ECpE Connections

Iowa State University

The ELECTRICAL and COMPUTER ENGINEERING Alumni Newsletter

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Note from the Chair

Arun Somani

It's autumn in Ames, a transitional time in the upper Midwest. Leaves are falling from the trees, carpeting the campus lawns—lots of ISU cardinal and gold there.

It's a time of transition for the College of Engineering and ECpE as well. In January we'll welcome **Mark Kushner** as the tenth dean of the college. We're delighted that Dr. Kushner is one of ours—he's currently Founder Professor in electrical and computer engineering at Illinois—and trust he'll bring new ideas to help a great department and college become even better.

What will he find here? He'll find the largest department on campus. Our undergraduate numbers have gone down a bit the past couple of years, but they're still too high for our resources. So to continue delivering quality education, we need to identify new resources.

Certainly the best resource is our faculty, and we're looking for five of the best in power, control, VLSI, and software engineering. We especially want to attract candidates in multidisciplinary fields and are keen to find new talent in bioinformatics and for our software engineering degree program. Also, we're looking for a strong candidate to become our new Palmer Chair.

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"FastPlace" software wows ISPD 2004

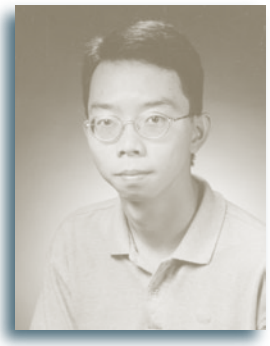
Imagine you're a traffic controller. You've got a million trucks you need to line up in a relay to deliver your product as quickly as possible. The red trucks are the fastest, the blue trucks are the slowest, the yellow trucks always crash into the red trucks, and the green trucks crash into everybody. There are thousands more scenarios—but you get the picture.

But not quite the whole picture: now put your million trucks on the head of a pin.

If you're a computer engineer who is fitting millions of cells on a silicon chip the size of a strand of hair, you face a two-dimensional problem: how to arrange the cells on a surface and how to accommodate the cells' interconnections. It's a time-consuming task, and dozens of software programs have been created to help carry it out.

But none is as fast as a program recently created by **Chris Chu**, assistant professor of electrical and computer engineering, and his former master's student, **Natarajan Viswanathan**. In fact, their software, called FastPlace, is so fast that when they described it in a paper and submitted it to the International Symposium on Physical Design, the paper was almost rejected because no one believed it.

"We thought it was too good to be true," said **Chuck Alpert**, a researcher at IBM's Austin Research Laboratory and chair of the 2004 International Symposium of Physical Design. "We asked Chris to verify it—something we very rarely do." The results were duplicated, the paper was named "Best Paper," and the software rocketed from obscurity to a prominent spot on the radar screens of the country's top computer companies.



Chris Chu

FastPlace, a quadratic placer, reduces the time it takes to place cells from at least two hours to about 10–15 minutes. "It is an order of magnitude faster than anything seen before," Alpert said.

A number of software companies have expressed interest in FastPlace, and its success means Viswanathan will leave his job at Micron Technology and return to Iowa State to pursue his PhD, where he will work on other cell placement problems. "It was a great experience to get noticed," he said.

"I hope to get even better results in the future." ■

Note from the Chair

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Graduate enrollment remains strong—PhD students have increased in number—and our research output is impressive. Research funding has increased as well, despite the fact that external funding sources are increasingly difficult to obtain. If you'd like to see how productive ECpE people are, check out our recently published research review at ***www.ece.iastate.edu/*** (follow the "Research" menu to "Highlights") or e-mail to ***ece@ee.iastate.edu*** and we'll send a copy along.

We've outfitted two new labs for investigating sensor networks, and, thanks to a $250,000 NSF equipment grant, we now have a state-of-the-art high-performance computing Laboratory with a cluster of 74 dual processor nodes connected by a 128-port Myrinet. The first stage of procurement included 64 Pentium III 1.26 GHZ processors followed by 84 Intel Xeon 3.2 GZH processors in the second, for total main memory of 148 GB. Used primarily in high-performance scientific computing and computational biology research, this equipment can create up-to-date assemblies of the maize genome and solve large-scale problems in computational electromagnetics.

But while such tools show our fundamental strength, Coover Hall reveals our fundamental limitations. It's like putting new tires on an old car: they'll get you further down the road, but eventually you're going to have to replace the car itself—or at least overhaul that '50s jalopy. The Campaign for Coover Hall is kicking off, and we'd like you to think about how you might be part of the process. The realities of funding today dictate that much of the support for Coover enhancements will come from private sources, and we have no greater resource than our friends and alumni.

So please be generous in supporting our work to give today's young people as good an education as you received, and we'll update you next spring on this campaign to reinvent not only Coover, but ourselves. Spring is, after all, a time of renewal and restoration—and those cardinal and gold leaves will once again be green.

Mapping the road to more secure power systems: Iowa State hosts the 8th International PMAPS Conference

On Tuesday, September 14, saboteurs bombed oil pipelines near the town of Beiji in northern Iraq, setting off a chain reaction in power generation systems that plunged the entire country into darkness. "This made the Beiji electricity station stop for technical reasons, making the whole electricity system (in Iraq) stop," said Iraq's Minister of Electricity **Ayham al-Samarie**.

The same day Iraqi power system engineers struggled to restore that nation's fragile electric grid, over 200 power industry professionals from 29 different countries convened in Ames as part of the 8th International Conference on Probabilistic Methods Applied to Power Systems (PMAPS), the world's most visible and recognized forum for addressing the problem of uncertainty in power systems engineering.

> "Operating and maintaining … electric power interconnections … is an information collection and processing problem as formidable as any mankind faces today."
>
> —James McCalley

The conference, hosted by the Electric Power and Energy Systems Group of Iowa State's Department of Electrical and Computer Engineering, offered 2 workshops, 11 special sessions, 21 paper sessions, and 3 tutorials, including one led by **Dr. Bill Meeker**, Distinguished Professor of Liberal Arts and Sciences in the Department of Statistics at Iowa State. Conferees presented over 170 papers addressing infrastructure, network security, governmental regulation, operator training, market dynamics, cascading blackouts, and a host of other factors affecting the economic efficiency and reliability of the planet's aging and increasingly vulnerable power systems.

PMAPS was first held as a symposium in June 1986 in Toronto, Canada, with about 75 papers presented and roughly 180 attendees from 15 countries. At that meeting, a temporary PMAPS International Council was formed with members from North America, Europe, and Asia to assist in the selection of conference venues and to provide continuity. Six additional conferences have been held across the globe since then, including meetings in London; Vancouver, B. C.; Rio de Janeiro; Oakland, California; Naples; and Portugal's Madeira Island.

Massive power system failures are hardly peculiar to war-torn nations like Iraq. Indeed, little over a year ago the lights went out in New York City, Albany, Buffalo, Cleveland, Columbus, Detroit, Ottawa, Toronto, and dozens of other cities in the northeastern United States and Canada. One hundred power plants went down, and 50 million people were affected in a failure that was itself traced to a single power station in Ohio. In this case the "saboteurs" were not insurgents but inadequately trimmed trees around power lines—coupled with, in the words of a joint U.S.-Canadian task force report released last month, "inadequate training of operators to recognize and cope with emergency conditions."

According to PMAPS organizers, this year's conference took place at a time when electric industry participants must carefully strategize financial and technical decisions, especially those related to managing existing infrastructure. Conference workshops therefore focused on risk and asset management, with numerous paper sessions dedicated to associated topics. This focus, notes conference chair **Jim McCalley**, professor and associate chair of Iowa State's Department of Electrical and Computer Engineering, reflects the ascendancy of probabilistic approaches over deterministic methods for assessing risks associated with physical and economic disturbances to electric power networks and market systems.

Joao Tome Saraiva *of the University of Porto, Portugal, presents his paper, titled "Long Term Transmission Expansion Planning—A Simulated Annealing Based Multiyear Algorithm Including Long Term Marginal Prices"*

"Operating, maintaining, and planning electric power interconnections, their extensive range of capital-intensive equipment, and the complex Internet-based financial markets on which they depend," said McCalley, "is an information collection and processing problem as formidable as any mankind faces today. The ability to manage this information and to understand its value is where probabilistic and other related methods play a huge role."

Keynote speaker for the conference was **José M. Delgado**, president and CEO of American Transmission Company (ATC), a transmission-only utility serving portions of Wisconsin, Michigan, and Illinois that he helped to create in 2001. Delgado previously spent 27 years at Wisconsin Electric Power Company (now known as We Energies), starting as an electrical engineer and ending as vice president of electric system operations, before he left to become CEO of ATC.

In his address, Delgado discussed fallout for the electric power industry from the recent cascading blackouts in North America and Europe, especially with regard to the security and adequacy of transmission networks. Of special concern to the United States, Delgado said, is the need to continue strengthening the high-voltage transmission system through investment in new transmission and application of new technologies.

"These events have acted as a wake-up call to the whole electric industry in North America," Delgado stressed as he outlined practical options for the planning, construction, and financing of investments in the nation's transmission networks.

In other conference proceedings, **Dr. John Endrenyi**, principal scientist emeritus with Kinectrics Inc. and emeritus professor of electrical engineering at the University of Toronto, was recognized with a special award for his work in the development of probabilistic methods applied to power systems. The conference concluded with a presentation of prize awards for best papers (listed below) and the announcement of the next PMAPS conference site, which will be the Royal Institute of Technology, Stockholm, Sweden, in 2006.

"Hosting 200 people from 29 different countries over 4 days for an international conference of this caliber creates direct and indirect benefits to our university that will last for years," said McCalley, "and the contributions made to the evolution of electricity systems, a critical infrastructure of all nations today, will be recognized worldwide." ■

Conference chair **Jim McCalley**, *wife* **Lynda**, *with Canadians* **Edith Endrenyi** *and* **Puica Nitu** *(far right) socialize at Memorial Union*

Conference prize papers:

FIRST PRIZE: *Roy Billinton* and *Yifeng Li*, "Incorporating Multi-State Unit Models in Composite System Adequacy Assessment"

SECOND PRIZE: *N. Dag Reppen*, "Increasing Utilization of the Transmission Grid Requires New Reliability Criteria and Comprehensive Reliability Assessment"

THIRD PRIZE: *G. Carpinelli, D. Proto, C. Di Perna, P. Varilone*, and *P. Verde*, "Probabilistic Short-Circuit Analysis in Unbalanced Three-Phase Power Systems"

FOURTH PRIZE: *A. A. Chowdhury, B. P. Glover, L. E. Brusseau, S. Hebert, F. Jarvenpaa, A. Jensen, K. Stradley, H. Turanli*, and *G. E. Haringa*, "Assessing Mid-Continent Area Power Pool Capacity Adequacy Including Transmission Limitations"

Conference student prize papers (first author must be a student):

FIRST PRIZE: *Qiming Chen* and *James D. McCalley*, "A Cluster Distribution as a Model for Estimating High-Order Event Probabilities in Power Systems"

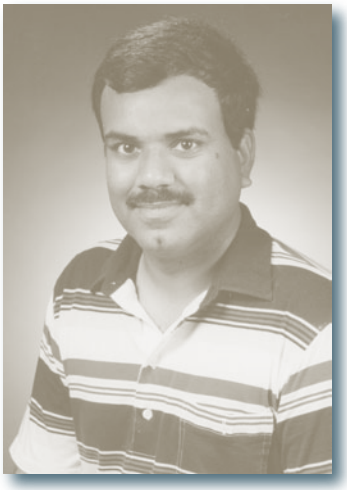
SECOND PRIZE: *Eduardo M. Gouveia* and *Manuel A. Matos*, "Operational Reserve of a Power System with a Large Amount of Wind Power"

THIRD PRIZE: *Wijarn Wangdee* and *Roy Billinton*, "Utilization of Time-Varying Event-Based Customer Interruption Cost Load Shedding Schemes"

FOURTH PRIZE: *M.-P. Cheong, D. Berleant*, and *G. B. Sheblé*, "Information Gap Decision Theory as a Tool for Strategic Bidding in Competitive Electricity Markets"

Srinivas Aluru: Assembling the maize genome

Srinivas Aluru, associate professor of electrical and computer engineering, is on a fast track. At age 36, he is associate chair of graduate education for his department and associate chair of Iowa State's bioinformatics and computational biology graduate program. He has received the Young Engineering Faculty Research Award, the IBM Faculty Award, and an NSF Career Award.



So it should come as no surprise that Aluru's contribution to assembling the maize genome involves speed and has made the genome available worldwide in new ways. (More about that later.)

When he visited campus in 1998 to present a seminar, Aluru said he knew the university had what it took to be a leader in bioinformatics, or the use of computational methods to better understand biological data. "There was a lot of activity and also interest from the top of the administration," he says. Information infrastructure is one of five initiatives ISU President **Gregory Geoffroy** identified in 2002 as "big impact" areas tagged for special funding by the university.

Aluru, who received his M.S. and Ph.D. degrees in computer science from Iowa State, joined the ECpE faculty in 1999 to become part of only the second institution in the nation with a Ph.D. program in bioinformatics. Today, with 60 students, Iowa State is one of the largest such programs in the nation.

Aluru and his team of 11 graduate students work in the areas of scientific computing, bioinformatics and computational biology, and parallel processing, which involves using multiple computers simultaneously to solve large-scale problems.

It was Aluru's expertise in parallel processing that was particularly useful in solving the maize genome problem. There is little question that describing and understanding the genetic blueprint of the corn plant is of significant value. But because maize comes with its own unique mysteries, the problem is a thorny one.

Aluru frequently compares solving the maize genome problem to putting together a puzzle. Imagine you are trying to arrive at a destination, but your map has been torn into a billion pieces. Before you can figure out where you're going, you must paste all the pieces together. But thousands of the "straight road" pieces look identical. You not only can't tell where to place these pieces in your map, but they aren't very useful because they don't include vital bits of information—names of towns and highways, mileage markers, curves in the road, etc.

Figuring out the placement of genes in the maize plant is similar to piecing together that road map. Along the maize genome, short sequence samples are taken from billions of nucleotides, but many look identical and not all include the most vital information—the plant's genes.

The complex problem demanded unique sampling methods, an inventive algorithm, a sophisticated software program—and a very fast method of running it. Two consortiums were funded by the National Science Foundation to generate sequences to sample maize: the Consortium for Maize Genomics, formed by the Danforth Center, the Institute for Genome Research at Purdue University, and Orion Genomics; and a partnership between Rutgers University and the University of Arizona. Throughout the process, the institutions shared their data on the Web.

A multidisciplinary Iowa State team comprised of Aluru, plant geneticist **Pat Schnable**, and mathematician **Daniel Ashlock** put their heads together and worked with the shared data. In November 2003, they posted the finished project three months before it would otherwise have been available.

Using Aluru's parallel processing expertise, the team used 60 processors simultaneously to assemble the nearly one million pieces, thus paring the process from weeks down to hours. In fact, the process is so fast that Aluru says it represents a "paradigm shift." "Scientists can use other methods, but they can't question them because the process takes so long," he says. "Because our process takes only a few hours, we can accommodate a researcher's requests to run it a little differently. Because it is fast, it is flexible."

The team's Web site (***www.plantgenomics.iastate.edu/maize***) is the top Google entry under "maize genome assembly" and, receives more hits than any other maize genome assembly site, says Aluru.

Aluru says he is looking forward to continued work on the genome project and hopes to receive a major grant from the NSF. In addition to this and other projects, he has been invited by the U.S. Department of Energy to be a member of a 300-person team of the nation's leading computational scientists to prepare a blueprint for future research in solving large-scale problems in science and engineering.

Have yourself a very little Christmas: New faculty member explores different uses for tiny sensors

You can tell **Daji Qiao** is excited about his work with wireless sensors when he begins talking about their applications: firefighters, he says, can toss a handful of the tiny devices into a smoldering building to measure levels of smoke and heat; agronomists can sprinkle them in fields to measure soil moisture and temperature; military personnel can toss them from planes to survey enemy territory; city governments can use them to direct traffic; and hospitals can use them to monitor patients.

Linked to a computer network, the tiny sensors can provide almost any kind of information about almost any kind of environment. Currently the size of quarters, the sensors will soon become even smaller—so small, in fact, that scientists have dubbed them "smart dust." "Remote sensors will become cheaper and smaller," says Qiao. "They will be affordable for many industrial applications."

But there is much work to be done before that happens. Transmission must be reliable and secure. Batteries must be efficient. In fact, wireless sensor networks represent all kinds of challenging research issues in computer engineering, says Qiao. In order to test sensor networks, Qiao has developed a mobile test bed. For now, the $25,000 platform stays in the laboratory, but Qiao anticipates that eventually he will move it into a variety of environments.

Qiao, who received his PhD in electrical engineering systems from the University of Michigan in January, joined ECpE's Information Infrastructure Institute (iCUBE) this May. A bachelor's degree in control engineering from Tsinghua University in Beijing, China, and an MS in computer engineering from Ohio State provide Qiao with the versatility he needs to tackle a multidisciplinary research problem.

Qiao will teach a graduate course in sensor networking in which he will ask students to come up with their own creative applications for sensors. "Applying my research to teaching is challenging but fun," Qiao says. "I enjoy working with students."

As an example, Qiao cites a similar class at another university in which students tackled a "smart Christmas tree project." "The sensors in the tree measured activity," he recalls. "If people were walking around, they blinked happily. If nobody was there, they shut down." ■

Preventing power failure—one (short) course at a time

Iowa State's short courses fulfill its land-grant mission

Last year's massive blackout in Canada and the northeastern U.S. was a disaster that could have been prevented with one of the most effective weapons in any defense arsenal: education. Ongoing training of power system operators, technicians, electricians, and engineers is essential to the health of electrical utility companies, says Tom Baird, who coordinates Iowa State's short courses for power industry professionals.

But many state universities don't consider electrical power an "exotic" engineering discipline, says Baird, who worked 40 years in Iowa's electrical industry before joining Iowa State in February 2004. "Electrical power is considered by many institutions to be tried, proved, and staid. That's a misperception. There's a lot of sophisticated technology involved in electrical power systems, and it deserves the kind of attention Iowa State gives to it."

Iowa State has been formally supporting the power industry since Engineering Extension was formed in 1913 and probably even before that, says **Ron Cox**, director of ISU's Center for Industrial Research and Service (CIRAS). A partnership between CIRAS, ISU Extension, and the Department of Electrical and Computer Engineering has resulted in training for 150–200 power system professionals every year.

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Preventing power failure—one (short) course at a time

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For example, MidAmerican Energy Company has sent employees to the workshops for the past 12 years and finds them a valuable resource, says **Clay Lindstrom**, manager of substations for MidAmerican. "Someone always comes away with at least one new idea."

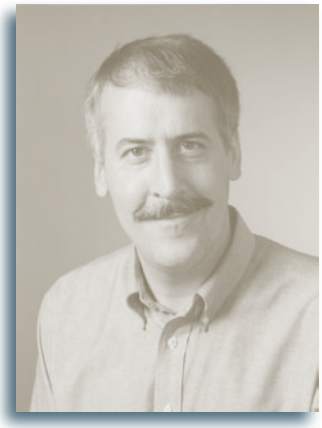
Since last August's blackout, government regulators have intensified their interest in formal certification of power system operators, opening new opportunities for Iowa State, says Baird. Iowa State will apply to the North American

Electric Reliability Council to become a certified provider of continuing education credits for operators.

Iowa State's experts are also planning to offer courses on streaming video so that power system professionals can receive training at their convenience, whether at work or home. Baird, who in 1976 was the first Iowa State student to receive his M.S. in electrical engineering from the department's distance education videotape program, compared the technologies of yesterday and today.

"In the old days, videotapes were reel-to-reel and many towns had only one video player. We all got together in one room to watch the tapes, and if there weren't enough students, the course was cancelled," he recalls. "Today, we can tailor our courses for professionals in the field and build a library that can be used by anyone at any time." ■

ECpE's Jacobson recognized by Regents



ECpE Associate Professor **Doug Jacobson** has received the Regents Award for Faculty Excellence. The award was presented by the Board of Regents, State of Iowa, to outstanding faculty at the five Regent institutions in a ceremony held at the University of Iowa on September 14.

"This year's award recipients epitomize the many faculty of our public education institutions who work every day to enhance the quality of life for Iowans," said **Gregory S. Nichols**, executive director of the Board of Regents. "They are in Iowa largely because of their great dedication to the Regent institutions and their three-part missions of education, research, and public service."

Jacobson specializes in computer security and is the director of the ISU Information Assurance Center. He has received two R&D 100 Awards, both for development of security software packages sold by Palisade Systems, a company he co-founded in the ISU Research Park. Jacobson's current funded research is targeted at developing robust countermeasures for network-based security exploits and large-scale attack simulation environments. ■

Patents

To **Arun Somani** and **Govindarajan Krishnamurthy**, Location Information Recovery and Management for Mobile Networks, Patent No. 6,718,173.

To **Lin Wu** and **William Black** (ret.), Apparatus for and Method of Implementing Time-Interleaved Architecture, Patent No. 6,768,356.

Somani, Gupta recognized at HiPC 2004 ▪

"An Incentive Driven Lookup Protocol For Chord-Based Peer-to-Peer (P2P) Networks" by ECpE chair Arun Somani and graduate student Rohit Gupta has been named "Best Paper" for the Ninth International Conference on High Performance Computing (HiPC) to be held in December in Bangalore, India. The paper was one of only two selected as "Best Paper" from over 250 submissions, Somani and Gupta's honor coming in the Algorithm and Applications area. The authors will share a prize of 25,000 Rupees provided by Infosys Technologies Ltd. and will present their work in a special plenary session of the conference.

ECpE Connections

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Alumnus honored

Richard Stanley is "citizen of the world"

Stanley Consultants, INC.

Richard H. Stanley (EE/ME'55) has received the prestigious Order of the Knoll Cardinal and Gold Award for his creative leadership and for time and energy devoted to Iowa State.

Stanley is the consummate engineer, businessperson, and world citizen. After receiving his graduate degree in sanitary engineering from the University of Iowa, he went on to devote his entire professional career to Stanley Consultants, Inc., a leading international engineering firm he currently heads as chair of its board of directors. He has served his profession in a variety of capacities, including as chair of the American Council of Engineering Companies, chair of the National Construction Industry Council, chair of the Northeast Midwest Institute, and president of the Iowa Engineering Society.

Stanley began serving Iowa State as a student—he was student body president and sat on the Memorial Union Student Board—and continues to serve as an alumnus. He was a member of the Engineering College Industrial Advisory Council for 28 years, including two as chair, and is a past member and chair of Iowa State's Center for Industrial Research and Service (CIRAS) Advisory Council. He is a member of the Knoll Patron's Society, the Order of the Knoll's highest recognition level.

According to Stanley, his most meaningful contribution was the creation of the Stanley Foundation, established in 1956 to foster world peace. President and chair of the foundation since 1984, Stanley was instrumental in creating the Iowa Peace Institute in 1987 and the Iowa International Council in 1992. He continues to serve on the board of the Institute for Social and Economic Development and as a leader in the United Nations Association. He founded the Emergency Coalition for U.S. Support of the United Nations and was honorary chair of the United Nations' 50th anniversary observance in Iowa.

John Kleitsch retires

John Kleitsch, associate professor of electrical and computer engineering since 1983, retired in July. Kleitsch taught a wide range of courses while at Iowa State, including digital design, circuit design, and senior design projects. He came to Iowa State with 25 years of industrial experience, which he said enhanced his teaching effectiveness and helped him communicate to students how to be successful practicing engineers.

Kleitsch has three daughters who graduated from Iowa State, including **Deanna**, who received her degree from ECpE; **Susan**, who received her degree in forestry; and **Carol**, who graduated in business administration.

Alumni shorts

Vivek Mehra (MSCpE'88) has joined August Capital of Menlo Park, California, a venture capital firm that invests in a wide variety of information technology startups. A co-founder of Cobalt Networks in 1996, Mehra pioneered and helped that company become a world leader in server appliances, resulting in a highly successful initial public offering. Cobalt's products won numerous awards, including "Innovation of the Year" by *PC Computing Magazine*. Before joining August Capital, Mehra was employed by Sun Microsystems as vice president and general manager of the Cobalt Business Unit after Sun acquired Cobalt for $2 billion. Mehra and wife Sonia have one son.

Gary Hartmann (MSEE'67) was honored by Honeywell at an April ceremony in Phoenix, Arizona with a Lifetime Achievement Award in recognition of his "technology contributions, dedication, and innovation" to Honeywell's aerospace businesses. Gary joined Honeywell following his graduate work at Iowa State. He has held a series of engineering positions with the firm and is currently a corporate fellow at Honeywell's Aerospace Electronic Systems R&D Center in Minneapolis, Minnesota. Gary and his wife, Laurel, have two grown daughters and live in a Minneapolis suburb.

ECpE alum Gary Hartmann receives the Lifetime Achievement Award from Bob Johnson, chief operating officer and executive vice president of Honeywell Aerospace.

ECpE's Dogandzic receives top IEEE signal processing recognition

ECpE Assistant Professor **Aleksandar Dogandzic** has received the 2003 IEEE Signal Processing Society Young Author Best Paper Award in the sensor array and multichannel (SAM) area for "Space-time fading channel estimation and symbol detection in unknown spatially correlated noise," *IEEE Trans. Signal Processing*, March 2002, co-authored with Professor **Arye Nehorai** of the University of Illinois, Chicago.

The Young Author Best Paper Award honors the author(s) of an especially meritorious paper dealing with a subject related to the society's technical scope and appearing in one of the society's *Transactions* and who, upon the date of submission of the paper, is less than 30 years of age. A maximum of four Young Author Best Paper Awards are presented annually by the society.

Dogandzic received the Dipl. Ing. degree in electrical engineering from the University of Belgrade, Yugoslavia, in 1995 and the MS and PhD degrees in electrical engineering and computer science from the University of Illinois at Chicago in 1997 and 2001, respectively. He joined ECpE in 2001. His research interests are in statistical signal processing theory and applications, particularly SAM processing, an area that exploits spatio-temporal measurements provided by an array of sensors to estimate or detect desired signals. ■

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
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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