faculty. Integrated circuits were coming onto the scene. Shortly thereafter, computers became commonplace and programming became a hot issue. Horton helped define a new computer-engineering curriculum and create fresh classes to keep up with the changing needs of students and employers. He even taught some of the first classes in integrated circuits, computer organization, and microprocessors at Iowa State.

Horton says he never taught a course that he took as a student. "Every course I taught was something new," he explains. "It was a constant challenge to keep up with the changes over the years, and you really had to learn from scratch, but that's what made it fun and interesting."

Even more fun, though, was the interaction with students, Horton recalls. He especially enjoyed watching students' eyes light up when they finally understood a concept that was giving them trouble. Horton says it's like the old cliché of seeing the light bulb turn on. "As a teacher you know if the concept you're trying to get across is registering or not," Horton says. "When it finally does, you've accomplished something."

In addition to his faculty position, Horton stayed busy over the years with several different appointments inside and outside the department. He served as manager of the hybrid computing laboratory in the Computation Center (now AIT) from 1976 to 1981, and he was a terminal/microcomputer consultant in '81 and '82. Horton also served as the assistant director for microcomputers from '83 to '86, helping create the Microproduct Center and the first student personal-computer labs at the university. In addition, Horton served as assistant chair in ECpE for 11 years, including a stint as interim chair in 1996.

And if that weren't enough, Horton's earlier extension and outreach activities included teaching short courses for the United States Independent Telephone Association for more than 10 years with Iowa State colleagues Paul Bond, Roger Camp, and Jim McMechan. He also served on more than 25 university, college, and departmental committees.

Many of those committees revolved around athletics, and Horton will be the first to tell you that he's a huge fan of Iowa State sports. Many people can say the same thing about themselves, but how many of them can boast that they haven't missed a single home football game since 1958? Horton's streak started with four years as a coronet player in the marching band.

By the mid '70s, Horton had become good friends with Max Urick, the university's director of athletics, and during one of their many conversations, Horton suggested to Urick that the athletic department should think seriously about getting a new scoreboard to replace the outdated one they were using at the time. Urick agreed, and the pair traveled to War Memorial Stadium in Little Rock, Arkansas, to see an exciting new scoreboard with color and animated graphics. When the athletic department purchased a similar system, Urick asked Horton if he would like to run it. Horton, obviously, was thrilled with the offer, and he recruited two friends from engineering—Paul DeYoung and Rollie Knight—to help create the animation. "The three of us were down at the stadium 24-7 for two weeks building the animation and getting ready for the grand opening," Horton says.

It's not just football that Horton loves. You can also find him at every home basketball game, working on the official stat crew, and even some golf meets. That makes sense considering his son, Jay, is Iowa State's head men's golf coach.

Horton and his wife, **Sandy**, have given so much time and effort to the athletic department that in 2003 they were named Cy's Favorite Alums. The couple accepted the award during halftime of the Iowa State vs. Texas football game that fall. The honor, Horton says, was a wonderful surprise that will be forever etched into his memory.

It's memories like that—and thousands more from his nearly 50 years on campus—that Horton likes to talk about. He fondly recalls the early years when he and a group of 15 or 20 faculty members and graduate students took fishing trips to the Boundary Waters of Minnesota at the end of the spring quarter, hoping that the ice had melted by the time they arrived. He also likes to tell stories about his colleagues getting together for five-cent coffee every morning at seven to read the newspapers and debate issues in the department, university, state, and world. The same group of people would meet for sack lunches, Horton says, playing competitive card games while discussing classes, labs, curricula, and students. Gatherings like those meant there was no need for long, weekly faculty meetings because most issues were resolved around the coffee table. "The camaraderie that came out of all of that was phenomenal," Horton says. "We were family."

Even though Horton and many of his long-time friends have retired, he finds it nearly impossible to stay completely away from campus. "I go back on Friday mornings for donuts and coffee with a couple of my old cronies," he says, laughing once again.

As he reclines back in his leather chair, Horton adds, "Iowa State was wonderful. There are so many good memories, and it's hard not to reminisce about all of them."

Supercomputing at Iowa State

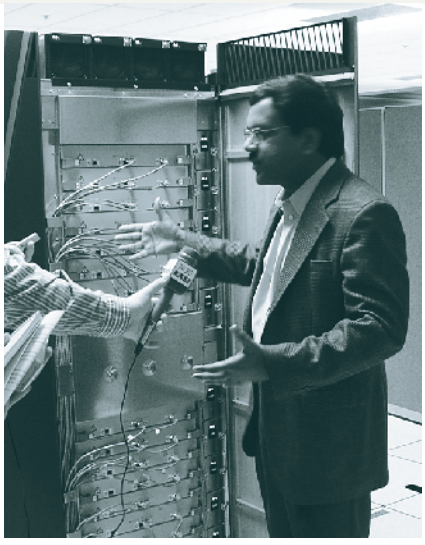
Durham Center on the Iowa State campus is now home to a $1.25-million IBM Blue Gene/L supercomputer. The National Science Foundation awarded $600,000 to a research team led by ECpE Professor **Srinivas Aluru** to cover nearly half the cost of the supercomputer; Iowa State paid the remaining $650,000 with allocations from the President's Office, the Office of the Vice Provost for Research, the Office of Information Technology, and the Plant Sciences Institute.

The new machine, which has 2,048 processors and 11 trillion bytes of data storage, is about the size of a large refrigerator. It is the 73rd most powerful supercomputer on the current TOP500 list of the world's fastest supercomputers—the first time Iowa State has ever made the list. It puts Iowa State's among the top 10 university supercomputers in the United States.

Aluru estimates the new supercomputer will be more than 10 times more powerful than any high-performance computer currently on campus, capable of a peak performance of 5.7 teraflops. A teraflop equals 1 trillion calculations per second.

Iowa State researchers will put the equipment right to work on some very large projects. The university is one of four institutions working on a $29.5-million, three-year project to sequence the corn genome. The corn genome is considered the most complex sequencing project attempted to date because corn has 50,000 to 60,000 genes, or about twice the number humans have. Researchers here are also working to understand protein networks in whole organisms. Those networks can involve 30,000 proteins interacting with each other, which is why having a supercomputer on campus will be a big boost to that project.

In addition to Aluru, members of the supercomputing research team are **Arun Somani**, professor and chair of electrical and computer engineering; **Robert Jernigan**, professor of biochemistry and biophysics and director of Iowa State's Laurence H. Baker Center for Bioinformatics and Biological Statistics; and **Patrick Schnable**, professor of agronomy and director of the Center for Plant Genomics.



Srinivas Aluru presents the Iowa State supercomputer to the media.

'88 grad loves high definition

Adam Kunzman was just a kid when his grandfather, an engineer at AT&T, showed him how telephone conversations are carried by light across a fiber-optic network. Kunzman was fascinated. And he was hooked on engineering.

After graduating from Olympia High School in Stanford, Illinois, Kunzman enrolled at Iowa State, earning a BS in computer engineering in 1988. He took his degree and experience to Texas Instruments, where in 1994 he began working in the new field of digital light processing (DLP®), which uses the world's only all-digital display chip, a key component in the best digital projectors and high-definition televisions available today.

DLP technology utilizes an optical semiconductor with an array of up to 2 million microscopic mirrors, each measuring less than one-fifth the width of human hair. The code in the semiconductor directs each mirror to turn on and off up to several thousand times per second, ultimately creating stunning, full-color images. When Kunzman was first developing this technique for TI, he and other engineers were trying to figure out how to make a good picture using a silicon chip. "We could move the mirrors with the chip," he says, "but we wanted it to make pictures on television screens and projectors."

Like all research, finding the answers that led to the discovery of DLP technology took time, patience, and an interdisciplinary approach. In addition to engineering expertise, Kunzman relied on principles of physics, chemistry, and high-speed electronics.

The challenge of using interdisciplinary concepts was the initial attraction of the project, Kunzman says. And it was his undergraduate training at Iowa State that prepared him well for that challenge. "One emphasis in the computer engineering curriculum is bringing various disciplines together," Kunzman offers. "I remember lab courses where we had to work with business students or design students, using real-life, practical problem-solving skills."

And now that he's seen the tremendous progress in DLP technology over the last dozen or so years, Kunzman realizes that all his hard work and long hours were well worth it. "It was a challenge making a business out of DLP technology," he admits, "but it's been very rewarding to see how far we've come."

Iowa State team is top 10

You follow the rules and arrive at the airport an hour and a half before your flight is scheduled to leave. The first thing you do when you get inside the terminal is check the schedule to see if your plane is leaving on time. Just your luck; that dreaded word, DELAYED, is flashing on the screen next to your flight number.

"What are my options?" you ask yourself. You could sit there watching the other flights take off or you could find a restaurant and grab something to eat, since you missed lunch anyway trying to get to the airport on time. Then again, you might find a TV and catch the second half of a good football game.

You decide you'd really like to see the rest of the game, but you hesitate because all of the TVs are on the other side of the airport, and you don't want to take a chance on missing your flight.

"It's too bad you can't check the flight schedules on your cell phone," you say to the college student standing beside you, who also happens to be disappointed because his flight is delayed as well.

That day, he responds, isn't too far away.

He's right, and the work of four Iowa State computer engineering students may be the reason why. The four created a product they call JANIX (an acronym for Janus Adaptable Network of Integrated qbX), which could someday be used for a large number of applications, one of which might be an alert system for flights. The product was an entry in the Sixth Annual Computer Society International Design Competition (CSIDC), co-sponsored by the Institute of Electrical and Electronics Engineers, in 2005. The team was one of only 10 in the world that qualified for the final round of the competition. More than 200 entries were submitted for the contest.

The Iowa State group won honorable mention for its entry. A team from North Carolina State University—the only other school from the U.S. to make the finals—won the top prize, while Poznan University of Technology from Poland was second and Politehnica University of Bucharest in Romania took third.

China had two teams in the finals, while the others came from Columbia, India, Pakistan, and the United Arab Emirates.

Iowa State's team—**Christopher Hagen** (Cedar Rapids, Iowa), **Andrew Lundberg** (Blue Grass, Iowa), **Janice Wong** (Hong Kong), and **Chun "Reggie" Yu** (Clinton, Iowa)—took their project to Washington, D.C., in June. All but Yu, who is a senior now, graduated last spring.

Arun Somani, Jerry R. Junkins Endowed Chair Professor and current chair of the Department of Electrical and Computer Engineering at Iowa State, was the group's mentor, while Professor **John W. Lamont** served as project facilitator.

Participants in the CSIDC were challenged to design and implement computer-based solutions to real-world problems. They were further tasked to work as a team to create a system for PCs or hand-held computers that performed a socially useful function. Each team was required to submit a final report documenting the design and implementation of its product. Experts from industry and academia evaluated those reports to determine which 10 teams would compete in the finals.

What makes the Iowa State team's product different from other wireless information-distribution systems, Lundberg says, is that the product doesn't require special hardware or software for the user. "They can just walk into the airport," he explains, "and they'll be immediately contacted by the system and asked if they want to receive the available information."

Somani points out another advantage of JANIX. If the user doesn't want the information, the "No" option can be chosen and the system will stop sending messages.

JANIX was born out of a senior design project that the group worked on together. Lamont and Assistant Professor **Pat Patterson** told the group that their project fit the scope of CSIDC and encouraged them to submit a report and take part in the competition.

After some research and tinkering with the product, the group decided it wasn't quite what they wanted. "We ended up having to develop a second project that was different than what we were doing in our senior design class," Lundberg says, "because we didn't feel (the original product) could win."

"We didn't want to put in all that work unless we were going to win," Hagen adds.

After a couple of meetings, the group finally agreed on JANIX. Because their first report was due about five weeks later, the team had to get to work quickly on the new project.

Lundberg's main responsibility was working on the system's server software and the sensors, while Hagen made those sensors functional and interpreted the data they provided. Wong worked on the user-interface side. "I wrote menus for a cell phone so it communicates with our system," she says. Yu, meanwhile, developed the firmware (computer programming instructions) inside the JANIX system.

While the foursome did all of the work, ECpE faculty members offered their insight and support, helping when asked. The team held weekly meetings with professors to discuss different issues that were causing problems or confusion. "They provided ideas on where we could go to solve those problems, and they helped keep us on schedule," Lundberg says.

Somani, the team mentor, assisted by pointing out potential challenges, making sure he didn't interfere with the group's efforts. "(Students) need to learn to take responsibility and understand the value of their time, the value of planning, and the value of documentation," Somani says. "We provided a little direction, but we wanted them to come up with their own ideas. I want my students to feel like they're doing the work on their own."

Despite not winning first place, the team learned a number of valuable lessons while working on the project. But, the entire team stresses, it wasn't just engineering they learned. "We also learned a lot about people," Hagen explains. "We're all good friends now, and we probably will be for a long time. Plus, working with all these faculty members has really helped a lot." ■

Electronic Technicians

When **Jason Boyd** and **Gary Bridges** sit down at their desks and fire up their computers on any given morning, their e-mail boxes are quite often full of messages asking for help. Boyd and Bridges are electronic technicians for the Department of Electrical and Computer Engineering who spend several hours each day helping faculty, teaching assistants, lab assistants, and even students fix problems with their electronic devices. Most of that time is spent working on computer problems, but not all. "We also work on equipment maintenance and repair," Bridges says. "We make sure the labs have everything students need, and we make sure everything in the labs is functioning properly."

For example, Boyd says, a recent e-mail notified him that two students were having problems with software licenses expiring, while another e-mail pointed out that a lab's oscilloscope didn't have an FFT module installed.

"Putting out the small fires is usually the first thing I take care of," Boyd says about his typical day at work. "Then after that I'll start working in the labs."

Boyd currently spends much of his time upgrading software and hardware in many ECpE computer labs. Because those labs support classes, outdated equipment or equipment that no longer meets class specifications must be replaced. And that's where Bridges comes in most of the time—ordering and providing those parts so students can complete their projects.

Boyd, who has worked at Iowa State since 1998, is in his final semester of undergraduate work in computer engineering. He's in the concurrent BS/MS program, so he plans to continue working on his master's degree next year, then possibly a PhD.

Bridges graduated from the Tech Institute on campus in 1966 and has been working at Iowa State since 1972. It doesn't seem like 30-plus years have passed by since that first day, he says. "You come in to work one day as a young 20-year-old, then you get out of bed and you're that gray-haired old guy," Bridges chuckles. "It happens overnight."

Being a fixture on campus has its advantages, though. Everyone in ECpE knows Bridges is the guy to see if you need new parts. ■

Peanut butter crazy

Why would an electrical engineering graduate trade a great job for a career in peanut butter? In a nutshell, to run her own business.

Jodene Jensen says she always had an entrepreneurial spirit. It just took some time to find the courage to exercise it. That's why, after earning a BS from Iowa State in 1989, she took a more traditional route and accepted an engineering job at 3M in St. Paul, Minnesota. It was work she enjoyed, but not something she wanted to do forever. She later combined work with night classes at William Mitchell College of Law, thus pursuing another dream—earning a law degree.

Jensen clerked for a federal judge for two years before accepting a position with a Twin Cities firm, where she specialized in intellectual property law. And even though she loved practicing law, Jensen knew she wouldn't be truly satisfied until she was running her own company. There was, however, one thing holding her back: she could never convince herself to give up everything and start a business by herself. "It felt like jumping off a cliff," Jensen explains, "and I wanted somebody to jump with me."

It didn't take Jensen long to find a couple friends willing to take the plunge with her. **Ken Hall**, a lawyer in Jensen's firm, and **Keri Barney** also thought starting a business was a great idea. The trio got together for several brainstorming sessions, searching for a business idea they thought would be successful. "We figured if we were going to quit our jobs and throw ourselves into this," Jensen says, "we wanted something with a lot of potential."

Yet, at the same time, they wanted something new and exciting.

They talked about franchises that built their menus around a single item, like gourmet coffee or cinnamon rolls. Those types of businesses, Jensen offers, have taken a food or drink that Americans love and given it a twist of some sort, making the products new again.

Eventually, the group came up with an idea that all three were convinced would work: peanut butter.

"Once we hit peanut butter," Jensen says, "we knew that was it. We did some research and found it was a huge, untapped market, so we quit our jobs and off we went."

In November 2003, Jensen, Barney, and Hall opened P.B.Loco, a small café serving peanut butter sandwiches, at the Mall of America in Bloomington, Minnesota. Seven different flavors of peanut butter were offered on that first day of business. Since then, choices have grown considerably, and customers can now select their own spreads or request one of 12 signature sandwiches, like the PBBLT, which is a peanut-butter-with-sun-dried-tomato sandwich, topped with bacon bits, cream cheese, and lettuce.

"I didn't think of that one," Jensen admits, "but people are surprised by the taste. It's not what you would expect."

Great-tasting products have helped the business expand substantially, and now the company even sells its most popular flavors of peanut butter in jars. In addition to the classic creamy and crunchy options, customers can purchase peanut butter mixed with Dutch dark chocolate or creamy white chocolate. There's also a European café mocha, Sumatra cinnamon and raisin, sun-ripened apricot, and Asian curry spice, among others.

There's a flavor for almost everyone, Jensen says.

Burdick-Martin—new academic advisor

Deb Burdick-Martin, hired as an academic advisor last October, is the newest member of ECpE's student services group. Prior to taking her new position, Burdick-Martin worked part-time for Youth and Shelter Services in Ames.

The new advisor is no stranger to Iowa State, though, having worked for the university's student financial aid office for 15 years before taking time off to be at home with her children. But now that her daughter is 15 and her son has turned 10, Burdick-Martin was ready to get back to her career full time. She already knew a couple of people in the department, and when she heard about the advisor opening, she applied right away. "I thought this would be a great place to work because I knew the staff was wonderful," Burdick-Martin says. "They're one of the reasons I actually decided to apply for the position."

Advising 80 students this semester is keeping Burdick-Martin busy, but she loves a good challenge. That number will increase as she gets more experience. And that's good, she says, because she enjoys having an impact on students' lives. "I get to help students achieve their career, personal, and educational goals," she says. "Academic advisors are here to help guide, encourage, and support students in that process, and hopefully we end up empowering them to make good decisions, think critically, seek out resources, and come up with action plans to help them meet their goals."

One thing Burdick-Martin has learned is that no two days are alike. Students come to her office with a variety of needs, ranging from advice about academics to assistance with career choices to help with personal issues. "Every day is a little different," she says, "and I really like that." ■

In addition to being on the shelves of many grocery stores in and around the Twin Cities, P.B.Loco products can be found at national food chains. Customers can also buy the company's products online.

With the expansion, the three owners have moved from taking orders and making sandwiches at the original café to different executive roles. For Jensen, it's franchise development and sales, which is going well, she says, with two new cafés set to open soon—one in Scottsdale, Arizona, and another in Woodbridge, New Jersey, just outside of New York City.

Jensen confesses that people are surprised when she tells them her undergraduate degree is in electrical engineering. Except for occasionally rewiring a machine that's on the fritz, Jensen doesn't do much engineering at work. But that certainly doesn't mean her background in the field isn't extremely useful in her day-to-day responsibilities as a business owner.

"Starting and running a business requires good analytical skills," Jensen explains. "That helps with things like figuring the books and looking at cost structure. When you study engineering, you learn how to think through things and analyze everything, which has helped me tremendously running a business and negotiating with people."

PEANUT BUTTER FACTS

(courtesy of www.pbloco.com)

- Peanut butter is one of America's favorite foods, and Americans eat more than 800 million pounds of peanut butter each year.
- Peanut butter was invented around 1890 as a health food for undernourished patients.
- Dr. George Washington Carver, who earned a bachelor's degree in 1894 and a master's degree in 1896 from Iowa State, made more than 300 products from peanuts, including a milk substitute, face powder, printer's ink, and soap.
- While Dr. Carver did not invent peanut butter, he so improved peanut horticulture that he is considered by many to be the father of peanut butter.

Knight is new ECpE secretary

Karen Knight, who was hired as a secretary for ECpE in October, says her new job presents a different challenge every day.

If she's not assisting students with finding a classroom, Knight might be in the department mailroom, stuffing faculty mailboxes with important information. She could even spend an hour or two helping a member of the ECpE staff with phone problems, since part of her job is serving as the department's telecommunications coordinator with IT services. In addition to formatting faculty vitas and helping the ECpE Search Committee by checking references and coordinating visits for faculty candidates, Knight also spends several hours each week working on the department's ABET recertification process.

Although new to the ECpE department, Knight is not new to the university. She's been employed at Iowa State for 10 years, first with ISU Extension in the state 4-H office and for the last seven years with the Alumni Association.

Honors and Awards

Srinivas Aluru
Best Paper Award—IEEE International Parallel and Distributed Processing Symposium

Manimaran Govindarasu
Guest co-editor for July 2005 special issue of *Journal of Systems and Software*

Hanjun Jiang
Research Excellence Award

Sang Kim
Best Paper Award—IEEE Conference on Mobile Ad Hoc and Sensor Systems

Chen-Ching Liu
Palmer Chair in Electrical Engineering

Joseph Mesterhazy
P&S CYtation Award

Murti Salapaka
Research at the Nanodynamics Systems Lab highlighted in *Nature*

Jiming Song
NSF Career Award for "Accurate and Efficient Electromagnetic Modeling Techniques for RF Integrated Circuits"

Jiming Song
The Air Force Office of Scientific Research Summer Faculty Fellow, 2005

Daniel Stieler
Research Excellence Award

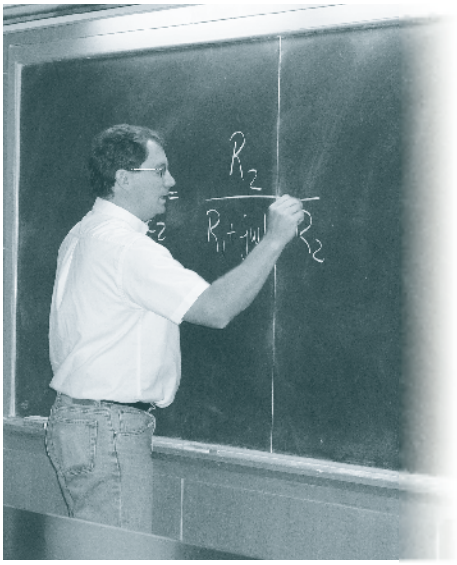
Vicky Thorland-Oster
Outstanding Faculty/Staff Award

Nathan VanderHorn
Jerry R. Junkins Chair Fellowship

Robert Webber
Patent: "Tapered-Width Microcantilevers and Microbridges"

Tuttle lends a helping hand

On a warmer than usual day early last semester, sophomore **Kyle Meyer**, an electrical engineering major from Omaha, followed ECpE Associate Professor **Gary Tuttle** to his office after class. Meyer was having a difficult time understanding a transfer function from the previous day's lab, and he needed some clarification. It



took only about five minutes for Tuttle to help Meyer understand the complicated formula.

"I got a little lost in the math," Meyer admits, "but Dr. Tuttle made it a lot simpler, and I have it figured out now."

"We sat down and I took him through the derivation of the formula," Tuttle explains. "I showed him how to get that (derivation) so he could compare his calculation to what he actually measured in class."

Meyer says Tuttle is like most of his other electrical engineering professors—there to lend a helping hand when students are in need. "It's great to get the one-on-one attention from a professor in a situation like this," Meyer says. "It's the best help you can get."

Tuttle, who is teaching a nanoelectronics class and a microelectronics fabrication techniques lab this semester, takes it all in stride, saying helping students is why he loves teaching. Lectures don't always get the information across, he adds, and some students prefer one-on-one interaction. Some professors, like Tuttle, prefer that approach too, and it's always rewarding when a student finally gets a concept he or she has been struggling to understand.

"You can always tell when things aren't real clear," Tuttle explains, "because they have that perplexed look on their face. But then suddenly the light goes on, and that's a real satisfying thing when you're able to explain something to them and they understand."

That "click" isn't just for students, Tuttle stresses, and coming up with the answer to a difficult problem you've been working on for months or years is what he likes best about research. Much like his students, Tuttle struggles with problems in the lab. "You're trying to figure out how to make something work, trying to get over a hurdle," he explains, "then you do something in the lab that gives you the hint you need or you get an idea that takes you past that sticking point. It's the exact same feeling, and there's nothing like that 'gotcha' moment when you figure it out."

Research is the primary reason Tuttle began teaching at Iowa State 15 years ago. He says at that time there were two options if you wanted to go into research: academia or industrial labs. Since he was always geared toward the academic life, the choice was easy—Tuttle went to graduate school. It was perfect for a guy who wanted to work on the problems he found interesting rather than the ones a company told him to be interested in.

Tuttle's interest happens to be in photonics; he works with devices and materials that manipulate light in some way. The idea, he says, is taking what Mother Nature gives him with light and then shaping those materials so they perform how Tuttle wants them to. To make that happen, he often blends two different kinds of dialectic materials. The resulting structure has optical properties that are much different than the properties of either of the materials that he started with.

To get the results he wants, Tuttle must ask questions. He hopes his students see that and ask questions themselves. "That doesn't happen as much as it should," he says. "I think students should ask a lot more questions."

That's why his office door is always open.

Daniels makes summer explode

Tom Daniels, an assistant professor in the electrical and computer engineering department at Iowa State, knows how to make sparks fly. His summer hobby is setting off fireworks—the ones you see at your local Fourth of July celebration.

"I do everything from wiring and fusing together shells and other pyrotechnics to manually lighting the shells," he says. For some shows, he'll shoot as many as 400 shells into the night sky, bringing oohs and ahhs from young and old alike.

Last year, Daniels and his co-workers from Aerial FX in St. Joseph, Missouri, did four shows over the Fourth of July holiday. That, he says, is pretty typical. In all, he might shoot eight to ten shows during the summer, depending on his work schedule at Iowa State.

His hobby isn't always glamorous, though. Once in a while, instead of lighting the fuses to send exploding rockets into the air, it's his job to drop the shells into a tube. It's not as easy as it sounds. "You walk around with an armful of explosive shells, and you hope you don't get blown to bits," he explains.

While his passion can be dangerous, Daniels explains that training workshops have shown him and other pyrotechnic professionals how to safely shoot these high-powered fireworks. Knowing the guidelines, he says, is part of the certification process.

Daniels also points out that the greatest number of firework-related injuries comes from products as simple as sparklers, followed by illegal fireworks.

Professional injuries do happen once in a while. "Sure, there is a risk of an accident, but we do a number of things for our safety and crowd safety," he says. "It's a matter of minimizing risk." To do that, Daniels works with four or five other team members for a show in a small community. The crew can be as large as 30 for a city the size of Des Moines.

Of course, planning also mitigates some of the danger, and that's why Daniels and his crew spend considerable time working out details for every show. Each show requires a level of choreography consistent with the complexity of the performance. Shells can be synchronized with music so that the explosion occurs at a particular moment, he says, "so there's some level of creativity that goes into a show."

Getting started

Knowing someone already shooting fireworks is usually how a person gets started in this hobby, and that's how it happened for Daniels. You might even say he married into the business. "My father-in-law has been shooting professional fireworks at his home shows for 20 years," he explains, "so I couldn't wait to help."

Daniels was hooked right away. Then, about four years ago, he took the next step and became certified through Pyrotechnics Guild International, an independent worldwide nonprofit organization of amateur and professional fireworks enthusiasts that was founded in 1969. Among its purposes, the group promotes the safe and responsible display and use of pyrotechnics and fireworks, along with encouraging the display of public and private fireworks in conjunction with local and national holidays and patriotic events.

While all of his jobs are in Missouri, Daniels would eventually like to get a club started here on campus. "I've always thought it would be nice to find a group of interested, mature students to start a club here at Iowa State," he says. "It has to be the right set of students, but I think it would be great fun."

Daniels admits to one caveat for anyone thinking about getting into this line of business. "We don't do it for the money," Daniels says. "We do it because it's a lot of fun." ■

ECpE would like to hear from you!

Write to us at 2215 Coover Hall, ISU, Ames, IA 50011-3060; call us at 515 294-2664; e-mail to ece@ee.iastate.edu; or fax to 515 294-3637.

We want to hear about your personal news and career moves for alumni notes in future newsletters. You're welcome to enclose photos; however, we can't return them. We need your help, too, with donations to scholarship funds, lab facilities, student groups, and other department activities. If you're making a contribution to Iowa State, please consider designating it for the Department of Electrical and Computer Engineering. This form will make it easy to send us news (feel free to add a page to this form), a pledge, or a gift.

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More about the Palmer Chair

The Palmer Chair in Electrical Engineering, endowed in 1986 by the late **James R. Palmer** and his wife, **Barbara Raeder Palmer** of State College, Pennsylvania, was established to supplement the chair holder's salary and research funds. Uses of the funds include, but are not limited to, graduate fellowship support, faculty travel, research grants, publication expenses, and scholarship support.

The chair holder is expected to:

- demonstrate an awareness and understanding of current developments in electrical engineering by engaging in related research activities
- lead in developing academic programs in electrical engineering or specialize in an area related to electrical engineering that serves the needs of students and the academic priorities with the College of Engineering at Iowa State
- promote and maintain communication between the academic and industrial communities to their mutual benefit
- attend or participate in various meetings/seminars that focus on electrical engineering
- maintain the margin of excellence needed to build a program that is rich in innovation, strong in both research and teaching, and modern in scope and application

Both James and Barbara Palmer earned bachelor's degrees at Iowa State—James in electrical engineering in 1944 and Barbara in household equipment in 1944. The Palmers had a long history of support to Iowa State. In addition to the Palmer Chair and major contributions to the Engineering Teaching and Research Complex, they established the James R. and Barbara R. Palmer Graduate Fellowship in Electrical Engineering and the Irving Raeder Scholarship for Excellence, which is in memory of Barbara's father, a 1918 graduate of Iowa State. The couple also donated $1.1 million to Iowa State to help build the Palmer Human Development and Family Studies Building, which was dedicated in October 2000.

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