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LED inventors & innovators win 2002 National Medal of Technology

By Laura Schmitt

ECE Professor Nick Holonyak Jr. and two of his former graduate students, M. George Craford and Russell Dupuis, received the 2002 National Medal of Technology November 6, 2003, from President George Bush at a White House ceremony. The three were recognized for their contributions to the development and commercialization of light-emitting diode (LED) technology, with applications to digital displays, consumer electronics, automotive lighting, traffic signals, and general illumination. LEDs are the world's most efficient light source being mass produced today.

Holonyak received the National Medal of Science in 1990. He is one of 13 Americans who have been awarded both the National Medal of Science and the National Medal of Technology.

The National Medal of Technology recognizes men and women who embody the spirit of American innovation and have advanced the nation's global competitiveness. The award was established by Congress in 1980. To date, 146 recipients have been honored with the medal.

Holonyak (BSEE 1950, MSEE 1951, PhD 1954) was the first graduate student of two-time Nobel laureate John Bardeen, an Illinois physics and ECE professor who invented the transistor while at Bell Labs in 1947.

In 1962, while at General Electric, Holonyak invented the first practical light-emitting diode and the first semiconductor laser to operate in the visible spectrum. He was also the first to make electronic devices from III-V compound semiconductor alloys (i.e., using elements from the third and fifth columns of the periodic table).

2002 National Medal, continued on page 33



(Right to left from President Bush) ECE Professor Nick Holonyak Jr. and two college alumni, M. George Craford and Russell Dupuis, received the 2002 National Medal of Technology November 6, 2003, from President George Bush at a White House ceremony.

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Department head's message

What is an electrical and computer engineer, and how should one be educated? This is a question I often think about, and I have discussed it in this column before. The Department's goal is to educate engineers to be leaders of product design and development, leaders of research, leaders of entrepreneurship, leaders in business and corporate management, and leaders in the political process. Our future ECE graduates will develop the foundations for new products and services, start companies, and develop new industries and enterprises that will change the world, just as have our graduates of the past.

To this end, I believe it is now appropriate for the Department to construct a new home. This is my goal and the pursuit of this goal is my major priority these recent months.

The new ECE building will be the home of the Department of Electrical and Computer Engineering for the 21st Century, housing administrative, faculty, and student service offices. The building will make a bold statement of expectations to students and faculty, and emphasize innovation, creativity, and entrepreneurship in an interdisciplinary environment. The building will provide outstanding teaching classrooms and laboratories and will fully integrate undergraduates into the department's activities. It will also be a gathering place for interdisciplinary groups of students and faculty to foster innovation at the intersection of traditional disciplines.

A building that combines interdisciplinary activities with a stimulating environment will become a powerful tool to recruit the very best students and faculty to the University of Illinois. This building will provide an environment

in which to train the future creators of economic growth and prosperity—it may be the most important new building to the university, the state, and the nation because of the students that pass through it. I like to think that this building, although it will be in Urbana, will eventually change the skyline of Chicago, because of the economic vitality that it will bring to the state of Illinois.

Few ECE undergraduates are aware that nearly a third of their ECE faculty are involved with start-up companies. Perhaps fewer students are aware that more than half of the invention disclosures from the College of Engineering come from ECE faculty. The new building will, for the first time, place undergraduates in the very center of ECE innovation by highlighting such activity. The ECE building will also house a Technology Entrepreneur Center.

I also want the building to be a magnet that will invite students to congregate at study tables and conversation centers. There will be reminders, such as paintings or sculptures, of great engineering accomplishments and engineers of past years. The message will be clear: these are the expectations we have of you.

The building will be sited between the Beckman Institute and the Micro and Nanotechnology Lab, and across from the Coordinated Science Lab. It will be the keystone of our complex of buildings housing the ECE faculty. This complex



Etching holes in vertical-cavity surface-emitting lasers creates better beam

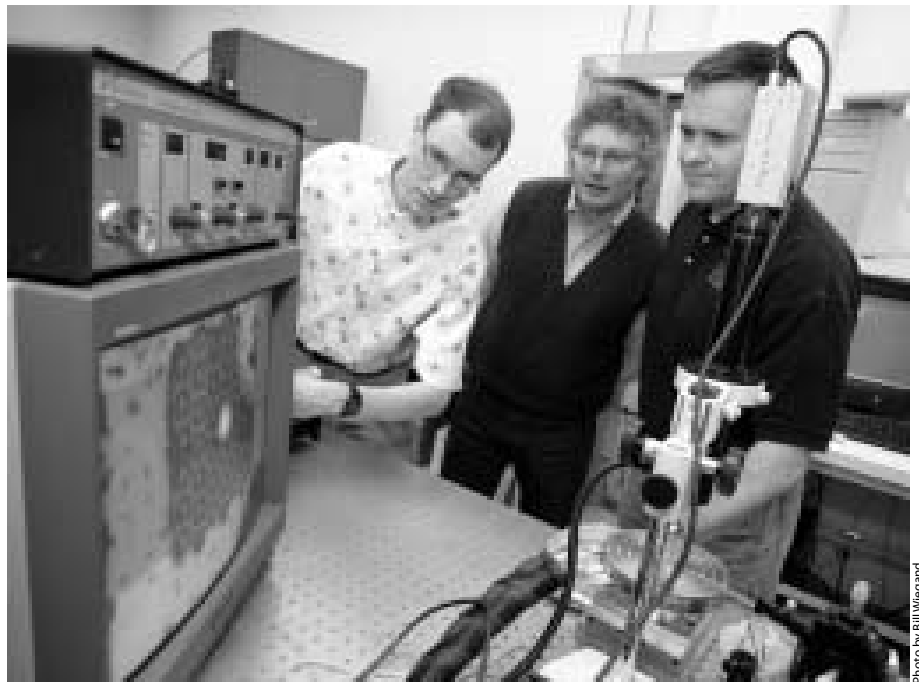
By Jim Kloeppel, U of I News Bureau

University of Illinois researchers have found a way to significantly improve the performance of vertical-cavity surface-emitting lasers (VCSELs) by drilling holes in their surfaces. Faster and cheaper long-haul optical communication systems, as well as photonic integrated circuits, could be the result.

Low-cost VCSELs are currently used in those data communication applications where beam quality is of little importance. To operate at higher speeds and over longer distances, new devices must function in a single transverse mode with a carefully controlled beam.

"These characteristics are normally found only in very expensive lasers, not in mass-produced VCSELs," said ECE Professor Kent Choquette, a researcher at the university's Micro and Nanotechnology Laboratory. "By embedding a two-dimensional photonic crystal into the top face of a VCSEL, however, we can accurately design and control the device's mode characteristics."

Choquette and his colleagues—Illinois graduate students Aaron J. Danner and James J. Raftery Jr., and scientist Noriyuki Yokouchi at the Furukawa Electric Company in Yokohama, Japan—reported their findings in the Feb. 16 issue of the journal *Applied Physics Letters*. The two-dimensional photonic crystal, created by drilling holes in the semiconductor surface, introduces a periodic change in the index of refraction, Choquette said. The holes represent regions of low refractive index, surrounded by semiconductor material where the index is higher. A particular combination of refractive indices will produce a single-



ECE Professor Kent D. Choquette (center) and graduate students Aaron J. Danner (left) and James J. Raftery Jr. have discovered that drilling holes in the surfaces of inexpensive, low-quality vertical-cavity surface-emitting lasers transforms their beam quality so they function similar to very expensive lasers.

mode waveguide that permits only one transverse wave of the laser beam to propagate.

"Our photonic crystal consists of a triangular array of circular holes that have been etched into the top of a VCSEL," Choquette said. "Because the index variation has to be on the length scale of light, the periodicity of the holes must be on the order of several hundred nanometers."

To create such a precise array of holes, the researchers first lithographically define the desired pattern into a silicon dioxide mask layer on the semiconductor surface using focused ion-beam etching. The holes are then bored into the semiconductor material using inductively coupled plasma etching. "By

selectively varying parameters such as depth, diameter and spacing of the holes, we can control the modal characteristics of the laser," Choquette said. "This means we can accurately design and fabricate single-mode VCSELs for high-performance optical communication systems."

The next step, he said, is to push VCSEL performance toward higher power by considering designs that are much larger in diameter. "Looking beyond that, we also have fundamental problems with high-speed data communication on our circuit boards and in our chips," Choquette said. "This is a technology that could serve as the foundation for a new way of looking at optical interconnects and photonic integrated circuits."

Photo by Bill Wiegand

New light-emitting transistor could revolutionize electronics industry

By Jim Kloeppe, U of I News Bureau

Put the inventor of the light-emitting diode and the maker of the world's fastest transistor together in a research laboratory and what kinds of bright ideas might surface? One answer is a light-emitting transistor that could revolutionize the electronics industry.

ECE Professors Nick Holonyak Jr. and Milton Feng have uncovered a light-emitting transistor that could make the transistor the fundamental element in optoelectronics as well as in electronics. The scientists reported their discovery in the January 5, 2004, issue of the journal *Applied Physics Letters*.

"We have demonstrated light emission from the base layer of a heterojunction bipolar transistor, and showed that the light intensity can be controlled by varying the base current," said Holonyak, a John Bardeen Professor of ECE and Physics. Holonyak invented the first practical light-emitting diode and the first semiconductor laser to operate in the visible spectrum.

"This work is still in the early stage, so it is not yet possible to say what all the applications will be," Holonyak said. "But a light-emitting transistor opens up a rich domain of integrated circuitry and high-speed signal processing that involves both electrical signals and optical signals."

A transistor usually has two ports: one for input and one for output. "Our new device has three ports: an input, an electrical output and an optical output," said Feng, the Holonyak Professor of ECE at Illinois. "This means that we can interconnect optical and electrical signals for

display or communication purposes."

Feng is credited with creating the world's fastest bipolar transistor, a device that operates at a frequency of 509 gigahertz. Unlike traditional transistors, which are built from silicon and germanium, the light-emitting transistors are made from indium gallium phosphide and gallium arsenide.

"In a bipolar device, there are two kinds of injected carriers: negatively charged electrons and positively charged holes," Holonyak said. "Some of these carriers will recombine rapidly, supported by a base current that is essential for the normal transistor function." The recombination process in indium gallium phosphide and gallium arsenide materials also creates infrared photons, the "light" in the researchers' light-emitting transistors.

"In the past, this base current has been regarded as a waste current that generates unwanted heat," Holonyak said. "We've shown that for a certain type of transistor, the base current creates light that can be modulated at transistor speed." Although the recombination process is the same as that which occurs in light-emitting diodes, the photons in light-emitting transistors are generated under much higher speed conditions.

So far, the researchers have demonstrated the modulation of light emission



Photo by Gabriel Walter

in phase with a base current in transistors operating at a frequency of one megahertz. Much higher speeds are considered certain. "At such speeds, optical interconnects could replace electrical wiring between electronic components on a circuit board," Feng said.

"In retrospect, we could say the groundwork for this was laid more than 56 years ago with John Bardeen and Walter Brattain and their first germanium transistor," said Holonyak, who was Bardeen's first graduate student. "But the direct recombination involving a photon is weak in germanium materials, and John and Walter just wouldn't have seen the light – even if they had looked. If John were alive and we showed him

Jack Ingram: power forward and power engineering

By Tom Moone

If you think undertaking the athletic rigors of a major NCAA Division I sport together with the academic rigors of a major electrical and computer engineering curriculum is impossible, then you don't know Jack.

ECE senior Jack Ingram stands head and shoulders above the typical student, but at six foot ten inches tall, he stands head and shoulders above just about everyone on campus. Ingram also has the distinction of being the only ECE student on the Fighting Illini basketball team, where he plays power forward and center.

A star on the John Marshall High School team in his hometown of San Antonio, TX, Ingram was originally recruited to the basketball program at the University of Tulsa by coach Bill Self. But before Ingram arrived at Tulsa, Self had moved on to Illinois. After two years at Tulsa, Ingram felt that things were not working out as he would like, and he looked to transfer to another university.

One place Ingram looked was Illinois. NCAA rules indicate that if a student transfers from one four-year institution to another, the student is not eligible to play at the second institution for one academic year. "He [Coach Self] laid it out for me," said Ingram. "He knew he couldn't give me a scholarship last year because there were some rules that forbid it." At first, this made Ingram less keen on Illinois. However, because he was an electrical engineering major at Tulsa, the ECE program helped pull him in. "After I did some research," said Ingram, "I realized Illinois had a great electrical

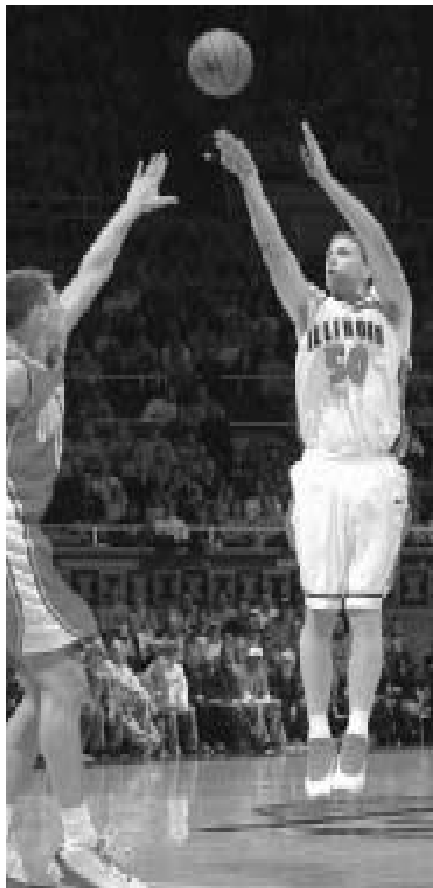


Photo courtesy of U of I Sports Information

ECE senior Jack Ingram began his first year as a scholarship player for the Fighting Illini basketball team. He sat out last season as a redshirt transfer student.

engineering department. It came to the point where that was a good enough reason to come here."

Ingram came to Illinois and spent the 2002-2003 season as a redshirt player. He practiced with the team every day and sat on the bench during the games but he could not compete that entire year. Then, at the end of the season, the coach that he had followed to two different

universities, again moved on. "That was tough," said Ingram, though he felt this move less strongly than the first one during his time in Tulsa. "I understand the business side of college basketball more now," he said.

Juggling the demands of a premier basketball program with those of a premier electrical engineering program can be difficult. "My teammates joke around about how I'm always doing homework all night and staying up all hours at night," said Ingram, who is focusing on power systems. "It can be tough." So far, though, he has been able to budget his time to keep himself from being spread too thin.

His redshirt year may actually help him in this regard. He will be able to spread his work as a senior in ECE over the two years of NCAA eligibility he has at Illinois.

Being a redshirt last year also made Ingram eager to play as well as he can this year. "Jack is a very hungry player," said Illinois assistant coach Chris Lowery. "He is very hard worker." Lowery added, "Jack is going to be a leader. He can definitely make plays offensively. He will be able to take guys out and make the shots."

During the summer of 2003, Ingram traveled with the basketball team on a ten-day basketball tour in Europe. The team went 6-0 for the tour. Ingram averaged 9.3 point per game, made 59% of his field goal attempts, and made 78% of his free throws. "Jack did a good job for us," said Lowery. "He can shoot a three-point shot very well for a big guy."

ECE professor is wafer “matchmaker”

By Jamie Hutchinson

Years ago, ECE Professor Kuang C. (“KC”) Hsieh was doing experiments aimed at understanding gallium arsenide crystal growth. He learned that a temperature of 600° C was just right for coaxing the vaporized species to deposit themselves on a substrate in the well-ordered, single-crystal form prized by semiconductor device engineers. A little cooler, and you still got a single crystal, but with inferior electrical and optical properties. Cooler still, and you got a gallium-arsenide polycrystal—solid, but with a jumble of crystalline chunks oriented at odds to one another. Cooler than that, and you got amorphous gallium arsenide.

With no discernible structure whatsoever, the amorphous solid seemed electronically useless. And yet, out of it certain ideas began to crystallize. Now, Hsieh has applied for a patent on a technology he calls “amorphous wafer bonding,” which he believes will alleviate some of the difficulties involved in the traditional mode of wafer bonding—called direct wafer bonding—used in heterostructure device fabrication.

One such issue is “lattice matching,” or aligning the crystal structures of different materials. Vertical cavity surface-emitting lasers (VCSELs), for example, currently require lattice-matched crystal layers for both the active region and the reflecting mirrors. But if the mirror layers of gallium arsenide and aluminum arsenide are made with Hsieh’s low-temperature process, there are no lattices to match, and the problem disappears. What’s more, Hsieh’s process retains the ability to selectively oxidize



Members of Hsieh’s research group in the Micro and Nanotechnology Laboratory, clockwise from top left: graduate student Frank Shi, Hsieh, graduate student Chaofeng Xu, and postdoc Kuo-Lih Chang. Undergraduate members of the group are Michal Bulkowski, Ethan Byrd, Suneil Hosmane, and Michael Liu—all ECE seniors.

the aluminum arsenide layer. Selective oxidation, developed by Hsieh’s Micro and Nanotechnology Lab colleague Nick Holonyak, allows engineers to build the current apertures that are integral to VCSELs.

“While we were doing that study,” recalled Hsieh, “we noticed that the aluminum arsenide oxidized completely, but the amorphous gallium arsenide actually started to crystallize at about 300 °C, becoming polycrystalline.” That led to the realization that an amorphous layer could make a great adhesive. (The crystallizing process is much like what happens with common glue, only without the phase change from liquid to solid.)

The adhesive idea was especially attractive for another big advantage it offered over direct wafer bonding: low

temperature. Direct wafer bonding requires such high temperatures that delicate components within wafers, such as quantum wells and doped regions, can be damaged. Hsieh’s new adhesive can eliminate that hazard, leading to increased yields for manufacturers.

A potential application for the amorphous adhesive layer is a device such as Hewlett-Packard’s high brightness LED, developed by Illinois alumni George Craford and Fred Kish. HP’s high brightness LED improves on common LEDs by incorporating—through direct wafer bonding—a transparent substrate that doesn’t absorb any emitted light. Hsieh’s adhesive layer is more light absorbent than a transparent substrate, but it can be made so thin that the difference is almost negligible. And it offers the advantages of low temperature and easy alignment.

Hsieh’s technology could ease the manufacture of next-generation “systems on chips,” which will require delicate integration of disparate components. Examples of such systems are those being developed in ECE Professor Norman Cheng’s Bio-Opto-Electronic Sensor Systems project.

Future high-speed devices based on gallium antimonide, which has created a buzz in the semiconductor community, could also benefit from low-temperature bonding. Current gallium antimonide prototypes show good speed but poor efficiency because the substrates leak even at room temperature.

“Every project, we learn—and then

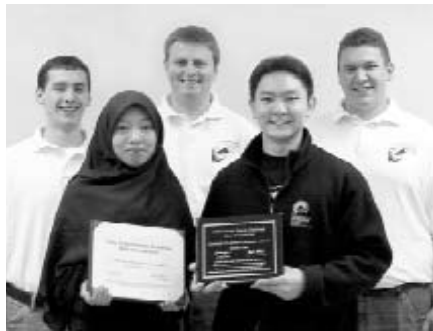
Student team wins second place in Future Energy Challenge

By Tom Moone

On May 20, 2003, six ECE students, along with ECE Professor Philip Krein, Assistant Professor Pat Chapman, and Research Engineer Jonathan Kimball, arrived in Raleigh, NC, to present their team's project for the 2003 Future Energy Challenge (FEC). Under the theme of "Energy Challenge in the Home," student engineering teams from around the world worked to create innovative designs that demonstrated dramatic reductions in residential energy consumption. The goal of the final project was to have an adjustable-speed motor and controller that had a final cost of \$40 while increasing energy efficiency over currently used motor designs.

This team project was organized through the ECE Department and through the Grainger Center for Electric Machinery and Electromechanics (CEME). The CEME was established in 1999 with funds from The Grainger Foundation Inc. CEME is dedicated to enhancing education, technology, understanding, and research activities on the fundamental topic of electric machinery. A competition such as the Future Energy Challenge fits very well within the mission of CEME. "It is a great way to engage undergraduate students in energy-related research and development," said Krein, who is the director of CEME. The project operated as an advanced design course, ECE 371 FEC.

The innovative changes to motors that the FEC required are the types of innovations that CEME is also working on. "We are really trying to focus on things that will change the way we



The Illinois entry into the Future Energy Challenge resulted in two awards. In the front are Maszatul Mustafa (left), holding the award for Best Technical Presentation, and Ryan Cheng, holding the award for Second Place overall. In the back (left to right) are Brett Nee, Marco Amrhein, and Jason Wells. Other students involved, but not pictured, were Dane Barhoover, Adam Klinkner, Matt Pagendarm, Ed Sim, Eric Wild, and Mark Wu.

think about motors and about the use of electrical energy," said Krein. The basic design of most motors has not changed much since 1950, primarily because basic motor designs were designed well. But today, materials and industrial processes unknown in the 1950s provide an opportunity to redesign motors for efficiency. The FEC competition was one way to get students to start thinking about these newly available materials and processes.

The combination of size constraints and efficiency was challenging for the students. "The small motor is particularly challenging to make efficient," said Chapman, associate director of CEME. The teams all had the same dimension and weight limitations for their motors.

According to graduate student Jason Wells, the size of the motor would

be something the team would like to change if they had the choice of it.

The competition was full of challenges right up to the very end. Just a day before the motor was to be shipped for judging, the group was waiting for some final parts. "Due to different lead times with different companies we didn't get everything in at the same time we wanted, so we were kind of down to the wire on that," said Brett Nee, who is now a graduate student.

Results from the competition were announced in October 2003 at the IEEE Industry Applications Society Annual Meeting. The Illinois team won the award for best technical presentation and placed second overall. "[Our] team was the only team to perform a complete, comprehensive design and fabrication," said Krein.

Though the hardware had limited function due to the difficult packaging challenge and the difference between the testing laboratory and the end use in the home, Krein was pleased with the team's results. "The Illinois team dominated in many aspects, and received strong encouragement from the team of expert judges," said Krein. "The second place award, along with special recognition for excellence in engineering presentation, represents a significant achievement."

And Krein wants to encourage more students to build on the achievements made by this team. Already a weekly meeting has been organized to prepare a team for the recently announced 2005

A supreme Illinois invention: Frequency independent antennas

By Jamie Hutchinson



Cleve Nash



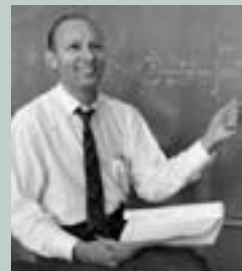
Vic Rumsey



Raymond DuHamel



Georges Deschamps



Bob Hansen



Nate Scarpelli

With 40 years experience as a patent attorney, Nate Scarpelli (BSEE '58) has seen a lot of inventions. But there's only one upon which he looks back and says, "If I ever saw an invention, that was an invention." Scarpelli refers to the log-periodic dipole antenna (LPD), first built in 1958 by Dwight Isbell, an undergraduate researcher in the ECE Antenna Laboratory. By the time Isbell's LPD patent was issued in 1965, every commercial electronics company in the United States knew that the LPD with its simple design, economy of materials, and broadband operation, was ideally suited for color television reception. The University of Illinois licked its chops at the thought of big royalties from the LPD and related patents.

That those royalties never materialized is not the fault of the Illinois antenna technology. Indeed, antenna engineers still recognize the LPD as one of the major design advances since Hertz's simple dipoles and loops in the 1880s. And the LPD is only the most salient of several innovative broadband antennas to come out of ECE's Antenna Laboratory between the end of World War II and 1971, when it was renamed the Electromagnetics Lab.

What happened was that the Antenna Lab established not only many venerable precedents in the world of antennas, but also one unlucky precedent in the world of patent law, thanks to a

surprise ruling by the Supreme Court. Here is the story.

The Ohio boys go west

The military need for radar, direction finding, communications, and countermeasures during World War II created a boom in electromagnetics research as engineers pursued higher frequencies and greater bandwidth in these applications. Thanks to William L. Everitt, who headed the Illinois EE department

from 1945 until 1949 when he became engineering dean, our department capitalized on the boom, assembling an extraordinarily creative group of antenna researchers during and after his tenure as head. Everitt's old student from Ohio State, antenna specialist Edward C. Jordan, had also joined the department staff after the war and organized the Antenna Lab. When Jordan became head in 1954, he brought in another antenna researcher from Ohio State, Victor H.



Rumsey, to serve as lab director.

While at Ohio State, Rumsey had worked on antennas for high-speed military aircraft, an objective that also occupied Illinois researchers upon his arrival in Urbana. Jordan had developed the “partial sleeve” antenna, a precursor to today’s popular patch antennas, and Richard Becker (MSEE ’54, PhD ’59) had come even closer to the patch with the U-shaped slot, essentially a short-circuited patch. Bob Hansen (MSEE ’50, PhD ’55) worked with Jordan on arrays of ferrite loops used for direction finding, and Hansen did some of the earliest sophisticated electromagnetics simulations on computer using the ILLIAC. Spirals, a configuration Rumsey would eventually seize upon, were not unknown at Illinois; Hansen recalls a variety of three-dimensional experimental designs, including spirals, on the shelves when he arrived at the lab in 1949—work he attributes to Martin Chase and Cleve Nash. And Rumsey was aware of Edward Turner’s work with spiral designs at Wright Field in Ohio during the period.

A declaration of independence
What Rumsey brought to Illinois that was not here before was the idea of frequency independence. In 1954, most antenna engineers assumed that the only way to change the operating frequency of an antenna was to change its size. In other words, antenna size was held to be dependent on frequency. Rumsey theorized that an antenna defined entirely by angles rather than lengths could operate at any frequency. He knew that if you doubled the size of an antenna along with its operating wavelength (thereby halving the frequency), then the radiation pattern and other operating characteristics remained the same. Therefore, Rumsey reasoned,

an antenna defined by angles should operate continuously for all frequencies because it encompassed all lengths. Furthermore, if radiation was confined to an “active region” of the device, that region should vary according to the particular frequency applied. The problem then lay in finding an angle for which antenna operation remained continuous even when the structure was truncated; after all, in theory structures defined by angles extend to infinity, but no real world antenna can do so.

“So we asked: Can you make a structure that combines both the angular concept and the spiral concept?” recalled John Dyson (MSEE ’50, PhD ’57), then a graduate student who became Rumsey’s advisee and would join the Antenna Lab staff after earning his PhD. A logical geometry to investigate was the equiangular spiral—so called because the angle formed by the radius vector and the tangent is the same for every point along the spiral. An equiangular spiral retains its contour as it expands.

Dyson’s 1957 dissertation reported “the first antenna to exhibit, in a practical size, the characteristics associated with an infinite structure.” His equiangular spiral antenna consisted of two identical curves with a common origin, each rotated at an angle with respect to the other (see picture on p. 13). Until Dyson’s antenna, broadband had been understood to mean a frequency range of about an octave, or a ratio of 2:1. Dyson’s antenna operated efficiently over more than ten times that range and offered the promise of more to come. Sure enough, the equiangular spiral was just the beginning.

From continuous to periodic
Raymond DuHamel, a professor in the Antenna Lab who had finished his PhD



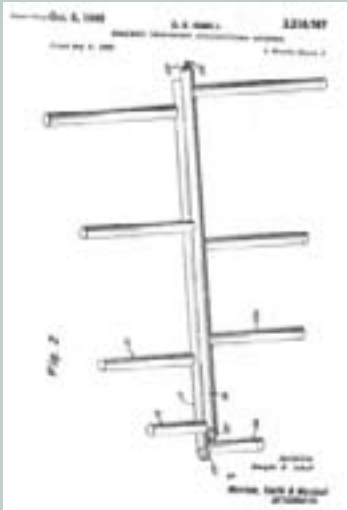
Diagram of DuHamel’s toothed bowtie design.



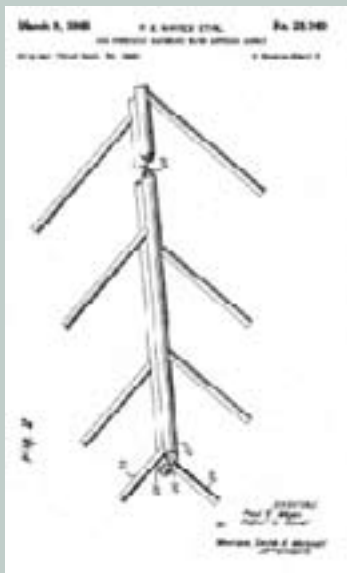
Conical spiral antenna.



Spiral antenna wrapped around spherical satellite.



Patent drawing of Isbell's LPD.



Patent drawing of Mayes and Carrel's resonant-V.

just before Rumsey's arrival, set about testing periodic, rather than continuous structures. With his "toothed bowtie" antenna shown at right, DuHamel substituted discontinuous, self-complementary, wedged arcs for Dyson's continuous spiral. The new device was essentially frequency-independent, but was not continuously so: its operating characteristics—impedance, radiation pattern, and polarization, etc.—repeated themselves at a period equal to the logarithm of the constant ratio governing the spacing of successive teeth. Therefore, the structure was called "log-periodic," and Rumsey referred to it and other periodic structures as "quasi frequency independent."

Being planar, both the spiral and the toothed bowtie (in addition to other DuHamel designs employing trapezoidal "teeth" and triangular "fins") radiated bidirectionally, with beams emanating from both sides of the plane. Rumsey, Dyson, DuHamel, Isbell, and Paul Mayes (who had joined the faculty the same year as Rumsey) sought to enhance the structures' utility by making them unidirectional. Mayes suggested that Isbell try a V shape for a toothed antenna, thinking that it might radiate hornlike out the big end of the V. Isbell tried it and found that the V indeed radiated unidirectionally; however, to everyone's surprise, it radiated from the small end, in what came to be called "backfire mode." A folded, V-type version of the toothed bowtie gave the same result. In a later discussion with Dyson about spirals, Mayes suggested achieving unidirectionality through an analogous revision of that geometry: wrapping the spiral around the surface of a cone (see picture on p. 9). Again, the idea worked, and the conical spiral radiated in backfire mode from the apex.

Dyson's cones found wider use than the planar spirals, primarily in military

and space applications where users could now focus all of an antenna's energy in a desired direction. ECE and astronomy professor George Swenson used conical log-spirals designed by Dyson as reflector feeds for his 600-foot-long by 400-foot-wide radio telescope, excavated within a streambed near Danville, IL, which catalogued cosmic radio sources from 1959 until 1969. Arrays of conical log-spirals found use in radio direction finding. And when wrapped around a sphere, Dyson's spiral served NASA as an antenna on one of the earliest satellites (see p.9).

Work continued on periodic structures. Isbell designed a triangular log-periodic element for Harold Webb's famous "moon-bounce" antenna atop Everitt Laboratory, then called the Electrical Engineering Building (see photo on p.8). DuHamel demonstrated that toothed and fin geometries could be modified as outline structures, built completely of wire rather than sheets (see photo on p.11). Dyson adapted this idea to his cones, fashioning the spirals out of wire rather than sheets, which had required chemical etching. Wire construction simplified the fabrication of both spiral and periodic devices, and it helped extend the range of applications of the periodic antennas down into the high-frequency band. Commercial applications, namely television and radio, were now at hand.

From element to array

Whereas all the log-periodic designs to date had consisted of a single composite element, Isbell's LDP was an array of elements and so could make use of array techniques for increasing directive gain (see drawing at left). What's more, the dipoles comprising the LPD were conventional, easily assembled elements, and the concepts surrounding their design and operation were familiar to engineers



Early commercial version of a wire outline, log-periodic, triangular toothed array.

Isbell's contribution was to apply to an array of dipoles the basic principles of frequency independence developed by Rumsey and Dyson, as well as the log-periodic advances of DuHamel. A major difference between the composite structures and the LPD was Isbell's method of feeding the antenna in order to achieve backfire radiation, now understood to be necessary for log-periodic structures. Isbell transposed the feeder line for adjacent elements, causing them to resonate with the necessary phasing for backfire mode operation. This way, Rumsey's scaling requirement was met as the active area of the antenna expanded away from the apex with increasing wavelength, and bigger elements toward the back of the array did not interfere with the radiation pattern at higher frequencies because they were out of the field.

Mayes and Robert Carrel refined Isbell's LPD with their "resonant-V" array (see drawing on p.10). The V-shaped ele-

ments could be reused at increasing frequencies as they resonated at different "modes," or proportions of wavelength ($1/2, 3/2, 5/2, 7/2$, etc.), and directive gain increased with higher modes. The result was a simple and efficient structure, easily built and modified, that could outperform Isbell's LPD for a few discrete, wide-frequency VHF bands. The year was 1959. Can you say color TV?

A conflict of circuits

"The amazing thing to me about them is I can travel in almost any state in the United States and I can see these antennas on rooftops still," says Mayes of the resonant-V. Through the University of Illinois Foundation (UIF), in the early 1960s the U of I had patented the Isbell and Mayes-Carrel designs and licensed them as a package exclusively to JFD electronics in New York. But most of the Illinois technology springing up on rooftops across the U.S. did not bear the

JFD label; rather, it was made and sold by electronics companies like Finney, Winegard, Blonder-Tongue Labs, Channel Master, Jerrold, and Gavin—all of whom UIF sued between 1965 and 1967. These infringements not only cut into potential royalties for the university, but also reduced the value to JFD of the Illinois license; therefore, the contract between UIF and JFD required the university to defend its patents against infringers. UIF's attorneys, Merriam Smith & Marshall of Chicago (Scarpelli's firm), decided to focus on the Isbell LPD patent because it was fundamental to the Mayes-Carrel resonant-V.

All the cases except Winegard (which had no place of business in Illinois) were filed in the Northern District of Illinois in Chicago. UIF sued Winegard in the Southern District of Iowa, and because of the backlog in the Illinois court, the Winegard case came to trial first. The Iowa judge ruled the Isbell patent invalid, agreeing with Winegard's argument that the LPD was no more than a set of known devices (dipoles) arranged according to a known principle (log-periodicity). In this view, the LPD did not meet the standard of patentability for a new invention as defined by the U.S. Code—namely, that the invention be "nonobvious" to a person with ordinary skill in the art. The Iowa decision was upheld on appeal by the U.S. Court of Appeals for the Eighth Circuit.

The first case to come to trial in Chicago was UIF v. Blonder-Tongue Labs, and here the judge's opinion in favor of UIF was upheld on appeal by the U.S. Court of Appeals for the Seventh Circuit.

Scarpelli recalls two factors upon which the conflicting Illinois and Iowa district decisions hinged. One was the interpretation of Jasik's Antenna Engineering Handbook, which explained that the principles of log-periodic frequency

Continued on next page



Dwight Isbell (left) and Paul Mayes discuss the feed point of a planar, log-periodic, triangular toothed array (c. 1957).

independence do not predict successful designs for dipole arrays; therefore, trial-and-error experimentation is a necessary part of the LPD design process. The Iowa district and appellate courts felt the handbook supported Winegard's claim that the LPD was obvious: anyone could test design after design until coming up with one that works. But the Illinois court interpreted the handbook as support for UIF's claim that the patent was nonobvious: How could the LPD be obvious if established principles of antenna engineering offered only partial guidance in its design? The difference of opinion underscored the subjectivity of the "nonobvious" standard in patent law.

The other factor in the divergence of opinions was DuHamel's powerful testimony in the Illinois district and appellate courts, while he was not called to testify in Iowa. DuHamel, who by then

had left Illinois for Collins Radio and was a recognized major authority on log-periodic antennas, testified that "the design principles which we were working on did not make this an obvious result." He admitted, "I was quite surprised at the simplicity of the structure, and my pride was a little hurt in that I had not thought of it first." Another factor working against UIF in the Iowa circuit was something the foundation's attorney's could not recognize at the time. Isbell's LPD would be one of the earliest in a long string of patent invalidations handed down by that court. Scarpelli says the Eighth Circuit became known as a "death knell" for patents, in contrast to the patent-friendly Seventh. From the very beginning, then, the stage had been set for what litigators call a "conflict of circuits"—and for a showdown in the Supreme Court.

Another supreme invention: The Blond-

er-Tongue doctrine

UIF's attorneys were optimistic given the patent litigation procedures that operated in 1970, when the Supreme Court agreed to resolve the conflict of circuits. Under the precedent of *Triplett v. Lowe*, established by the Supreme Court in 1936, the Seventh Circuit's opinion in the Winegard case carried no special weight by virtue of its being handed down 16 months earlier than the Eighth Circuit opinion in *Blonder-Tongue*. *Triplett v. Lowe* established that even if a court had ruled in favor of one defendant, the patent holder could sue other defendants for infringement of the same patent. Neither UIF nor *Blonder-Tongue* questioned this precedent going into the Supreme Court trial in January 1971. But the Court under Chief Justice Warren Burger was seeking to break the logjam of patent cases in the lower courts, and it asked the attorneys on both sides to brief the court on *Triplett v. Lowe*. Recalls Scarpelli: "Once we saw that, we knew—you could pretty well tell the Supreme Court has got something up their sleeve."

Justice Byron White's opinion, delivered in May 1971 for a unanimous Court, did not address the validity of the Isbell patent. The Court simply ruled that the precedent of *Triplet v. Lowe* was unsustainable. In the interest of "judicial economy," patent holders were now barred from defending patents that had been previously ruled invalid. The new precedent, called the *Blonder-Tongue* doctrine, governs patent litigation to this day, and since it was handed down anyone who wishes to make, use, and sell LPDs has been free to do so without a license from the University of Illinois.

Frequency independence lives on

In retrospect, it's clear things would have turned out much better for U of I if one of

Continued on next page

the Chicago cases had come to trial earlier—that is, ironically, if the very logjam Blonder-Tongue had been established to solve (at U of I's expense) had not existed in the first place. And Scarpelli believes that the Court of Appeals for the Federal Circuit, established since the Blonder-Tongue case, with its more technically savvy judges and pro-patent bias, would uphold the LPD patent if presented with the same conflict of district opinions today. (The circuit courts no longer handle patent appeals.)

Illinois did reap the well-deserved reward of its reputation as the foremost antenna laboratory in the world, continuing to attract top-notch researchers who would guide its transformation into the Electromagnetics Laboratory and Center for Computational Electromagnetics. (Rumsey left U of I in 1957, and Georges Deschamps succeeded him as director from 1958 to 1982.) Meanwhile,



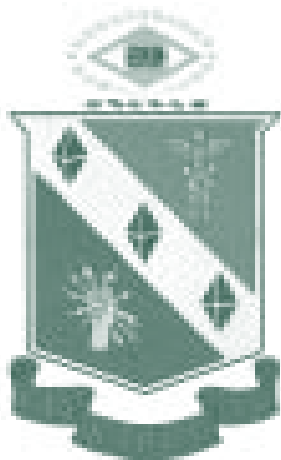
John Dyson in 2003 holding one of his early planar spiral antennas.

though cable has displaced antennas in the world of TV, mobile and wireless communications—with their limitless



Paul Mayes in 2003 with a prototype of his current project, a log-periodic monopole consisting of nested conical radiators over a ground plane. Mayes' antenna draws on longstanding log-periodic principles in meeting today's demand for broadband, electrically small antennas.

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Holonyak wins coveted prize for invention

By Laura Schmitt

ECE Professor Nick Holonyak Jr. received the 2004 Lemelson-MIT Prize April 23 at a black-tie ceremony held at the National Academy of Sciences in Washington, DC. The \$500,000 award is the world's largest single cash prize for invention. It is awarded annually to an individual who demonstrates remarkable inventiveness and creativity, and a proven commitment to inspiring others.

Among his other inventions and discoveries, Holonyak developed the first practical light-emitting diode in 1962. Today, these long-lasting, low-heat light sources illuminate everything from alarm clocks to the NASDAQ billboard in New York's Times Square. LEDs produce more lumens per watt than both incandescent and halogen lighting sources, making them more environmentally friendly and cost effective. The LED's long life span (about 10 times longer than an incandescent bulb) makes it ideal for use in automotive dashboards and taillights, traffic signals and consumer electronics.

"This year's prize recipient has created literally one of the most visible inventions ever," said MIT School of Engineering Dean Thomas Magnanti in his introduction of Holonyak at the ceremony. "He is, in a sense, the Thomas Edison of our times. Inventing LEDs by itself would be prizable, but there's much more."

Magnanti continued: "At GE, he invented the short emitter p-n-p-n switch, which is widely used in household dimmer switches and power tools. He demonstrated the first quantum-well laser, which is instrumental in fiber optic communications. He also intro-



Photo by Jeff Tinsley

Nick Holonyak Jr. addresses the audience at the National Academy of Sciences auditorium after receiving the 2004 Lemelson-MIT Prize for invention. "In kindergarten, or about that level, my dad handed me a pocket knife and he said: 'Now start making what you want,'" Holonyak said, recalling how his inventive creativity started.

duced an innovation that led to more reliable lasers now used in DVD players and CD-ROM drives. And the beat goes on... He continues to pass the inventive torch, mentoring more than 60 doctoral students—many of whom formed their own technology companies and are industry leaders."

The son of Slavic immigrants who settled in Southern Illinois, Holonyak (BSEE '50, MSEE '51, PhD '54) was the first graduate student of two-time Nobel laureate John Bardeen, a professor who invented the transistor. An early researcher in semiconductor electronics, Holonyak gained eminence through his numerous inventions and contributions to advances in semiconductor materials and devices.

"It's always a shock to get an award," Holonyak said in his acceptance speech. "But it is a really big shock to get something like the Lemelson-MIT Prize and to be designated in a different way—that

you're an inventor of some kind. Thanks to the Lemelson family and what it did...and thanks to MIT for focusing and building the Lemelson program and creating something like the Lemelson Prize and using that to show the world what the significances of invention are."

Holonyak went on to extend his thanks to some special people in his life. "Next year, my wife and I will have been married for 50 years," he said. "I can't think of living without her, so she has helped me the most. My parents would be terribly honored to know that something like this is occurring to their son, who started in a place where getting a living was a difficult thing."

He added: "John Bardeen, if he were alive today, would have a big smile. ... He would be very pleased with what we're doing today in the transistor world."

One of America's most prolific inventors, Jerome H. Lemelson (1923-1997), and his wife, Dorothy, established the Lemelson-MIT Program at the Massachusetts Institute of Technology in 1994. It is funded by The Lemelson Foundation, a private philanthropy committed to honoring the contributions of inventors, innovators and entrepreneurs, and to inspiring ingenuity in others.

Previous Lemelson-MIT Prize winners include: Raymond Kurzweil, inventor of the first reading machine for the blind; Thomas Fogarty, inventor of a revolutionary balloon catheter for removing blood clots in patients; and Carver Mead, who did pioneering work on the very large-scale integration (VLSI) design for complex circuitry at the microscopic level and an amplifying device known as the high electron mobility transistor (HEMT), which is used in microwave communications and is also an integral

College sponsors cyber security forum

By Tom Moone

The University of Illinois is rightfully recognized as a major technological presence in the Midwest. For one day last fall, the U of I was a major technological presence on the West Coast, as well. On October 27, the College of Engineering sponsored "Cyber Security: A Dialog on Policy and Technology" at the Tech Museum in San Jose, CA.

John Bourgoin (BSEE '68), CEO and President of MIPS Technologies, worked closely with the College of Engineering to ensure a successful event. In addition to helping underwrite the event, Bourgoin was instrumental in locating the venue.

Bourgoin also worked with Admiral Archie Clemins, U.S. Navy (retired) (BSEE '66, MSEE '72), and Department of Computer Science Head Marc Snir to serve as moderators for the event and develop the list of questions presented to the panelists.

The keynote address was presented by Richard Wilhelm, vice president of Booz Allen Hamilton and a recognized expert in the information and homeland security domain. Wilhelm encapsulated the problem facing the panelists at the forum: "Nearly every aspect of our lives relies on cyberspace," said Wilhelm, "providing malicious actors with a nearly unlimited number of targets. At the same time, the knowledge and resources necessary for cyber attacks have, just since the mid-1990s, gone from esoteric to commonplace."

As dependence on cyberspace increases, so does the vulnerability to security problems related to cyberspace. "There is no such thing as a safety net in cyberspace," he said.

The panel brought together many distinguished experts in the field of cyber security: Bob Blakley, chief scientist, security and privacy for IBM; Brad Boston, senior vice president and chief information officer for Cisco Systems; Bill Sayles, director of Global Engineering Information Technology for Intel; Steve Lipner, director of security engineering strategy for Microsoft; Shane Robison, executive vice president and

answer was achieved in the discussions (nor were such answers expected), the panelists provided insights into these questions from their own professional experience.

Those who attended the event also found it informative and worthwhile. Shawn Carolan (BSEE '96, MSEE '97), an associate at Menlo Ventures, was one of the many alumni who attended. "I really enjoyed the event" he said. "I think they



chief strategy and technology officer for Hewlett-Packard; and John Stammreich, vice president of homeland security for The Boeing Company.

The questions that the panelists discussed included: What do we mean when we say cyber security? What should be the measurements of risk? What technology will make cyber security more difficult in the future? Can security and privacy work together? Though no final

did an exceptional job choosing the panel. It was the right mix of people to draw out the major concerns and opportunities for innovation in the industry." Sreekanth Ravi (BSEE '87) also found much to praise about the event. "It was very topical, so it gained quick traction." In particular, Ravi found the opening reception a useful event. "The networking portion before the start of

Coleman invested as first Intel Alumni Endowed

By Erin Lukehart

At a ceremony on September 19, 2003, ECE Professor James Coleman was invested as the first Intel Alumni Endowed Chair in Electrical and Computer Engineering. The chair signals a growing partnership between ECE and Intel—already, a number of ECE alumni have established successful careers at Intel, and Intel has donated equipment to ECE's Integrated Circuit Fabrication Laboratory.

As Intel's senior sponsor for the University of Illinois, ECE alumnus Mark Bohr (MSEE '78) approached the College of Engineering's development office a few years ago with the idea for the endowed chair. Bohr, Intel's director of Process Architecture and Integration, then gathered support from other ECE alumni working at Intel.

In addition to Mark and Jean Bohr, other major contributors included Jerry (BSEE '73, MSEE '76, PhD '78) and Michelle Marcyk, Carl (BSEE '74) and Patricia Simonsen, Alan (MS-physics '75, PhD '79) and Carole Stivers, Leo (PhD '69) and Bella Yau, and Intel cofounder Gordon Moore and his wife Betty. The chair was created to recruit or retain a top researcher in integrated circuit technology within the department.

At the investiture ceremony, Vice President for Academic Affairs and ECE Professor Chet Gardner praised Coleman's years of dedication as a faculty member and researcher. Pointing out that Coleman had just been invested as the Franklin W. Woeltge chair in February 2002, Gardner said, "Those of us who know Jim are not surprised that he is being honored again so soon."

An alumnus of ECE, Coleman (BSEE



Intel Senior Fellow Mark Bohr (left) and retired Intel Fellow Leo Yau (right) are pictured with ECE Professor Jim Coleman following the investiture ceremony September 19, 2003. Bohr and Yau were among the Intel employees who contributed to the Intel Alumni Endowed Chair in Electrical and Computer Engineering.

Photo by Thompson-McClellan

'72, MSEE '73, PhD '75) worked as a member of the technical staff at Bell Laboratories from 1976 to 1978, developing high-performance lasers for early fiber-optic telecommunications systems.

From 1978 to 1982 Coleman worked for Rockwell International, where he demonstrated the first $Al_xGa_{1-x}As$ -GaAs self-aligned laser structure, which is presently used in commercial compact disc lasers and high-power lasers for optical storage and medical applications. "The next time you make a long distance phone call, or you listen to a music CD, or watch a DVD, you can think of Jim because he helped make that possible," said Gardner.

Coleman joined the ECE faculty in 1982. He is a fellow of the American Physical Society, American Association for the

Advancement of Science, Optical Society of America, and IEEE.

Among his awards are the William Steifer Scientific Achievement Award, the IEEE Lasers and Electro-Optics Society Award for pioneering research in high-reliability strained-layer semiconductor lasers, and the IEEE LEOS Distinguished Lecturer honor.

While highlighting these achievements, Gardner praised Coleman as "a scholarly inspiration to us all in ECE." He added, "Jim's varied interests and sense of humor make him enjoyable to be around, but what I admire most is his ability to be a world-class researcher, teacher, and still have significant time for his family and community." Among other activities, Coleman has coached volleyball for his children and he serves on the Monticello Board of Education.

Coleman's current work focuses on the development of III-V semiconductor lasers and photonic devices grown by metalorganic chemical vapor deposition (MOCVD). He and his students are studying quantum dots, quantum-well heterostructures, and low threshold and high power single mode index guided lasers and arrays.

In his acceptance speech, Coleman described the Intel culture as one of challenge and support, and promised to "accept the unspoken challenge" handed to him in receiving this endowed chair.

Helm Memorial

View the memorial celebration honoring Stan Helm from April 4, 2003.

www.ece.uiuc.edu/alumni/memorials/helm.html

Hwu invested as first Sanders–AMD endowed chair

By Laura Schmitt

ECE Professor Wen-mei Hwu was invested as the first W.J. “Jerry” Sanders III–Advanced Micro Devices Endowed Chair in Electrical & Computer Engineering (ECE) at a ceremony March 11, 2004, on campus. An endowed chair is the highest honor bestowed on university faculty.

AMD, a leading designer and producer of microprocessors, Flash memory devices, and system-on-chip solutions, provided the \$2.5 million donation to create the chair. Sanders co-founded AMD and served as chairman and chief executive officer of the company for 33 years from its inception until his retirement as CEO in 2002. He is a University of Illinois alumnus, earning his bachelor’s degree in electrical engineering in 1958.

“It is a privilege to further the educational excellence of my alma mater, honoring one of the nation’s best educators, and creating a lasting legacy of innovation and competition,” said Sanders. “Professor Hwu has demonstrated throughout his career a dedication to his students and a commitment to the advancement of technology that makes him the ideal first recipient of this chair.”

An expert in computer architecture and compilers, Hwu directs the Illinois Microarchitecture Project using Advanced Compiler Technology (IMPACT) research group. IMPACT provides architecture expertise and compiler prototypes for the microprocessor industry. He is best known for his contribution to the development of instruction-level parallel processing techniques that have



photo by Thompson-McClellan

AMD cofounder Jerry Sanders (left) talks with Wen-mei Hwu following the investiture ceremony March 11, 2004.

been adopted into many of today’s microprocessor products.

“The endowed chair is a tremendous gift from AMD to the University of Illinois, honoring Mr. Sanders,” said Professor Hwu. “It will greatly impact the education and research achievements of this institution for many generations to come. I am grateful that my colleagues selected me as the first steward of this magnificent gift, and I intend to leverage this resource to pursue educational and technological advancements important to the semiconductor industry.”

The endowed chair is the latest AMD gift in support of Illinois engineering. The company sponsors major computing research projects emphasizing binary code and run-time optimization. AMD has also sponsored the Jerry Sanders Creative Design Competition at the College’s annual Engineering Open House since

the late 1980s. Students from Illinois and other engineering schools design and build robotic vehicles that compete against each other in the contest.

“This chair represents one more step in the growing relationship between AMD and the ECE department,” said ECE Head Richard Blahut. “We hope to continue to help them grow their company and the industry, as we provide them our outstanding graduates as new employ-

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ECE faculty honored with professorships

By Laura Schmitt



Ilesanmi Adesida



William O'Brien



Narayana Rao



Jean-Pierre Leburton



Ben Wah

This spring, five ECE faculty members were invested as named professors—one of the highest honors bestowed on university faculty. In all, 22 ECE faculty now hold chairs or professorships (see www.ece.uiuc.edu/faculty/chairs.html for a complete list). These positions bring with them prestige and monetary reward, which faculty can use to augment their salary, purchase laboratory and computer equipment, or fund support staff and graduate assistants.

In March, ECE Professors Ilesanmi Adesida and William O'Brien were among the six College of Engineering faculty invested as Donald Biggar Willett Professors in Engineering. Adesida is an expert in the processing of semiconductors and other materials at the nanometer-scale level and in ultra-high-speed heterostructure field-effect transistors—the sort of transistors used in cellphones, fiber communications, deep-space communications, and other applications. His contributions have provided insights into the limits of advanced lithography and other nanofabrication techniques.

O'Brien is an expert on the interaction of ultrasound and biological materials.

His ultrasound bioeffects studies have made diagnostic ultrasound used in obstetrics safer for both mother and baby. His quantitative ultrasound studies have provided significant insights into the information contained in a diagnostic ultrasound image, and have guided the imaging and blood flow capabilities of modern diagnostic ultrasound systems.

The Willett Professorships honor the late Mr. Willett, who attended U of I from 1916 to 1922, leaving the university six credits short of earning his degree in civil engineering. Willett owned a bookkeeping and tax preparation business in Los Angeles. He died in 1981 at the age of 83. Willett bequeathed his gift to Illinois engineering because he admired the college's thriftiness and honesty.

On April 14, three ECE faculty were invested as named professors during a single ceremony. N. Narayana Rao was invested as the first Edward C. Jordan Professor in ECE. A faculty member since 1965, Rao conducted research in the area of ionospheric propagation and authored the textbook "Basic Electromagnetics with Applications" and six

editions of "Elements of Engineering Electromagnetics." He has served as ECE associate head since 1987. Among his many awards are the College of Engineering's Everitt Award for Teaching Excellence and the Campus Award for Excellence in Undergraduate Teaching.

The Jordan Professorship honors the memory of a legendary ECE faculty member and administrator, who led the department to research and education prominence during his 25-year tenure as department head. Jordan also authored or edited nine books, including "Electromagnetic Waves and Radiating Systems," which was first published in 1950 and influenced generations of electrical engineering students. An IEEE Fellow, Jordan was elected to the National Academy of Engineering in 1967 for radio direction finding and antenna research. He died in 1991 at the age of 80.

Jean-Pierre Leburton was invested as the first Gregory Stillman Professor in ECE. Leburton is an expert in semiconductor nano-physics and quantum device simulation. He is well known for his work on the optical properties of quantum structures, particularly for

his theory of the index of superlattice refraction. His research focuses on quantum wires and dots for which he predicted and interpreted a wide range of physical effects with applications in electronics and photonics.

The Stillman Professorship honors the memory of an internationally respected researcher and educator, who served on the ECE faculty for 24 years. As a researcher Greg Stillman (MSEE '65, PhD '67) established evaluation techniques for compound semiconductor materials that are now used universally. As an educator, Stillman guided the doctoral work of more than 40 students and he served as ECE 340 course director for many years. An IEEE Fellow and member of the National Academy of Engineering, Stillman died in 1999. He was 63.

Ben Wah was invested as a Woeltge Endowed Professor of ECE. A faculty member since 1985, Wah conducts research on optimization and search, computer networks, and multimedia signal processing. He pioneered the theory of extended saddle points that is now used worldwide, and he developed the theory's statistical generalization that has been applied to many problems in industry. He is also well known for his work on computers for artificial intelligence processing.

The funding for the Woeltge Professorship was provided by the late Franklin W. Woeltge (BSEE '26), who worked as an engineer in the Avionics and Space Division of Emerson Electric in St. Louis, retiring in 1963. When he died in 1998, Woeltge had no surviving relatives, so he bequeathed a \$4 million gift to ECE

Alumni to receive awards at September banquet

The ECE Alumni Association will present several awards at its annual fall banquet September 24, 2004, at the Grainger Engineering Library and Information Center on campus.

Established in 1999, the ECE Young Alumni Achievement Award is presented to young alumni (less than 40 years old) who have made outstanding professional contributions to their field. A complete list of recipients is available at www.ece.uiuc.edu/alumni/yaaa/yaaa.html. The 2004 recipients are:

Thomas M. Conte (MSEE '88, PhD '92); Professor & Director, Center for Embedded Systems Research, Dept. of Electrical & Computer Engineering, North Carolina State University
Bradford E. Gliner (BSEE '87); Director of Research & Program Manager, Northstar Neuroscience, Inc.

Established in 1970, the ECE Distinguished Alumni Award honors graduates who have made professional and technical contributions that bring distinction to the department and the university. A complete list of recipients is available at www.ece.uiuc.edu/alumni/distinguished/recipients.html. The 2004 recipients are:

A. Michael Andrews, II (PhD '71); Chief Technology Officer, L-3 Communications
Gary S. Brown (BSEE '63, MSEE '64, PhD '67); Professor, Virginia Polytechnic Institute and State University, Bradley Department of Electrical Engineering
John P. Hayes (MSEE '67, PhD '70); Claude E. Shannon Professor of Engineering Science, University of Michigan
Carl C. Wang (BSEE '58, MSEE '59, PhD '64); President, Medical Instrument Development Lab

Named for the longtime ECE staff member, the Marcia Peterman Award honors a former ECE Alumni Association board member for his or her dedicated service as a member of the board. A complete list of recipients is available at www.ece.uiuc.edu/alumni/peterman.html. The 2004 recipient will be named soon.

Engineers receive prestigious university alumni awards

By Erin Lukehart

Larry F. Altenbaumer (BSEE '70), Edward S. Davidson (PhD '68), Daniel W. Dobberpuhl (BSEE '67), Oscar L. Gaddy (PhD '62), Mark Shepherd Jr. (MSEE '47), and William A. Wulf (MSEE '63) received the ECE Distinguished Alumni Award at a banquet September 19 in Champaign. Established 33 years ago, this award recognizes ECE alumni who have made professional and technical contributions that bring distinction to the department and the university.

Altenbaumer, who recently retired, was president and CEO of Illinois Power in Decatur, IL, and executive vice president of regulated energy delivery for Dynegy Inc. He was recognized for his leadership in the electric power industry, his community involvement, and service to the University of Illinois. Altenbaumer was a member of the ECE Alumni Board from 1988 to 2001, serving as president from 1995 to 1998. He received the Orange and Blue Appreciation Award in 2002 for his loyal and dedicated service to the ECE Alumni Association.

A professor emeritus at the University of Michigan, Davidson was honored for his contributions to the design of high-performance computers and the establishment of computer engineering as an academic discipline. His research interests included computer architecture, parallel and pipeline processing, performance modeling, intelligent caches, supercomputing, and application code assessment and tuning. With his graduate students, he developed the reservation table approach to optimum design and cyclic scheduling of pipe-

lines, designed and implemented an eight-microprocessor SMP system in 1976, and developed a variety of systematic methods for computer performance evaluation and enhancement.

Dobberpuhl, president and CEO of start-up company P.A. Semi Inc. in Palo Alto, CA, was recognized for the design and engineering of a new generation of high-speed and low-power microprocessors. While at Digital Equipment Corp., Dobberpuhl started the Palo Alto Design Center, where he led the development of the StrongARM. In 1998, Dobberpuhl left Digital and cofounded SiByte Inc., where he served as president and CEO. There he led the development of the SB1250 chip, a high performance, coherent 64b multiprocessor CPU with high speed I/O, integrated multilevel caches, and 128b high performance DDR memory controller. SiByte was acquired by Broadcom Corp. in December 2000.

A professor emeritus of electrical engineering at Illinois, Gaddy was recognized for three decades of technical contributions and outstanding service in the ECE department. His research interests included gas lasers and subnanosecond response time laser detec-



Photo by Chuck Mercer

tors including special photomultiplier vacuum tubes and thin film infrared detectors. Gaddy also served as a consultant to McDonnell-Douglas in St. Louis, MO, and Varian Associates in Palo Alto, CA. He helped initiate an industrial affiliates program in physical electronics on campus, which attracted several million dollars in support. He also served as associate head of the ECE Department for the graduate and research programs. He later served as faculty coordinator for the ECE Alumni Association and as the department's graduate coordinator until his retirement in 1993.

Shepherd, retired chairman of Texas Instruments, Inc., was honored for his leadership at TI, which helped create and shape the microelectronics industry. As he worked with the development of semiconductors at TI, Shepherd rose rapidly through the ranks and became president in 1967, CEO in 1969, and chairman of the board in 1976, a posi-

Alumni Awards, continued on page 26

Alumnus develops life-saving technology

By Laura Schmitt

Each year about 700,000 Americans suffer a stroke. Nearly 170,000 of them die, making stroke the third leading cause of death behind heart disease and cancer, according to the American Stroke Association. For those who survive, the effects of stroke can be devastating.

Typically striking with little warning, a stroke occurs when a blood vessel that brings oxygen to the brain bursts or is clogged by a blood clot or other particle. Consequently, part of the brain does not get the blood and oxygen it needs. Without oxygen, nerve cells in the affected area of the brain die within minutes, and whatever function those cells controlled—motor activity, senses, speech, ability to understand speech—may be lost forever. In fact, stroke is the leading cause of serious, long-term disability in the United States.

A Seattle company, Northstar Neuroscience Inc., is hoping to change that with the development of the first cortical stimulation technologies for stroke recovery. As director of research at Northstar, ECE alumnus Bradford Gliner (BSEE '87) is leading the scientific program and managing the clinical trials.

Northstar's feasibility clinical trials are focusing on patients whose stroke has impaired their hand movement. Doctors use functional magnetic resonance imaging (fMRI) to pinpoint the part of the brain that controls hand movement in the trial subjects. Next, they surgically implant Northstar's investigational cortical stimulation device. The Northstar electrode is placed over the indicated part of the brain along the dura mater, or protective outer covering of the brain. The electrode lead is then tunneled be-



Alumnus Brad Gliner holds an automatic external defibrillator that he helped develop in the 1990s.

neath the skin to an area just below the collarbone, where it is connected to an implanted neurostimulator—a device similar to a pacemaker—that provides the electrical current to the electrode on the brain.

After a one-week recovery period from the surgery, patients participate in specialized rehabilitation sessions five days each week. The investigational device is turned on during the three-hour sessions, applying a low level of electrical stimulation to the affected part of the brain; it is turned off when the patient finishes his or her therapy.

The electrical impulse is designed to awaken injured but still living brain cells in the area damaged by the stroke. It is believed that these rejuvenated cells then take over for the nonfunctioning area.

To assess the effect of the targeted electrical stimulation, a control group of patients undergo the same rehabilita-

tion activities, but without the delivery of the electrical impulses. Patients randomized to this group do not undergo device implant procedures.

So far, the technology is showing great promise. "Our preliminary results suggest that patients who have had strokes are improving," said Gliner. "In our clinical trials the patients are averaging two years post-stroke. Many patients are able to do things that they hadn't been able to do prior to our therapy. For example, one patient is now able to crochet again. So, although more extensive study is ongoing, our early results are very encouraging and exciting."

Added Gliner: "Theoretically it's a technology that can be applied to brain damage independent of the cause of the damage," he said, referring to people who suffer traumatic brain injury from accidents resulting in physical disabilities. "If proven successful for motor recovery of the hand, then the next logical step would be motor recovery of other parts of the body."

This isn't the first time that Gliner has played a role in introducing such life-altering medical technology. During most of the 1990s, Gliner worked as director of research for a Seattle start-up company that he cofounded called Heartstream Inc. Heartstream developed the world's first portable, automatic external defibrillator (AED). In so doing, Gliner and his colleagues were the first to apply biphasic waveform technology to external defibrillators—up until then AEDs generated their shock in monophasic wave form. Biphasic wave forms, although used in implantable cardio defibrillators,

Gliner, continued on page 39

Albright's best and brightest: An ECE 353 legacy

By Jamie Hutchinson

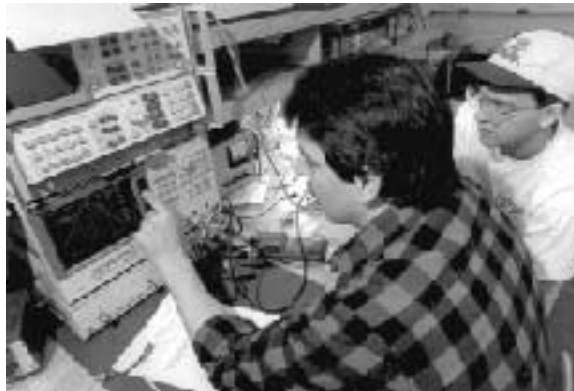
With graduation now behind her, Supriya Gupta (BSEE '04) is a new member of a particularly elite group of alumni: those who have taken ECE 353, Radio Communication Circuits. ECE 353 covers the basic principles of radio frequency (RF) circuit design and gives an overview of how such circuits are used in communication systems.

The heart of the course is a lab in which students design, build, and test a crystal oscillator and RF amplifier. "The biggest lesson for me was that all the theory really does exist in real life," said Gupta, who took the course in Spring 2003. "At the same time," she added, "you learn that nothing is ideal when you build it."

Gupta and other ECE 353 alumni since 1987 credit course director Steve Franke for the value of their experience. As it happens, Franke is himself an ECE 353 alumnus, and his old teacher, William G. Albright, gets similar reviews from alumni who took the course from the 1960s until around 1980.

"You had the feeling he'd really done the stuff he was explaining," said Randy Rhea (BSEE '69) of Albright's down-to-earth approach. Rhea also recalled Albright's genuine interest in students and their careers: "It was like having a father on campus." As for Rhea's career, he went on to found Eagleware, a worldwide supplier of RF and microwave software.

Don Peck (BSEE '72, MSEE '77), another ECE 353 alum from the Albright years, has gone on to great success in industry as manager of micro- and millimeter-wave engineering for Harris Corporation. "He was a practical man—he taught you



Students in this 1993 photo are shown working in the ECE 353 lab in Everitt Laboratory. As in 1993, lab sessions are dedicated to designing, building, and testing a crystal oscillator and orf amplifier using CAD software in addition to equipment such as vector impedance meters, and spectrum and network analyzers. Regular upgrades have kept state-of-the-art software and equipment in the lab.

how to put the equations to work," said Peck, who has recruited many younger 353 alums during his long career as a manager.

Albright's former students include university professors besides Franke who now teach some of the best RF courses offered around the country. Bill Davis (BSEE '69, MSEE '70, PhD '74) is on the faculty at Virginia Tech, and David Hertling (BSEE '70, MSEE '71, PhD '77) is at Georgia Tech. Hertling also collaborates with Rhea on professional development short-courses in RF.

Brian Gilchrist (BSEE '77, MSEE '79), now an electrical engineering professor specializing in RF at Michigan, incorporates the hands-on approach in his course there. Gilchrist recalls of Albright: "He just hated it if you designed a circuit, built it, turned it on for the first time, and it worked. He knew that more learning came from understanding why something didn't work."

Gary Monetti (BSEE '82) said ECE 353 was an "unreal" class that changed his life. He went on to join Sawtek, a supplier of surface acoustic wave (SAW) devices used in cellular communications, as a design engineer before advancing to

company president. Jon Gedymin (BSEE '71, MSEE '81) started out similarly, but then applied his RF skills to sales. He now travels the world selling wireless equipment for Agilent.

After Albright retired, ECE 353 was taught by Ed Mast and later Murray Babcock. Michael O'Mahoney (BSEE '84, MSEE '86) claims Mast was one of the best teachers he ever had. Now an RF hardware designer for Motorola, O'Mahoney also credits much of the course's success to Jay Gooch, who did a lot of teaching in the ECE 353 lab. Ron Boesch (BSEE '85, MSEE '87) took ECE 353 under Babcock, then was recruited by Peck to microwave systems manufacturer Watkins-Johnson. Boesch has since followed Peck to Harris, where he is a manager in the RF group.

Since Franke took over as director, ECE 353 has remained one of the most hands-on, practical, career-savvy courses you can take. And as Franke's contemporary Rick Lober (BSEE '79, MSEE '80) will tell you, shifting trends in the technology industry are unlikely to change that fact. Lober, who now manages the communications and electronics unit at Cubic Corporation, recalls that

ECE 353 legacy, continued on page 35

Floyd Dunn: finding sound uses for sound

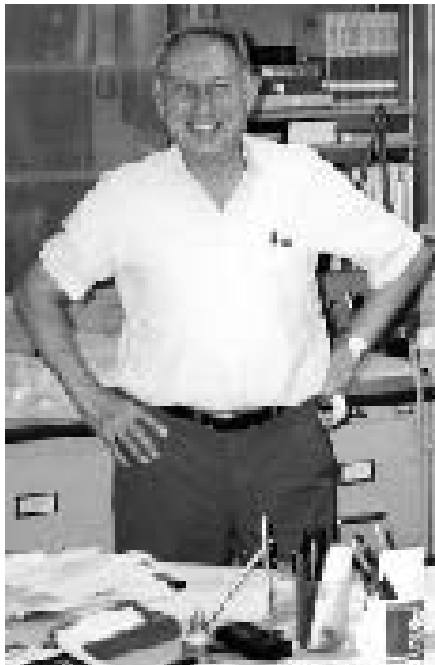
By Tom Moore

"I think that may be the record for the longest continuity," said ECE Professor Emeritus Floyd Dunn (BSEE '49, MSEE '51, PhD '56) about his time at the University of Illinois. He arrived at the university in 1946 to complete his undergraduate education and then stayed on for a master's and PhD. After completing his PhD, he was asked to stay on as a faculty member. He retired from the university in 1995. In all, he spent 50 continuous years at the U of I as a student and faculty member.

Dunn grew up in Kansas City, MO, where he was born in 1924. Prior to being drafted into World War II, Dunn had attended Kansas City Junior College. His physics teacher there spoke highly of Illinois, especially its program in electrical engineering. "He thought they had the best electrical engineering department in the country," said Dunn. "So, when I came out of the army in '46, I applied to the U of I for that reason. And I have to say that he was right."

Upon completion of his bachelor's degree, Dunn was looking around for a graduate program. He was also considering going into industry, having an opportunity to go to Bell Labs. He ended up speaking with Professor William Fry, who had joined the U of I in 1946 and began an ultrasound program that would, among other activities, study the structure of the mammalian central nervous system. Fry's enthusiasm for his research project rubbed off on the young Dunn.

"He was excited about what he was doing," remembered Dunn. "I didn't know anything about it. He made it understandable to me, and it seemed like I would learn much more, faster with him



ECE Professor Emeritus Floyd Dunn stands in his office in the former EE Annex in this photo taken in the early 1990s. Dunn's career at Illinois spanned nearly 50 years.

than I might if I had gone elsewhere."

For his master's thesis project, Dunn designed a double crystal acoustic interferometer, which he then used to analyze the acoustic properties of ammonia gas. Dunn said, "It was a very good educational experience for me from the point of view of having to design something, build and use it, and then come up with some data that no one had ever gotten before."

His PhD dissertation examined the effect of ultrasound on biological systems and endeavored to determine the degree of accuracy that could be attained in making these measurements. Dunn exposed mice 24 hours after birth to 1 MHz ultrasound at a particular point of the spinal column. At a high enough

dose, paralysis would result. If the dose was not high enough, no paralysis resulted. "I showed that you could make very precise measurements if you chose everything correctly," said Dunn.

In 1956 Dunn was asked to join the faculty of the Department of Electrical Engineering. He continued on in the work he had started during his PhD program, examining the ultrasonic properties of tissues. By the mid to late 1950s, ultrasound was becoming a useful medical diagnostic tool. In order for it to be used successfully in medical applications, including surgery, it was necessary to know at what point different tissues began to change as a result of exposure to ultrasound.

"You had to know how one tissue was different from another tissue and also how a pathology, a tumor perhaps, may be different from a normal tissue," said Dunn. "And that's what I set about measuring."

Dunn's research and contributions to his field have led to numerous awards, including the William J. Fry Memorial Award and the Joseph H. Holmes Basic Science Pioneer Award of the AIUM, the AIUM/WFUMB History of Medical Ultrasound Pioneer Award, the IEEE Edison Medal, and the Engineering in Medicine and Biology Society's Career Achievement Award. Dunn is a Fellow of a number of organizations including IEEE and the Acoustics Society of America. He is a member of the National Academy of Sciences and the National Academy of Engineering. He was a U of I Scholar in 1988, and in 1997 he received the ECE Distinguished Alumnus Award. He has also received recognitions in the United

Floyd Dunn, continued on page 26

From Ohm's law to patent law

Alumni attorneys draw on ECE backgrounds

By Jamie Hutchin-

ECE alumni don't need to be told what a successful group of engineers they are. Most alumni know, too, of the prominent entrepreneurs and business executives who hold ECE degrees. But any idea that our alumni accomplishments are limited to those fields is patently false.

ECE alumni also include prominent patent attorneys like Joel Poppen (BSEE '87), director of litigation for Micron Technology, and Larry Nixon (BSEE '65, MSEE '66), a former Alumni Association board member who is cofounder of the Washington DC-based Nixon and Vanderhye, one of the leading patent firms in the U.S. The stories of how ECE alumni ended up practicing patent law, and how their careers have progressed, provide intriguing, alternative examples of life after ECE.

Almost all patent lawyers have some sort of technical degree, and many have worked in a technical field before going to law school. Nate Scarpelli (BSEE '58) had taken a general engineering law course as an undergrad before going to work as a field engineer with Cook Research Labs. He enjoyed his work on top-secret government contracts dealing with radar and countermeasures, but soon started thinking he should do something else. Following the advice of an uncle with a chemical engineering degree who had become a patent lawyer, and remembering how easy the general engineering law course had been, Scarpelli decided he could handle working full time while taking night law classes at De Paul. After graduating four years later, he found himself in the patent law department with Automatic Electric,

a Chicago-based telephone equipment manufacturer. Scarpelli wanted to do more litigation than is typically done by in-house counsel, so by 1965 he was an associate with the firm Merriam Smith & Marshall, where he remained until retirement (the firm is now called Marshall Gerstein).

"I was the only electrical engineer, and that's why initially they gave me cases dealing with the University of Illinois on things like the plasma display panel case and the PLATO case," recalled Scarpelli. He filed the patents for the plasma display and PLATO (see Alumni News, winter 2002-2003), and also got to work on litigation in cases involving UI antenna inventions (see p.8).

Randall Rueth (BSEE '90), an associate at Marshall, found his way to law school in a similar way. Rueth holds a degree in math in addition to ECE and law, and after several years in engineering, consulting, and sales at AT&T, he decided the corporate world didn't offer enough intellectual challenge. "Patent law ... challenges me every day, both technically and legally," said Rueth.

Joe Barich (BSEE '94, MSEE '96) found his path to law school through graduate

study in ECE. Barich's appetite for working with new and diverse technologies—an appetite that was satisfied by ECE's broad-based undergrad curriculum—could not be satisfied by graduate-level study with its requirement of deep and sustained attention to one project. So Barich finished his master's and decided



to go to law school. He is now a partner with the Chicago intellectual property firm of McAndrews Held Malloy, where his appetite is definitely satisfied. "Today, I get to work with satellite technology, wireless communications, network communications, Internet and business method applications, software, semiconductors, and just about everything else ECE-related," said Barich.

Barich works with several other ECE

Patent Law, continued on page 28

Power systems faculty member Pai retires

By Laura Schmitt



An internationally recognized scholar in the area of power system stability, Mangalore Anantha Pai retired from the University of Illinois ECE department in

December 2003, after 22 years on the faculty. Pai joined the department in 1981 when the power program was struggling to survive.

"At that time, the power area was at rock bottom here," Pai said. "Enrollment had dropped down to something like 12 [students] per year. There was a danger that the power program might be phased out."

Pai was recruited to Illinois by ECE Professor Petar Kokotovic, a control system expert. Kokotovic was familiar with Pai's work at the Indian Institute of Technology (IIT) Kanpur campus, where Pai had been a faculty member since 1963. ECE Head George Swenson offered Pai a position as the first Grainger Visiting Professor, and he was charged with the task of resurrecting the power program.

With a background in nonlinear systems theory, Pai was among the first researchers to apply control system concepts to transient energy functions for studying power system stability. His use of the Lyapunov's method attracted the interest of Coordinated Science Laboratory faculty and students on campus. Joined by then Assistant Professor

Peter Sauer, Pai remade the program by integrating power research and education with control, systems theory, and computational aspects in the College of Engineering.

Pai also urged the department to add a power electronics component to the program. In 1987, the department hired Phil Krein (MSEE '80, PhD '82), who had been working at Tektronix, to initiate a power electronics research area. "Power systems by itself would not have taken off in this place," Pai said. "With power electronics, the power area is made very exciting."

Today, said Pai, the power and energy systems program is widely acknowledged as the best university power program in the country. The program includes five faculty, 37 graduate students, and it is home to the Grainger Center for Electric Machinery and Electromechanics.

Pai's academic career has spanned the globe. After earning a B.E. degree in electrical engineering from the Government College of Technology in Coimbatore, India, in 1953, he worked in distribution planning at the Bombay Electric Supply Company for four years.

In 1957, he entered graduate school at the University of California, Berkeley, where he received his master's (1958) and PhD degrees (1961) in electrical engineering. He then spent a year teaching at Berkeley and a year teaching at UCLA, where he turned down a tenure-track faculty position to return to India.

Like other American-educated Indians, Pai was attracted by the Indian-independence movement and he returned to help build the country's higher

education system. Administered and funded by the U.S. Agency for International Development (USAID), the Kanpur campus was founded in 1959 through a consortium of 10 leading U.S. universities.

"We started a whole new system of technical education," Pai said. "Until that time we used to have a British system of education. At Kanpur, I was part of the process of starting a U.S. system that emphasized complete faculty freedom, research, and book writing."

From 1976 to 1978, Pai was IIT Kanpur's dean of research and development, where he was actively engaged in developing in-house expertise at power utilities in computer applications. During his tenure, the first undergraduate computer science program in India was developed at IIT Kanpur.

Pai has supervised the doctoral work of 25 students—17 at IIT Kanpur and 8 at Illinois. He has written six influential textbooks, including "Power System Stability" and "Power Circuits and Electromechanics." A fellow of the Institution of Engineers (India), Indian National Science Academy, National Academy of Engineering (India), and the IEEE, Pai has also received the Indian government's highest award—the Bhatnagar Award for Engineering Research in 1974.

Although he is officially an emeritus professor now, Pai has no intentions of slowing down. He is rewriting a textbook on applying computer techniques to power systems, which he originally wrote at IIT Kanpur in 1979. He provides content for the nonprofit Induscitech.net Web site that he and his wife Nandini

Alumni Awards, continued from page 20

tion he held until his retirement in 1988. A member of the National Academy of Engineering, he received the University of Illinois College of Engineering Alumni Honor Award for Distinguished Service in Engineering and the university's Illini Achievement Award.

President of the National Academy of Engineering since 1997, Wulf was recognized for his leadership in engineering as president of the NAE, and his advocacy of engineering education and technical literacy. Wulf, who is on leave from the University of Virginia, has conducted pioneering research in computer architecture, computer security, programming languages, and optimizing compilers. A member of the NAE, Wulf also founded a software company, Tartan Laboratories.

Also presented at the September 19

banquet were the ECE Young Alumni Award, which recognizes alumni less than 40 years old who have made outstanding contributions to their field, and the Marcia Peterman ECE Alumni Award, which is presented annually to a former ECE Alumni Board Member for dedicated service.

Sreekanth Ravi (BSEE '87) and brother Sudhakar Ravi (BSCE '86), cofounders of SonicWALL Inc. in Sunnyvale, CA, received the Young Alumni Award. Sreekanth was honored for his entrepreneurial leadership in co-founding the Internet security appliance company, and establishing it at number one market share position worldwide. Sukhakar was recognized for his technical leadership in that endeavor. SonicWALL designs, develops, and manufactures comprehensive Internet security solutions that

are used by companies of all sizes to both protect their networks and provide secure remote access connectivity. Sales in 2002 exceeded \$100 million, and the company presently employs more than 350 people.

Se June Hong (MSEE '67, PhD '69), a retired researcher with IBM in Yorktown Heights, NY, received the Marcia Peterman ECE Alumni Award for his loyal service to the university and its alumni association. While at IBM, Hong had a broad research interest in fault tolerant computing, design automation and predictive modeling. He served as a visiting professor at Illinois, and he served on the ECE alumni board from 1995 to 2002, including three years as the Eastern region vice president. He received an ECE distinguished alumni award in 1989 and the U of I Orange and Blue Appreciation

Floyd Dunn, continued from page 23

Kingdom and Japan.

After retiring from the U of I in 1995, Dunn and his wife moved to Tucson, AZ. After nearly 50 years in Champaign-Urbana, what could lead to a move to the Southwest? "Tucson was a place where it is virtually impossible to have ice and snow," explained Dunn. "That's the principal reason we're here."

Though retired from the U of I, Dunn remains actively involved in his field of research. He continues his involvement on the editorial board of the Journal of the Acoustical Society of America. He is also chairman of that society's publication policy committee, which guides the journal as well as other publications of the society.

In addition, Dunn maintains a 20-year relationship with Tohoku University in

Japan. He still goes there one or two times a year and is still involved in research projects. One important aspect of the work there deals with ultrasonic microscopy to study biological specimens. Dunn explains that with these instruments, researchers can observe structures with the same degree of resolution as with optical microscopes, but different properties become evident since mechanical energy is employed rather than electromagnetic energy.

When asked what he does in his spare time, Dunn laughed: "Spare time?" When he actually does have a free moment, he likes to read English literature of the period between World War I and World War II, particularly the works of James Joyce, a writer others can find daunting. Dunn first picked up a copy of Joyce's "Ulysses"

in the early 1960s and has been hooked ever since. "I found that fascinating from the first page on," said Dunn. "I've read 'Ulysses' three times, and I've read some of his other works several times. For some reason that nobody else can understand, this has always fascinated me." He even has a publication (very minor he emphasizes) in a James Joyce periodical, wherein he discusses the origin of the word "supersonic," which Joyce used in his novel "Finnegans Wake."

The challenges he continues to face through engagement in research have been a similar source of enjoyment. "To me, just doing something new is always fun," said Dunn. "In fact, that's the reason I've stayed with it all these years. If it stopped being fun, I would have done

Faculty news

Ilesanmi Adesida was elected Fellow of the American Association for the Advancement of Science for contributions to advanced nanostructure materials processing and high-speed semiconductor devices and circuits.

Tamer Basar has been selected as the recipient of the 2004 Bode Prize of the IEEE Control Systems Society. He also received the Tau Beta Pi Daniel C. Drucker Eminent Faculty Award from the College of Engineering in April.

Jennifer Bernhard was elected to the Administrative Committee of the IEEE Antennas and Propagation Society for a three-year term.

Keh-Yung "Norman" Cheng was elected Fellow of the American Association for the Advancement of Science for distinguished contributions to heterostructure semiconductor materials and devices using molecular beam epitaxy.

Shun-Lien Chuang has been elected Fellow of the American Physical Society for his development of the fundamental theories for strained quantum-well

lasers and terahertz generation from semiconductors.

Professor Emeritus Dan Hang has received the U of I Alumni Association Constituent Leadership Award.

Nick Holonyak Jr. received the 2004 Washington Award at the Chicagoland Engineering Awards Benefit on February 27. The award recognizes Holonyak's invention of the light-emitting diode. Past recipients include Orville Wright, Neil Armstrong, John Bardeen, and H.G. Rickover.

Tom Huang was among the five campus professors appointed to the Center for Advanced Study—one of the highest forms of recognition the campus bestows on faculty for outstanding scholarship. He was recognized for important contributions in the broad field of multidimensional signal processing, analysis, synthesis, visualization, and understanding.

Ravi Iyer was selected as the first editor-in-chief of the newly created IEEE Transactions on Dependability and Security.

Jianming Jin is the lead

investigator on a new Department of Defense Multidisciplinary University Research Initiative (MURI) grant worth nearly \$1 million over three years. He is working with Andreas Cangellaris, Weng Chew, and Eric Michielssen on electromagnetic simulation and design of antennas and arrays using novel electronic materials.

Zhi-Pei Liang has been elected Fellow of the American Institute for Medical and Biological Engineering in recognition of his many distinguished contributions to the field as well as his demonstrated interest, concern, and involvement with critical issues affecting medical and biological engineering. He also has been elected to serve a three-year term on the Administrative Committee of the IEEE Engineering in Medicine and Biology Society.

Chang Liu was among the 13 campus faculty appointed as associates in the Center for Advanced Study for the 2004-05 academic year. He will pursue research on flexible sensitive skin: large area electronics and sensor integration.

Yi Ma has published a new

book entitled "An Invitation to 3-D Vision: From Images to Geometric Models." The publisher is Springer-Verlag, and it is co-authored with Stefano Soatto (UCLA), Jana Kosecka (George Mason), and Shankar Sastry (UCB).



Yi Ma
Burks Oakley was awarded the Sloan-C Award for the most outstanding achievement in online teaching and learning by an individual in November at the 9th Sloan-C International Conference on Online Learning in Orlando, FL. Also, he received the 2003 University of Michigan College of Engineering Alumni Society Merit Award in October 2003. He earned his master's and doctoral degrees from Michigan's Biomedical Engineering Department.

William O'Brien, Jr. received the 2003 Distinguished

Alumni Association Board president's message

Service Award from the IEEE Ultrasonics, Ferroelectrics, and Frequency Control Society. The award is the highest recognition given to one of the society's members. He received the award at the IEEE Ultrasonics Symposium in Honolulu, HI, in October 2003.

Bill Sanders was elected Fellow of the Association for Computing Machinery (ACM) for outstanding contributions to the evaluation and design of dependable systems and networks.

Andrew Singer was invited to join the IEEE Signal Processing Theory and Methods Technical Committee for a three-year term.

Rayadurgam Srikant has published the book "The Mathematics of Internet Congestion Control" (Springer Verlag).

Benjamin Wah received the Society for Design and Process Science Raymond T. Yeh, Life Time Achievement Award in December at the society's conference in Austin, TX.



Doug Criner, dcriner@ieee.org

My term as president of the ECE alumni board is ending. I welcome my successor, Sherel Horsley (BSEE '64, MSEE '65). He will do a fine job of representing the interests of alumni to the university, and vice versa.

I also salute the other members of the board, whose names are listed on page 2 in this newsletter; Emma Marshall, the department's alumni affairs coordinator; and Professor Pete Sauer, the board's faculty liaison.

There continues to be significant activity by university leaders to identify resources for construction of the much needed ECE building. I trust that ECE department head Dick Blahut will not allow paving the temporary gravel parking lot now occupying the future site of the ECE building, lest anyone else on campus think that space is theirs!

Patent Law, continued from page 24

alumni at McAndrews. Sharon Hwang (BSEE '89) considered changing her major to broadcast journalism as an undergrad, but her father convinced her that an ECE degree was a good background for any career. Now Hwang is a board member with McAndrews. Chris George (BSCE '97, MSEE '99), a McAndrews associate, learned about law school from a friend while he was in grad school in ECE. "I came to realize that patent law offered a unique environment to utilize my technical ECE knowledge, the problem solving and analytical skills I learned in engineering, and my ability to think creatively on my

feet in order to craft arguments and solutions for clients," said George.

Another member of the McAndrews team is technology specialist Dima Moussa (BSEE '01), who provides scientific support to the firm's lawyers. Meanwhile, Moussa is working on her ECE master's thesis and going to law school at De Paul. She's always been interested in law, but got interested in patent law during her graduate study in ECE.

Like Scarpelli, David Bluestone (BSEE '96) had an uncle who practiced patent law, so he started considering law school during his undergrad years.

He finds his engineering background useful for understanding the technologies he deals with at Brinks Hofer, and for general problem solving and for explaining complex issues to nonspecialists.

Understandably, most ECE alumni aren't as interested in law as this group. But every engineer should gain a basic knowledge of patent law. According to Alison Schwartz (BSEE '94) of Sonnenschein Nath & Rosenthal in Chicago, the consequences of not doing so can be dire. "I often see clients who reluctantly learn about patent law only after it is too late," she said. "For example, patent

Featured alumni careers

Nichols: Managing Intel's North American computer labs

By Erin Lukehart

When JeanAnn Nichols (BSEE '86) graduated from Illinois, she had some well-defined ideas about what she wanted to accomplish in her career. But as Nichols pointed out in a presentation to ECE students this past fall, sometimes your career trajectory leads to somewhere different from your initial plan. In her case, that career path has led to a high-level position with the Intel Corporation.

Nichols currently serves as the North America regional manager of Intel's Computer Sales Group, a hard-earned position after moving through several posts within the corporation. Her first job after graduation, however, was in semiconductor development at National Semiconductor. Her work there was cut short when the company's factories closed down within the first year.

Nichols quickly found a job at Intel, joining the company in 1987 to work as a technology development engineer. While in this position, she developed an interest in business and decided to pursue an MBA at Santa Clara University, which she completed in



JeanAnn Nichols

1993. With a new degree, Nichols also took on new positions at Intel, including a three-year stint in micro-processor pricing and three years as a market development manager.

In her current position, Nichols runs the Intel computer sales organization for all of North America, including Canada and Puerto Rico. She and her sales team travel several days a week to major urban areas, meeting with PC OEMs (Original Equipment Manufacturers) to identify their needs, and to match up which Intel products—like silicon chips and motherboards—will best serve their equipment.

Although her work now revolves around sales,

Nichols said an engineering background is crucial to her profession: "All the engineering work and problem-solving I've done helps me to figure out how best to meet my customers' needs."

Nichols said that in many ways her job is ideal because it combines the "soft side" of engineering—networking and people skills—with the technical, problem-solving side. "With this position I still get to let my propeller spin," she said.

Nichols looks back fondly on her experiences as an undergraduate in ECE. She said her favorite ECE class, a circuit fabrication course, was particularly memorable: "The class was great because it helped to connect theory on paper with an actual output. It was a lot of fun." The hands-on experience was important, as was "being surrounded by really smart people in the classroom," which Nichols said was "inspiring."

While managing a heavy courseload, Nichols found time to play bassoon in the orchestra and volunteer in the usher corps and stage crew at the Krannert Center for Performing Arts. She

also studied abroad at the University College in London, where she was one of only three women studying engineering at the time.

A native of the Chicago area, Nichols currently lives in Santa Clara, CA, with her husband, Dan, and her two children, Joe, 10, and Allison, 8.

Her advice to students preparing for the job market?: "Keep an open mind. Be ready to jump in and be flexible." Also, know what you like. "I found that I love working with people," she said. "When you find that spark, hang onto it. The sky's the limit—you can do anything you want with an engineering degree."

Bruning: Sculpting his companys success in precision optics

By Tom Moone



John Bruning

Several years ago, John Bruning (MSEE '67, PhD '69) met a mathematics professor who led a team at the International Snow Sculpture Championships held in Breckenridge, CO. They had sculpted a large "Costa" minimal surface in snow.

Bruning, who is president and chief executive officer of Corning Tropol Corporation, a leader in precision optic subsystems and advanced form metrology instrumentation for the semiconductor industry, was intrigued, because sculpture was one of his hobbies and because he has had a lifelong interest in mathematics. Carving a minimal surface from 20 tons of snow was too good to pass up. "We ended up doing three years of mathematically inspired snow sculptures together" said Bruning. He was part of the 2000 team whose sculpture "Rhapsody in White" took second place.

Though Bruning looks on his years of sculpting snow as a diversion, it is clear that he enjoys a challenge. One such challenge was moving into a new field after completing his graduate studies. Bruning's dissertation was on multiple scattering of electromagnetic waves by spheres. However, following the completion of his dissertation, Bruning joined the Optics Group at Bell Labs in Murray Hill, NJ.

"I was thrust into hard-core optics—for the production of microelectronic circuits" said Bruning, whose work there took in optical testing, interferometry, automated mask inspection and photolithography. "It was lots of fun, and I rationalized it as electrical engineering, only at a really high frequency."

In 1979 he became supervisor of the New Lithographic Systems Group, which worked on a variety of projects dealing with lithography for microelectronics. There, he initiated and managed the development of deep ultraviolet (UV) photolithography using excimer lasers. "It was basically developing optics that are so precise that the smallness of the circuits that can be imaged is lim-

ited only by the smallness of the wavelength of light" said Bruning. Today, microcircuits are produced with photolithography tools that operate at a wavelength of 248 nanometers and based on the same technology developed in his group.

During this work on deep-UV photolithography, Bruning worked closely with the Tropol division of GCA Corp. to fabricate the first UV optics. In 1984, he was hired by GCA to run its Tropol Division. GCA was acquired by General Signal in 1988, but in 1994, General Signal decided to exit the semiconductor equipment industry and put Tropol up for sale. However, Bruning's many years of experience in this same industry had made him quite comfortable with that volatility. He led a management group that took the Tropol Corp. private and began a new challenge as a corporate owner.

Over the next seven years, Tropol grew from 75 employees to 200. Bruning attributes the company's success in precision optics to its talented and dedicated workforce and its location in Rochester, with its strong tradition in optics. Throughout this period the company worked in close cooperation with Corning

Inc. to develop the most transparent and pure UV glass.

"As our customers matured and our business grew," said Bruning, "it became even more important for us to push the envelope in optical capability and performance. This meant continual improvements in materials and access to fundamental research like I was used to at Bell Labs." An opportunity to become part of Corning seemed like a natural progression, allowing Tropol to focus on next-generation products for its customers. In 2001, Tropol became a wholly owned subsidiary of Corning under the new name Corning Tropol Corp.

Though he no longer sculpts with snow as a medium, Bruning still enjoys sculpture in wood and glass.

Bruning was elected a member of the National Academy of Engineering for his work on deep-UV photolithography and associated manufacturing methods. He is a Fellow of IEEE and the Optical Society of America. In 1993 he received the Richardson Medal from the Optical Society of America. He received the 1992 ECE Distinguished Alumni Award.

Alumni class notes

1970

Larry Altenbaumer (BSEE) retired as president of Illinois Power April 1, 2004, after more than 30 years with the company. He will continue to serve in a consulting role. Altenbaumer is a past president of the ECE Alumni Association Board.

1971

A. Michael Andrews II (PhD) was appointed as Chief Technology Officer for L-3 Communications last June. L-3 is a leading merchant supplier of Intelligence, Surveillance, and Reconnaissance (ISR) systems and products, secure communications systems and products, avionics and ocean products, training devices and services, microwave components and telemetry, instrumentation, space and navigation products. Their clients include the Department of Defense and the Department of Homeland Security.

James Kesaris (BSEE) was named as president of Informatic Healthcare Solutions Ltd., a subsidiary of Peninsula Holdings Group Ltd., last June. Kesaris had previously served as vice president and CFO of Next Nutrition Inc., and as a chief financial officer of the San Diego Chargers football team.

Michael Paige (MSEE '69, PhD) joined White Label as Managing Director of Technology Strategy in December. White Label helps U.S. companies build technology capability solutions designed to provide global competitive advantage. Paige is also a full professor and chair of information and computer technology at Endicott College in Beverly, MA.

Dennis Parker (BSEE) retired in February 2003 from profes-

sional flying after 32 years as a pilot first with the United States Air Force, and more recently, as a pilot with American Airlines. While in the Air Force, he flew F-4 jets. As a commercial pilot, he flew 727, DC-10, and 777 aircraft.

1972

Admiral Archie Clemens (BSEE '66, MSEE), U.S. Navy (ret.), was appointed to the board of directors for Healthwise, Inc., in September. Healthwise distributes self-care guides and maintains a technology product containing information on conditions, diseases, and medical tests to help consumers make decisions about their health. Clemens was the 28th commander of the United States Pacific Fleet, a four-star position, before retiring from active duty in 1999. He is the owner and president of Caribou Technologies, Inc., co-owner of TableRock International, LLC, vice chairman of Advanced Electron Beams, Inc., and vice chairman of Positron Systems.

1973

Russell Dupuis (BSEE '70, MSEE '71, PhD) received the 2004 John Bardeen Award from The Minerals, Metals and Materials Society (TMS), for the pioneering demonstration of high-quality III-V semiconductor materials and devices grown by metalorganic chemical vapor deposition. The presentation took place March 14-18 at the TMS Annual Meeting and Exhibition in Charlotte, NC.

1974

David Coston (BSEE) was featured in the Carmi Times newspaper after appearing as a guest speaker at the Kiwanis

Club in Carmi, IL. Coston runs his own consulting business, United Energy, Inc., which helps companies to reduce energy consumption and increase efficiency. According to the Times, Coston is now working with Toyota to develop motion-sensitive systems to reduce lighting costs in a Chicago warehouse.

1975

Larry Weber (BSEE '69, MSEE '71, PhD), president and CEO of Plasmaco, has decided to leave the company to pursue other endeavors as of January 16, 2004. Weber cofounded Plasmaco in 1987 to apply plasma technology to large-screen displays. Weber holds 15 patents on plasma displays and was instrumental in Plasmaco's development of the first high-definition 60-inch display in 1999.

1976

Gerry Labeledz (BSEE '73, MSEE) presented the ECE graduate seminar "Hyperfast computational communications: Multiple engineering disciplines to get what you need" on campus February 12, 2004. He has worked at Motorola for 28 years, and holds the title of Dan Noble Fellow, Motorola's highest technical honor.

1977

John Orr (BSEE '69, PhD) was elected an IEEE Fellow for contributions to engineering education in 2002. More recently, he received the Leadership and Service Award from the national ECE Department Heads Association. He is a professor and former ECE department head at the Worcester Polytechnic Institute.

James Wiczer (MSEE '73, PhD) presented the ECE graduate seminar "Exploiting smart sensor technologies—why less is more" on campus October 16, 2003. He is the president and cofounder of Sensor Synergy Inc., in Buffalo Grove, IL.

1978

Mark Bohr (MSEE) was named an IEEE Fellow for leadership in advancing CMOS logic technologies, and also received the Andy Grove Award from IEEE at Washington, DC, in December.

Richard Landuyt (BSEE) is involved with his fourth high-tech start-up company. RF Ideas, which is located in Arlington Heights, IL, manufactures desktop RFID proximity card readers for building and computer security.

1981

Timothy C. K. Chou (MSEE '78, PhD) presented the ECE graduate seminar "Software economics 101" on campus November 13, 2003. He is the president of Oracle Outsourcing, whose customers include privately held companies and Fortune 500 corporations. Chou has also been a lecturer at Stanford University for over 15 years.

1984

Thanh Tran (BSEE) is a senior member of the technical staff at Texas Instruments, where he leads a system application team to assist customers developing products using the latest TI OMAP Dual-Core processors.

1985

Richard Mozack (BSEE) was named vice president and chief information officer of The Spiegel Group in August

of 2003. Mozack has worked for The Spiegel Group since 1994, most recently serving as vice president of application development.

1986

Wei Jeang (BSCE) is a registered patent attorney with Haynes and Boone LLP in Plano, TX. She is also a director of the Dallas Bar Association's Intellectual Property Section.

Michael Polacek (BSCE) presented a lecture on April 8, 2004, as part of the ECE graduate seminar series. He is vice president and general manager of National Semiconductor's Imaging Group.

1988

David Helman (BSEE) finished a fellowship in cardiac surgery at Massachusetts General Hospital in Boston in the fall. In January 2004, he started at the Cleveland Clinic.

1990

Kevin Warren (BSCE '83, MSEE '84, PhD) presented the ECE graduate seminar "Accommodating increasingly complex technology in future processor design: A view from IBM research," on campus November 20, 2003. From 1990 to 1992 he held a research and visiting faculty position in ECE. From 1986 to 1992 he helped found and served as a consultant for a plasma display manufacturing company, then joined IBM in 1992. He is currently a senior manager of the VLSI Design group in Yorktown.

1991

Rob Palandech (BSEE '89, MSEE) works for Anadigics,

where he develops new products—900 MHz, 2, and 6 GHz wireless transmitter blocks. The company is located in the Atlanta area.

1993

Lisa Hackbart Snyder (BSEE) was promoted to director of business process and intelligence services in August 2003 at Barton Inc. in Chicago. She is responsible for all Web sites, business intelligence services, project office, and business processes.

1997

Lisa Nami Sato (BSEE) married Robert Brent Whitelock on September 28, 2002. Sato is employed as an electrical engineer at Motorola, and is also currently a graduate student at the Northwestern University Kellogg School of Business. Whitelock, a graduate of U of I and the University of Illinois Medical School in Chicago, is completing his residency in Internal Medicine at the Loyola University Medical Center.

Steve Sullivan (MSEE '91, PhD) was featured in an IEEE Spectrum magazine cover story on dream jobs. Sullivan is director of R&D for LucasFilm Ltd.'s Industrial Light & Magic in San Rafael, CA. He won a 2001 Academy Award for Technical Achievement for co-inventing matchmoving and tracking software used for special effects.

1998

Siddharth Ramachandran (PhD) presented the ECE graduate seminar "Novel fibers and fiber devices drive the optical network" on campus September 4, 2003. He is a member of the technical staff

at OFS Laboratories.

1999

David Layne Ripley (BSEE) married Amy Danielle Miller on March 22, 2003. Ripley is employed as a software engineer for Syclo, LLC. Miller, also a '99 graduate of Illinois, is employed as a management analyst at Chicago Housing Authority.

2000

Jong Hwang (BSEE) is an electrical engineer with CB&I in the Chicago area. He handles designs power, heating, lighting, and control systems for chemical import terminals and storage facilities.

2001

Dima Moussa (BSEE) is working for the law firm of McAndrews, Held & Malloy Ltd. as she attends law school at DePaul University in Chicago.

2003

Robert James Mihalko (BSCE '01, MSEE) married Maria Rowland Trampe on August 16, 2003. Mihalko is employed by Intel. Trampe is a December 2003 graduate of Illinois with a master's degree in human resources and industrial relations. They live in Portland, OR.

Obituaries

Dale Lee Ashcroft (MSEE '53) died July 15, 2003. He was 77. Mr. Ashcroft was an electrical engineer for the Plasma Physics Lab of Princeton University for 23 years. He was a graduate of the U.S. Naval Academy and was a veteran of the U.S. Air Force, Army, and Navy.

Carl S. Benning (BSEE '77) died July 2, 2003. He was 48. Mr. Benning worked for 26 years as an electrical engineer and programmer with IBM in Rochester, MN. He was a member of the IBM Quarter Century Club.

Kenneth Carlson (BSEE '52) died June 25, 2003. He was 75. Mr. Carlson was vice president and general manager of one of the divisions at E-Systems (now Raytheon) before retiring in 1989. He was a veteran of the U.S. Army.

William Chapman (BSEE '50) died May 30, 2003. He was 78. Mr. Chapman was a retired electrical engineer and was a vice president of Arketex Ceramics Corporation. He served in the U.S. Navy during WWII as an electrician's mate.

Harold Creamer (BSEE '30) died July 1, 2003. He was 95. Mr. Creamer was retired from Commonwealth Edison.

Ernest Deloy Jernigan (MSEE '50) died July 1, 2003. He was 81. Mr. Jernigan graduated from the U.S. Military Academy in 1946, and was commissioned as a First Lieutenant in the Air Force in 1947. After receiving his master's degree, Jernigan worked in research and development for the Air Force until 1958, then for Motorola until 1961. Jernigan also worked for Industrial Nuclear, was director of AMCOL Corp., and started his own oil business in Chickasha, OK.

John F. Kruzic (BSEE '33) died January 2004. Mr. Kruzic was a member of Lucent Pioneers.

Michael Marchal (BSEE '80) died November 2, 2003. He was 54. Mr. Marchal was lead

2002 National Medal,

continued from page 1

engineer-communications systems for Boeing, and had worked on the AV8, T-45, F-15, and F-18 aircraft. He served in the U.S. Air Force from 1971 to 1987 as a linguist. He was a member of the University of Illinois Alumni Association, Phi Beta Kappa, and Eta Kappa Nu.

Calvin May (BSEE '42) died October 31, 2003, in St. Louis, MO. The WWII veteran held engineering positions in St. Louis for many years before his retirement.

Richard Naatz (BSEE '50) died November 14, 2003. Before retirement, Mr. Naatz had worked at Commonwealth Edison for over 30 years.

Frank Osuna (BSEE '84) died December 12, 2003.

John Quinlivan (BSEE '60) died December 2003. Mr. Quinlivan was a senior executive with Zenith Electronics. He served in the U.S. Navy.

Mack Willis (MSEE '50) died March 19, 2003. He was 76. Mr. Willis worked for Douglas Aircraft and Ramo Woolrich.

Frederic Zeisler (BSEE '48) died June 1, 2003. He was 75. Before retiring, Mr. Zeisler had worked for Ford Motor Company and taught at Lawrence Institute of Technology in Livonia, MI.

A faculty member at Illinois since 1963, Holonyak and his students demonstrated the first quantum-well laser, creating a practical laser for fiber-optic communications, compact disc players, medical diagnosis, surgery, ophthalmology and many other applications.

In the early 1980s, his group introduced impurity-induced layer disordering, which converts layers of a semiconductor structure into an alloy that has important electronic properties. In one use, this discovery solved the problem of a laser's low reliability. Such lasers exhibit enhanced performance and durability, making them ideal for DVD players and other optical storage equipment.

During the last decade, Holonyak and his students invented a process that enables the formation of high-quality oxide layers on any aluminum-bearing III-V compound semiconductor. The oxide process has had a major impact on vertical-cavity surface emitting lasers, making them practical for such applications as optical and data communications. His more recent research focuses on coupling quantum-dot lasers to quantum-well lasers. He continues to collaborate with Craford and Dupuis.

Craford (MS-physics 1963, PhD-physics 1967) is the chief technology officer of LumiLeds Lighting in San Jose, CA. Ten years after Holonyak invented the first visible LED, Craford invented the first yellow LED and 10 times brighter red and red-orange LEDs, expanding the potential uses of LEDs in commercial and consumer applications dramatically. He subsequently led the R&D efforts at Hewlett-Packard/Agilent Technologies/LumiLeds Lighting, which resulted in products that are now the highest-brightness LEDs available in the world.

Craford began his professional career as a research physicist at Monsanto Chemical Company before joining Hewlett-Packard in 1979.

Dupuis (BSEE 1970, MSEE

1971, PhD 1973) is the Steve W. Chaddick Endowed Chair in Electro-Optics at the Georgia Institute of Technology. In 1977, he was the first to demonstrate that metalorganic chemical vapor deposition (MOCVD) could be used to grow high-quality semiconductor thin films and devices, including LEDs. Most of the lasers today, as seen in grocery store scanners and in CD and DVD players, are made using the MOCVD process, which Dupuis perfected.

Dupuis and his research group are currently focused on developing new semiconductor materials, primarily to make light emitters more efficient so that every watt of electrical energy going into the semiconductor becomes light at 100 percent efficiency.

Previous National Medal of Science and National Medal of Technology laureates with ties to ECE

National Medal of Science

- Professor John Bardeen (1965)
- Alumnus Jack Kilby (1969)
- Affiliate Professor Paul Lauterbur (1987)
- Professor Nick Holonyak Jr. (1990)
- Alumnus Alfred Cho (1993)

National Medal of Technology

- Alumnus Jack Kilby (1990)
- Affiliate Professor Paul Lauterbur (1988)

Network administrator Cicone retires

By Erin Lukehart

Although he retired in October after more than 37 years with the ECE department, Bob Cicone hasn't completely said good-bye. In December, he returned as a part-time LAN systems administrator, while maintaining his computer support role for the ECE administrative offices. Cicone joined the ECE administrative network support group in 1993 and became the group's manager in 1994. In 2001 he became the first manager of the newly combined Administrative and Instructional Computing Support Group.

"I never had a chance to get bored, since things have constantly evolved," he said. "It's been fun."

Cicone's history with the ECE department goes back to October 1966, when he worked as a student in the Bioacoustics Research Lab (at the time, Biophysical Research Lab). After about a year, Cicone became a civil service employee. He assumed a number of duties within the lab, including the preparation of histological specimens and drawing technical illustrations for scientific publications.

"From that point I got into computers because the director of our lab at that time, Floyd Dunn, hap-



ECE Research Programmer Andy Assad (left) and ECE Assistant to the Department Head Carol Wakefield (center) present Bob Cicone with his very own Oculus replica, which doubles as a pencil holder, at Cicone's retirement reception October 16, 2003.

Photo by Tom McKeone

pened to get one of these classic Macintosh computers that had MacDraw on it." Once Cicone became adept at doing technical drawings on the computer, he became more interested in technology.

"The laboratory started using Apple computers for everything because they were much easier to use back in those days, and I just happened to know them because I was the second person in the building using them."

Before becoming manager of administrative computing support, Cicone also held posts as facility manager of the old Electrical Engineering Annex, and was also manager of an animal colony. "At the time,

we were using animals for ultrasound research, which was the business of the Bioacoustics Research Lab," he explained.

Cicone's early computer knowledge was largely self-taught, though the demands of changing technology required that he participate in numerous seminars and workshops to stay current in his field. Keeping up with technology is one of the biggest challenges of the job, he said. "Things that I learned four years ago are useless because that technology has been superceded by something new."

Cicone has always proved to be adaptable and an invaluable asset to the department. He was the

recipient of the ECE Staff Employee of the Year Award in 1997 and the Chancellor's Distinguished Staff Award in 1998.

Josh Potts (MSEE '99) has taken over Cicone's former role as manager of Administrative and Instructional Computing Support. "Josh is the absolute consummate programmer," said Cicone. "He works harder than anybody I have ever met in my life, and is extremely conscientious about the things that he does."

Because his new position requires fewer days in the office, Cicone has had more time to spend in hobbies and doing work around his home in Tolono, where he lives with his wife, Barb, the graduate admissions officer for the Department of Computer Science.

In these fast-paced times, it's not very common to see employees stay in one place for too long. But for Cicone, staying with ECE was an easy choice to make. "This is the best department on campus, bar none," he said.

Parsons retires from counseling office

By Erin Lukehart



Photo by Tom Moore

ECE Associate Head Narayana Rao reads a poem to Mary Parsons at her retirement reception January 27.

The ECE department recently bid a fond farewell to a familiar face: beloved colleague and friend, Mary Parsons. After 26 years of hard work and dedication, Parsons retired from her position as administrative clerk in the Office of Graduate Affairs and Graduate and Undergraduate Counseling and Records.

"When I first came here," Parsons said, "I interviewed with Dr. Edward Ernst, who was associate head at the time, and I remember saying, 'I can't do this job. I think I've wasted your time.' And he called me back in a few days and said, 'Well, I think you can! You're coming.'"

Parsons agreed to take the job despite not having much campus experience. "I had worked as a file clerk over in McKinley Health

Center, and before that I raised my family," she said. "If it weren't for [Professor Ernst], I would have given up right then."

Despite her initial misgivings, Parsons quickly proved to be an asset to the office, juggling a number of roles and becoming a master of organization. The woman who once doubted her ability to handle the job later became an office supervisor, as well as a recipient of the ECE Staff Employee-of-the-Year Award in 1998.

Parsons wore many hats as an administrative clerk, including coordination of areas such as the timetable, professor evaluations, graduate student admissions, assistantship and fellowship appointments, and advising assignments.

Student interaction was one of the best aspects of the job, said Parsons. "That's one of the parts I'm going to miss most—the student contact. It keeps you young and keeps your mind always working," she said.

Now that she has more free time, Parsons plans to do some traveling. "Towards the end of March I'm going to go south for a while, and then I'm going to visit Minneapolis where my daughter and her children are." Spending time with her six children and several grandchildren is top priority, she said, and since her husband Don is also retired, "If we want to pick up and go somewhere, we can."

Although she retired on January 30, Parsons said she plans to continue visiting the office to help train Laurie Fisher, the new clerk, as well as to just stop in and say hello to her friends.

Parsons' long-time co-worker and friend, Sherry Beck, said she is glad Mary will continue to visit. "I've known her since she started in 1978," said Beck. "The best part of working with Mary was the companionship. We're all going to miss

ECE 353 legacy

continued from page 22



ECE Professor William Albright

during his student days the rise of digital circuits had many engineers believing RF would lose relevance as a field. "Albright said, 'The digital guys have RF problems—they just don't know it yet,'" recounted Lober. "With semiconductors today operating at two gigahertz, you can appreci-

ECE donors' generosity helps department maintain its excellence

ECE extends its appreciation to those graduates and friends who have generously supported the department in the last year through gifts and donations. This list is sorted by the graduation dates within each gift level—the date of the first degree appears for alumni with more than one degree. Contributions were made between December 1, 2002, and December 31, 2003. If we have inadvertently omitted your name, please notify Emma Marshall at (217) 333-5817 or marshall@ece.uiuc.edu.

gifts of \$500 or more

(Sorted by degree date)

friends of ece

Joe C. Campbell
 Mary L. Cipriano
 Magnus George Craford
 Caroline W. Egbert-Jordan
 Andrew H. and Julie M. Everitt
 Joan K. Henderson
 William R. and Janet K. Hunter
 Michael H. Lee
 Joan L. Mitchell
 Gordon E. and Betty I. Moore
 John S. Moore
 Burks Oakley II
 Dilip V. and Sandhya D. Sarwate
 Alan R. Stivers
 Timothy N. Trick
 Betty J. Wilson

1920s

Franklin W. Woeltge, 1926
 Richard W. Benfer, 1929

1930s

Clarence E. Van Slyck, 1938

1940s

Frank S. Korona, 1941
 Donald E. Nelson, 1941
 Richard W. Landon, 1942
 W. T. Reace Jr., 1942
 Paul L. Cochran, 1943
 John G. Miller, 1943
 Lowell E. Ackmann, 1944
 Russell Landreth, 1947
 Richard F. H. Yang, 1948
 Nicholas Yaru, 1948
 Edward W. Ernst, 1949

1950s

Wendell R. Dunning, 1950
 George E. Misthos, 1950
 R. A. Read, 1950

Edward F. Bell, 1951
 David G. Berry, 1954
 Robert E. Finnigan, 1954
 Robert M. Janowiak, 1957
 Walter J. Sanders III, 1958
 Nate F. Scarpelli, 1958
 Joseph W. Semmer, 1958
 James J. Mikulski, 1959
 Henry C. Pao, 1959
 Sik-Sang Yau, 1959

1960s

Herbert Y. Chang, 1960
 James Y. Fujitani, 1960
 J. K. "Jake" Aggarwal, 1961
 Steven B. Sample, 1962
 Allen L. Short, 1962
 Joseph T. Verdeyen, 1962
 Gary S. Brown, 1963
 Milton M. T. Chang, 1964
 Douglas E. Criner, 1964
 Sherel D. Horsley, 1964
 Peter W. Sognefest, 1964
 Robert J. Camillone, 1965
 John J. Henderson, 1965
 Roger L. Johnson, 1965
 C. P. Bates, 1966
 William D. O'Brien Jr., 1966
 Michael G. Tomasic, 1966
 John H. Bruning, 1967
 Daniel W. Dobberpuhl, 1967
 Se June Hong, 1967
 Charles W. Beall, 1968
 Steven T. Highbarger, 1968
 Glenn H. Sherman, 1968
 Jim deHaan, 1969
 Tatsuo Itoh, 1969
 Carl J. Johnson, 1969
 Thomas O. Mueller, 1969
 Kenneth F. Smolik, 1969
 Leopoldo D. Yau, 1969

1970s

Larry F. Altenbaumer, 1970
 Paul R. Davis, 1970

Merle Gilmore, 1970
 James J. Coleman, 1972
 Martin Korn, 1972
 Donald J. Meeker, 1972
 Marwan Simaan, 1972
 John J. Allemong, 1973
 Gerald Marcyk, 1973
 David Edward Borth, 1974
 Paul M. Erickson, 1974
 Jeffrey A. Niehaus, 1974
 Gerald T. Sekimura, 1974
 Carl J. Simonsen, 1974
 Jerry A. Tanaka, 1974
 Steven R. Thompson, 1974
 Joe H. Chow, 1975
 Frank A. Bernatowicz, 1976
 Thomas Y. Lo, 1976
 David R. Pesavento, 1976
 Bob Ackmann, 1977
 Alex M. Mihalka, 1977
 Linda J. West, 1977
 William S. Bennett, 1978
 Mark T. Bohr, 1978
 John M. Cioffi, 1978
 Donna E. Fathke, 1978
 Mark M. Tashima, 1979

1980s

Todd M. Beanblossom, 1980
 Leland Berkwits MD, 1980
 Julia E. Wold, 1980
 Ronald S. Owdom, 1981
 Gale Beanblossom, 1982
 Charles W. Brentz, 1982
 William C. Schindler, 1982
 Jordan Plofsky, 1983
 Daryl Farley Varney, 1983
 Dale L. Lomelino, 1984
 Teresa Pytosh Covington, 1985
 Daniel L. Colbert, 1986
 David H. Julifs, 1986
 Thomas J. Ziomek, 1986
 Neil S. Hirshman, 1987

Robert Jung, 1987
 Lisa Chan, 1987
 Paul R. Turner, 1987
 Caroline G. Chicoine, 1988
 Frederick A. Kish Jr., 1988
 Jennifer T. Sterling, 1989

1990s

Sylvia Chen, 1990
 Aran Hegarty, 1990
 Edwin C. Lennox III, 1990
 Mary A. Plano, 1990
 Mark J. Laufenberg, 1992

gifts of \$100-\$499

(Sorted by degree date)

friends of ece

George E. and Cynthia M. Anner
 Alan B. and Carolyn M. Auby
 Stephen W. Barth
 Richard A. Baumgartner and Elizabeth M. Salzer
 Cheryl S. Bennett
 Paul D. Coleman
 Michael J. Costa
 Robert L. Dalrymple and Elizabeth Feuerstein
 K. F. Duncan
 Edith R. Emery
 Ruth B. George
 Helen O. Landreth
 Kathy Laska
 Charles L. and Roberta L. Palmer
 Nell C. Percival
 Charles W. and Marilyn R. Pratt
 Eleanor H. Reace
 Niles R. Sandell Jr.
 D. Lynn Schlansker Sr.
 William Andrew Struzinski
 George W. Swenson Jr. and Joy Janice Swenson

Francis D. and Phyllis Thomas
 Robert M. West

1930s

Marvin C. Greer, 1936
 R. E. Steinfort, 1939

1940s

H. Kenneth Foute, 1940
 John L. Jones Jr., 1940
 Robert Schadt, 1942
 James W. Stubner, 1942
 T. P. Ellsworth, 1943
 Charles F. Iffland, 1945
 Harry J. Venema, 1946
 William A. Bridge, 1947
 Pete Fenoglio, 1947
 Bernard Silverman, 1947
 Sorab K. Ghandhi, 1948
 Donald E. Steeper, 1948
 Robert W. Beck, 1949
 Newton A. Campbell, 1949
 Floyd Dunn, 1949
 J. Stephenson Kerr, 1949
 Everett W. Schwarm, 1949

1950s

Kay N. Burns, 1950
 Dwight J. Garrison, 1950
 August J. Gartner, 1950
 Earl J. Hajic, 1950
 Virgal L. Schad Jr., 1950
 G. Bruce Welbourne, 1950
 Leonard Chevlin, 1951
 Frank W. Grebner Jr., 1951
 William N. Keck, 1951
 Richard J. Klensch, 1951
 Arthur W. Reynolds, 1951
 John Romanelli, 1951
 Gilbert F. Sacco, 1951
 Theodore O. Wright USAF, 1951
 Milton H. Hieken, 1952
 Philip K. Trimble, 1952
 Robert O. Hansen, 1953

John B. Kreer, 1954
 Milton E. Radant, 1954
 Porter J. Womeldorff, 1954
 Robert L. Laursen, 1957
 Gerald J. Marinello, 1957
 Howard Keith Ray, 1957
 Robert W. Kafka, 1958
 Jose B. Cruz Jr., 1959
 Vernon C. Mueller, 1959
 John S. Perry, 1959
 Robert L. Poeschel, 1959
 Mandyam D. Srinath, 1959

1960s

Kenneth F. Morman, 1960
 John J. Quinlivan, 1960
 Frank C. Alterio, 1961
 Jerome J. Chesnul, 1961
 Richard F. Donnelly, 1961
 Phillip H. Doppelt, 1961
 Dirk Krueger, 1961
 Allen M. Barnett, 1962
 Oscar L. Gaddy, 1962
 Robert G. Heeren, 1962
 Ronald E. Larson, 1962
 Erwin E. Schulze Jr., 1962
 Carl F. Stubenrauch, 1962
 Eikichi Yamashita, 1963
 Joseph N. Owens, 1963
 William L. Porter, 1963
 Luzern A. Richter, 1963
 Thomas M. Smith, 1963
 Irwin E. Tuckman, 1963
 Dennis L. Balzarini, 1964
 James W. Carlin, 1964
 Wai-Kai Chen, 1964
 Ronald L. Wenda, 1964
 James A. Dayton Jr., 1965
 Edward P. Krumwiede, 1965
 Neale M. Luft, 1965
 Larry S. Nixon, 1965
 Alan L. Stahl, 1965
 Stuart H. Starr, 1965
 James E. Tate, 1965
 James C. Chow, 1966
 Archie R. Clemens, 1966
 W. Michael Diekman, 1966
 Win H. Emert, 1966
 Samuel I. Green, 1966
 Richard A. Lerche, 1966
 Jack L. Saltich, 1966
 Barry D. Briggs, 1967
 David H. Cowling, 1967
 John T. James, 1967

Theo J. Powell, 1967
 Richard M. Van Swol, 1967
 William C. Spelman, 1968
 John A. Orr, 1969
 Paul J. Whitney, 1969

1970s

Jack L. Blevins, 1970
 George M. Cleveland, 1970
 David M. Rogers, 1970
 William B. Smale Jr., 1970
 Stephen E. Grodzinsky, 1971
 John S. Guzik, 1971
 Dennis R. Howland, 1971
 Timothy F. Mentkowski, 1971
 Duane R. Polson, 1971
 James R. Stigall, 1971
 Andrew B. White, 1971
 Richard L. Brown, 1972
 Bruce R. Hermann, 1972
 Park D. Waldrop, 1972
 Alfred Delio, 1973
 Patrick F. Manning, 1973
 Gary W. Nelson, 1973
 John P. Sheehan, 1973
 Dennis E. Fuoss, 1974
 John R. Noonan, 1974
 Gregory N. Ruffner, 1974
 Timothy G. Huemiller, 1975
 Thomas M. Kinter, 1975
 John S. Benway, 1976
 Gary L. DeGregorio, 1976
 Bradley D. Nelson, 1976
 David W. Smart, 1976
 Alan D. Swim, 1976
 George L. Gidzinski, 1977
 Newton E. Johnson, 1977
 Neil T. Kamikawa, 1977
 Laurence D. Lewicki, 1977
 Philip P. Mann, 1977
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Shawn T. Carolan, 1996
Suzanne E. Landry, 1997
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Gliner, continued from page 21

had never been used in external defibrillators. The biphasic wave forms require less energy to produce a shock, enabling Gliner

and his team to make their external defibrillator about half the size of conventional external defibrillators.

“Biphasic wave technology is widely used now,” said Gliner. “Most, if not all, of the major manufacturers of defibrillators have a biphasic wave form. I think we did really advance the state of the art then.”

Not only was the Heartstream defibrillator portable, it was as easy to use as a first-aid product. Heartstream researchers had developed an algorithm to advise when and whether to shock a person during cardiac arrest. Their ap-

proach measured how to deliver shocks to the heart from the surface of the skin without overshocking.

In 1996, four years after Heartstream was founded, the Forerunner defibrillator was introduced. That same year, American Airlines bought Forerunners for its fleet of commercial aircraft. According to a July 2003 article in USA Today, the Heartstream AED has saved 38 lives aboard American Airlines planes since being introduced.

Although only 38, Gliner holds 27 patents in defibrillation and cortical stimulation technology, and he manages Northstar’s intellectual property portfolio. In addition to his bachelor’s degree from Illinois, Gliner has a master’s degree from Johns Hopkins University in biomedical engineering. He believes this

education has helped him move from one medical technology to another.

“I think it was a natural progression,” he said about transitioning from defibrillation to stroke-recovery technology. “I had to update myself on the anatomy and physiology of the nervous system, but I had a good background for that from my experience at Illinois and Johns Hopkins.”

He added: “One of the great advantages I have is that I work well with the engineering team because I understand their needs, and I can interface those

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Champaign Country Club
- June 26
ece distinguished alumni and young alumni awards presentation
University of Illinois campus
- July 13
ece alumni reception (during the semicon west conference)
San Francisco, CA
- September 4
illinois vs. florida a&m football
Memorial Stadium
- September 11
illinois vs. ucla football
Memorial Stadium
- September 18
illinois vs. western michigan football
Memorial Stadium
- September 24
ece alumni association board meeting
University of Illinois campus
- September 25
illinois vs. purdue football
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- October 16
illinois vs. michigan football
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- October 22-24
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- October 30
illinois vs. iowa football
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