

### Electrical engineer named provost

Craig Chamberlain, U of I News Bureau



Linda P.B. Katehi

Linda P.B. Katehi, the former Dean of Engineering at Purdue University, began her duties as provost and vice chancellor for academic affairs at Illinois on April 1. Her faculty affiliation is with ECE. Chancellor Richard Herman said Katehi is a perfect choice for Illinois. "She is engaging, quick and has experience with strategic planning. She has accomplished much in

her time at Purdue and has a great deal of support there, as well as from those in the national community. We are enormously excited that she will be joining us in a leadership role."

Katehi, a native of Greece, earned a degree in mechanical and electrical engineering from the National Technical University of Athens in 1977. She came to the United States in 1979 to

study at the University of California at Los Angeles and earned master's and doctoral degrees in electrical engineering there in 1981 and 1984.

Katehi began her academic career in 1984 as a professor of electrical engineering at the University of Michigan, where she stayed for 18 years. Starting in 1994, she served in a succession of administrative roles in the College of Engineering, culminating with the position of associate dean for academic affairs from September 1999 through 2001.

Katehi said she was attracted to the position at Illinois because of the University's reputation and the opportunity to work with a new president and chancellor who are plotting the campus' future course. "It is very exciting for me to become a member of this team, and I look forward to participating in a very exciting future," she said.

Katehi said she hopes to foster an environment that en-

Provost, continued on page 10

### Adesida named College of Engineering dean

By Rick Kubetz, College of Engineering



Ilesanmi Adesida

ECE Professor Ilesanmi Adesida, the Donald Biggar Willett Professor of Engineering, is the new dean of the College of Engineering at Illinois. No stranger to leadership within the college, Adesida has served as the director of the Micro and Nanotechnology Laboratory and the Center for Nanoscale Science and Technology. He was named interim dean in June 2005,

and becomes the 13th dean since the inception of the College of Engineering in 1870.

"Ilesanmi (Ade) Adesida is an established leader on the University of Illinois campus, with a record of success as a center director and as interim dean," said Richard Herman, the chancellor of the Urbana campus. "He has demonstrated exemplary

stewardship of the College of Engineering over the past year, as well as a compelling vision for the future of the college.

"His intellectual vitality, energy and enthusiasm are impressive, and will be critical in pursuing emerging opportunities in the field of engineering and attracting external partners to strengthen and sustain new directions. I have every confidence in Ade's leadership ability and full trust in his vision for the future."

After earning his BS, MS, and PhD in electrical engineering from the University of California at Berkeley, Adesida was an IBM Postdoctoral Fellow at the National Research and Resource Facility for Submicron Structures (NRRFSS). In the mid-1980s, he was a visiting assistant professor of electrical engineering at Cornell University in Ithaca, New York, and later headed the electrical engineering department at Abubakar Tafawa Balewa University in Bauchi, Nigeria.

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## Department head's message

Recently, the scientific journal *Applied Physics Letters* listed the five most important papers published in that journal over its 43-year history. Not one, but two of those papers were written by ECE faculty. In fact, Professor Nick Holonyak Jr. was a co-author of both of those papers. Professor Milton Feng, postdoctoral research associate Gabriel Walter, and graduate student Richard Chan were co-authors on one of them. (See related story on page 3.)



Richard E. Blahut

Both of these papers present astounding research achievements. The individuals involved can rightly be proud of this distinction, and, as part of the ECE family, we can all share, to some small degree, in this pride.

As the head of this ECE Department, I feel immense pride in these accomplishments. But having said this, I must ask myself what I have done to be proud of. This department continues to be one of the most productive sources of ideas, inventions, and innovations in the world. My primary role is to “get out of the way.” My job is the recruiting and retention of absolutely the best faculty possible, finding discretionary money, and turning them loose. I believe that great men and women can’t be managed, only nurtured.

Our pride doesn’t end with research. This past fall, ECE graduated another crop of outstanding engineers: 346 bachelor’s, 124 master’s, and 53 doctoral degrees were conferred. Congratulations to our students and faculty for their hard work this past school year. As many of you know, earning a degree from ECE Illinois is no small accomplishment. Our graduates take with them a unique blend of theory, practice, and leadership.

It’s a challenge for our staff to keep up with all of the accomplishments of our faculty, let alone our students and alumni. It’s important to me that we tell those stories and share good news with each other through this newsletter. So, to ensure that we’re covering the many accomplishments that make us proud, please don’t hesitate to drop us a note from time to time.

Regards,

A handwritten signature in black ink that reads "Richard E. Blahut". The signature is written in a cursive, slightly slanted style.

Richard E. Blahut

(Editor’s note: See Alumni class notes on page 32 for the best ways to keep us abreast of your work.)

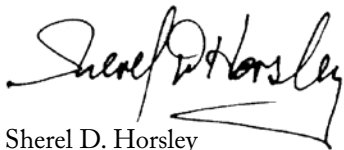
## From the Alumni Association board president

Last September I had the privilege of attending the installation ceremony for B. Joseph White as the 16th president of the University of Illinois. In his inaugural address he characterized the University as “high achieving, under-recognized and under-resourced.”

Dr. White noted that while the state of Illinois will continue to play a vital role in resourcing the mission of the University, private donors will play an increasingly important role in assuring that strategic objectives are met. He stressed the need for leadership among our students and alumni “because earning a degree is like investing in stock—except that you can never sell it. You have a deep self-interest in maintaining the U of I as a top-flight institution.”

As alumni of the Electrical and Computer Engineering Department we know firsthand about top-flight learning. Our ECE Department, one of the largest in the world, is consistently ranked in the top four along with MIT, Stanford, and Berkeley. Yet, when it comes to fostering a sense of tradition and an understanding of philanthropic giving, many feel that we are behind our peers. Your ECE Alumni Board has spent a lot of time discussing this issue, and it is a difficult one to fully understand. We need a better environment for engendering a sense of tradition—we have outgrown Everitt Lab. Everitt has no common spaces that support non-class-time activities—it is difficult to build a sense of tradition in this environment. We desperately need a new ECE building. We also need to establish stronger, lasting links to our alumni base of nearly 20,000. There are certainly no easy answers, but the board continues its discussion on the issue. It will take a lot of time to change the way we think about this great institution that has given us the opportunities we all have had. But it can be done.

Let’s all do our part in responding to Dr. White’s alumni leadership challenge.



Sherel D. Horsley



Sherel D. Horsley



ECE graduates and their parents were honored with a department-sponsored brunch on May 14. Alumnus Chris George (BSEE '97, MSEE '99) (right) addressed the audience. He is pictured with Barbara Blahut, Dick Blahut, Emma Marshall, and Seth Hutchinson.

## Department of Electrical and Computer Engineering at the University of Illinois at Urbana-Champaign

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# Hidden structure revealed in characteristics of transistor laser

By James E. Kloeppel, U of I News Bureau

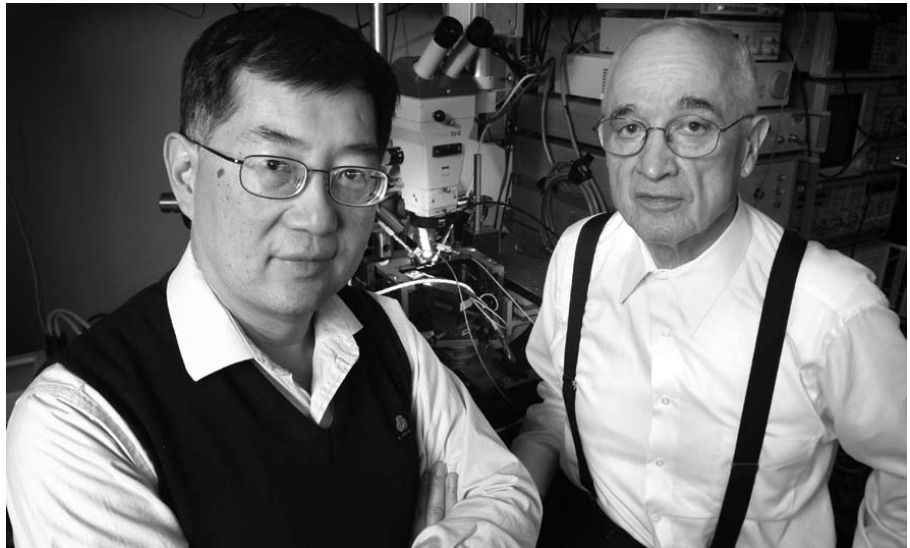
The transistor laser, invented by ECE scientists has been full of surprises. Researchers recently coaxed the device to reveal fundamental properties of the transistor, and of the transistor laser, moving it a step closer to commercialization.

As reported in the April 3 issue of the journal *Applied Physics Letters*, Nick Holonyak Jr., Milton Feng, and colleagues at Illinois explored the current-voltage relationship in a transistor laser. During stimulated emission, the laser light allowed the scientists to see into the device and study its elusive electronic structure.

“We were able to look at the transistor’s operating characteristics, look inside of the transistor, and see features and behaviors that we couldn’t see before,” said Holonyak, a John Bardeen Endowed Chair in Electrical and Computer Engineering and Physics. “The current-voltage characteristics were clearly distorted under stimulated recombination, compared to ordinary 58-year-old-transistor spontaneous recombination.”

The transistor laser employs a quantum well and a resonator in the base to control electron-hole recombination and electrical gain. By blocking the laser resonator with white paste, the researchers converted the device into an ordinary transistor. Because the process is reversible, the researchers could compare collector characteristics when the device was functioning as a normal transistor and when it was functioning as a transistor laser, something that was never before possible.

“We found significant structure in the current-voltage characteristics of the transistor laser that can be mapped in detail and related to the quantum-well carrier recombination,” said Holonyak, who also is a professor in the University’s Center for Advanced Study, one of the highest



Photos by Kerame Ross.

ECE Professors Milton Feng and Nick Holonyak Jr.

forms of campus recognition.

“We were also able to correlate optical measurements with electrical measurements of quantum-well properties,” Holonyak said.

The transistor laser combines the functionality of both a transistor and a laser by converting electrical input signals into two output signals, one electrical and one optical. Photons for the optical signal are generated when electrons and holes recombine in the base, an intrinsic feature of transistors.

“When we weaken the strength of the photon generation process, we change the nature of the process connecting the electron and the hole, and we change their behavior in an electrical sense,” Holonyak said. “When we let the device operate as a transistor laser, however, the photons streaming out let us look inside and see more of the mechanics that goes on. We see features of the transistor never revealed before.”

The change in gain and laser wavelength corresponding to stimulated

recombination on quantum-well transitions can be compared to operation in spontaneous recombination and used with conventional transistor charge analysis to determine some of the dynamic properties of the transistor laser.

“This transistor laser is letting us see the properties and mechanics of how fast the electrons and holes generate photons, and we can turn laser photon generation on and off,” said Feng, the Holonyak Professor of Electrical and Computer Engineering. “This allows us to alter the processes and see how the speed and time factors are changing. This is the first time we could directly determine the lifetime, the speed of stimulated recombination. The transistor has now made certain laser measurements easier or more convenient.”

This capability opens the door to developing transistor lasers that operate at different speeds for a variety of commercial applications, Feng said. “Until now, we had missed something important and

Continued on page 3

## Transistor laser

(continued from page 2)

fundamental about the boundaries of what the photon can do, of what the electron and hole can do, and of what the semiconductor can do," Holonyak said. "We found those boundaries to be much

further out than we had ever imagined, which now makes our prognosis for the transistor laser much more optimistic."

Co-authors of the paper with Feng and Holonyak are postdoctoral research asso-

ciates Richard Chan and Gabriel Walter, and graduate student Adam James. The Defense Advanced Research Projects Agency funded the work.

## Illinois researchers produce two most important scientific papers

By James E. Kloeppel, U of I News Bureau

Two of the five most important papers published in the 43-year history of the journal *Applied Physics Letters* were written by ECE faculty members.

Nick Holonyak Jr., a John Bardeen Endowed Chair in Electrical and Computer Engineering and Physics, was an author of both papers, which span the development of the light-emitting diode to the invention of the transistor laser.

As the American Institute of Physics celebrates its 75th anniversary this year, editors of the organization's research journals were asked to select the five most significant papers published in each journal. In the case of *Applied Physics Letters*, thousands of papers were considered—not only for scientific content, but also for the impact a paper had, or might have, on industry or the general public.

The first of Holonyak's chosen papers appeared in the journal's December 1, 1962, issue and reported the first semiconductor laser in the visible spectrum and the first visible light-emitting diode, which formed the basis for today's high brightness light-emitting diodes.

"This may be the most important piece of work I've ever done," said Holonyak, who was employed at the General Electric Co. in Syracuse, New York, at the time. Holonyak's techni-

cian, Sam (Severio) Bevacqua, was the paper's only co-author.

The second paper selected by the journal appeared in the September 26, 2005, issue and reported the first room-temperature operation of a transistor laser. "I consider this a very important development and maybe—time will tell—a great development," Holonyak said.

In addition to Holonyak, the paper's co-authors were ECE Professor Milton Feng, and postdoctoral research associate Gabriel Walter and graduate research assistant Richard Chan (now at BAE Systems).

The Illinois researchers first reported the demonstration of a light-emitting, heterojunction bipolar transistor in the journal's January 5, 2004, issue. They described the first laser operation of the light-emitting transistor in the November 15, 2004, issue, but at that time the transistor laser had to be chilled with liquid nitrogen to minus 73 degrees Celsius.

By demonstrating room-temperature operation, the researchers moved the transistor laser much closer to practical applications.

"Room-temperature transistor lasers could facilitate faster signal processing, large capacity seamless communications, and higher performance electrical and optical integrated circuits," said Feng, the Holonyak Professor of Electrical and Computer Engineering. Feng has received

worldwide recognition for his research on heterojunction bipolar transistors. He has produced the world's fastest bipolar transistor, a device that operates at a frequency of more than 700 gigahertz.

The transistor laser combines the functionality of both a transistor and a laser by converting electrical input signals into two output signals, one electrical and one optical.

"By incorporating quantum wells into the active region, we have enhanced the electrical and optical properties, making possible stimulated emission and transistor laser operation," Holonyak said. "What we have here is a new form of transistor and a new form of laser."

The transistor laser also raises the possibility of replacing wiring between components at the chip- or board-level with optical interconnects, offering more flexibility and capability in true electronic-integrated circuits.

"Fifty-eight years after [John] Bardeen and [Walter] Brattain invented the transistor, we have hit upon something new that is surprisingly fundamental and rich in possibilities," Holonyak said. "I am happy to have had a hand in this."

# Two faculty members receive endowed professorships

By Tom Moore



Photos by Thompson-McClellan.

On March 1, Bill Sanders (left) was invested as a Donald Biggar Willett Professor in Electrical and Computer Engineering. Tom Overbye (right) was invested as the first Fox Family Professor of Electrical and Computer Engineering.

At a ceremony held in the auditorium of the Beckman Institute on March 1, William Sanders was invested as a Donald Biggar Willett Professor in Electrical and Computer Engineering, and Thomas Overbye was invested as the first Fox Family Professor in Electrical and Computer Engineering.

Speaking to the crowd at the ceremony, Chancellor Richard Herman said that these professorships and the investiture ceremonies “give us a chance to honor [the recipients’] work and celebrate their contributions not only to our university, but to the world.” College of Engineering Dean Ilesanmi Adesida concurred, noting that “when we have these occasions, I call it a validation of excellence.”

The Donald Biggar Willett Professor of Engineering is named for Donald Biggar Willett (1897-1981), who attended Illinois from 1916 to 1922.

Sanders is a renowned expert in methods for assessing computer system and network dependability, security, performance, and performability. The director

of the Information Trust Institute (ITI) at Illinois, Sanders has engaged in research that has made Illinois one of the nation’s most important centers for research in information trust. Sanders developed the UtraSAN and Mobius tools, which assess performability of systems represented as stochastic activity networks. These tools are used widely in academic institutions as well as in industry.

After receiving the medallion that recognizes his receiving the Willett professorship, Sanders said, “This is just such an honor.” He recognized his colleagues, saying, “It’s really wonderful to work with all of you.” The growth of ITI is one aspect of his career at Illinois of which Sanders was particularly proud. “We’ve brought something that was only a vision a few years ago to something that is having a real impact.”

The Fox Family Professor in Electrical and Computer Engineering was made possible by a contribution from Peter and Kim Fox. Peter Fox is founder of Fox Development Corporation (FDC), a

real estate development and investment firm. A subsidiary of this company, Fox Ventures, has provided startup capital for numerous technology firms in the area. Fox also serves as manager of Fox/Atkins Development, LLC, which has developed and manages the University of Illinois Research Park in Champaign. Through the Fox Family Professorship, they wish to help business ideas blossom and flourish.

Overbye is an expert in power system computational algorithms, operations, control, and visualization. His research is concerned with improving power system trustworthiness by better using information from the growing stream of data generated by the operation of the power grid. In 1996, Overbye, along with ECE Professors George Gross and Pete Sauer, and ECE alumnus Mark Laufenberg, founded PowerWorld Corp., which markets the PowerWorld Simulator, a software program Overbye developed that simulates the operation of a multi-region power system over a specified period of time, from several minutes to several days.

The teaching and research work Overbye has done at Illinois has been an enjoyable experience for him. “I’ve got a lot of really wonderful colleagues,” he said. He also described the thrill he got visiting a power plant that was using the PowerWorld Simulator in its operation. As he said, “I like seeing engineering brought out into the real world to help people.”

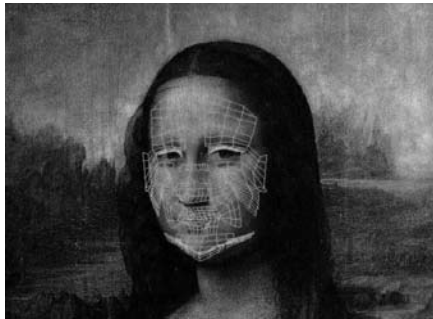
# Science decodes Mona Lisa's smile

By Steve McGaughey, Beckman Institute

Science, through the power of face-tracking technology, can now tell us in hard numbers what many who have seen the Mona Lisa only sensed: the deeper emotions hinted at by her famous, enigmatic smile.

Professor Nicu Sebe of the University of Amsterdam says he can calibrate those emotions using face-tracking software developed in collaboration with Professor Tom Huang, the William L. Everitt Professor of Electrical and Computer Engineering at Illinois. Sebe, Huang, and Huang's students have spent years writing algorithms that quantify facial expressions and the emotions they represent into a face-tracking software program. Recently, for fun, Sebe decided to apply the program to an image of the Mona Lisa, painted by Leonardo da Vinci probably between 1503 and 1506. The subject of the Mona Lisa is thought to be Lisa Gherardini, wife of a cloth merchant from Florence, Italy. But her true identity and other aspects of the painting's history are as mysterious as her smile.

Now, at least that part of the painting's mystery can be explained. Sebe said he used the computer recognition software program to compute Mona Lisa's emotional state. Sebe placed a virtual wireframe model first developed by Huang and his students over the image's face and computed displacements from a prototypic, neutral Caucasian female face from the Cohn-Kanade database at Carnegie Mellon to obtain the results. The numbers showed a great degree of happiness (82.67 percent), along with lesser feelings of disgust (9.17), fear (5.81) and a tiny bit of anger (2.19). Sebe interprets the disgust



*The Mona Lisa's expression was analyzed using face recognition software developed by ECE Professor Tom Huang.*

percentage as possibly being a measure of irony (many viewers have sensed an ironical smile), but he is not sure how to interpret the fear angle.

In a description of its most famous work of art, the Louvre says on its Web site that the subtle, happy smile gracing the best-known portrait sitter in history is key to Leonardo da Vinci's masterpiece: "Leonardo made this notion of happiness the central motif of the portrait: it is this notion which makes the work such an ideal."

Huang, who is co-chair of the Human-Computer Intelligent Interaction Research Initiative at the Beckman Institute for Advanced Science and Technology, said the software program assesses six emotional categories: happiness, surprise, anger, disgust, fear, and sadness. He said Sebe's findings "validate the algorithm in terms of the dominant emotion" of happiness, but more work needs to be done to assess some of the deeper emotions suggested by Mona Lisa's smile.

"If you're interested in things like enigma or mystery, maybe these six categories are not enough," Huang said. "But

this is just for fun. We really need to talk to psychologists or artists to find out how do you model those more subtle aspects of facial expression."

Even though there have been face-tracking techniques applied to the Mona Lisa, Huang said none have tried to interpret the subject's emotions in this way.

"A number of groups have been working on similar things, but surprisingly no one has thought of applying it to the Mona Lisa," Huang said.

While decoding the Mona Lisa may be fun, the human facial computer recognition project Huang and Sebe collaborated on has important potential applications, including business and educational uses. For example, Huang has been working on improving the computer interface experience for middle school students by using a face-tracking program to give the computer a better understanding of the user's emotional state. The work on emotion analysis by Huang and his students was funded by the National Science Foundation and the Yamaha Motor Company.

# Eight faculty named IEEE Fellows

By Tom Moore

In November 2005, the Institute of Electrical and Electronics Engineers (IEEE) elected eight faculty members of the ECE Department as Fellows.

The grade of Fellow is designated by the IEEE to be one that “recognizes unusual distinction in the profession.” The accomplishments that this distinction honors are those that have provided important contributions to the advancement of engineering, science, or technology and have provided value to society as a whole. Election to IEEE Fellow grade is one of the highest honors that can be bestowed upon an individual by the Institute. It is an honor to have even one individual at an institution achieve this rank. It is highly unusual to have so many recipients of this honor from one institution, and this speaks highly of the quality of the faculty at Illinois.



Kanti Jain

Kanti Jain (MSEE '70, PhD '75) was recognized “for contributions to high resolution excimer laser lithography.” Excimer laser lithography is an important component of semiconductor chip manufacturing, and Jain’s pioneering work in this field resulted in his receiving two Outstanding Innovation Awards from IBM.



Zhi-Pei Liang

Recognized “for contributions to biomedical applications of magnetic resonance imaging,” Zhi-Pei Liang has performed research that has resulted in major contributions to the theory, techniques, and biomedical applications of the model-

based approach to high-speed magnetic resonance imaging (MRI). He was the first to propose the generalized imaging concept, which results in great improvements in imaging speed and efficiency.



Michael Loui

Michael Loui has long been an advocate and innovator in ethics education. Recognized “for leadership in teaching of engineering ethics,” Loui has created engineering ethics courses that have served as models for other institutions. His research has been able to document how ethics instruction affects student’s perception of their professional identities.



Thomas Overbye

Thomas Overbye was recognized “for contributions to power system education and simulation.” Overbye is an expert in power system computational algorithms, operations, control and visualizations. PowerWorld Simulator is a software program Overbye developed that simulates the operation of a multiregional power system.



Naresh Shanbhag

Naresh Shanbhag, who was recognized “for development of a communication-centric design paradigm for low power systems on a chip,” has developed a paradigm in which techniques used in communications such as equalization and coding are applied to systems-on-a-chip.

In his work on communications networks, Rayadurgam Srikant (MSEE '88, PhD '91) combines queuing theory, con-



Rayadurgam Srikant  
networks.”

trol theory, information theory, and game theory to solve problems. The IEEE has recognized him “for contributions to modeling and control of communication



Venugopal Veeravalli

works.” Venugopal Veeravalli (PhD '92) was recognized “for contributions to wireless communication systems and sensor networks.” Veeravalli has long been a leading researcher in the development of techniques to optimize the quality and capacity of wireless telecommunications systems, and to develop a framework for the design, analysis and application of sensor networks.



Martin Wong

Martin Wong has become a leader in devising and developing software that is used to design complex VLSI circuits. For this work, he has been recognized “for contributions to algorithmic aspects of computer-aided design (CAD) of very large scale integrated (VLSI) circuits and systems.”

IEEE formed in 1963 with the merger of the AIEE (American Institute of Electrical Engineers, formed in 1884), and the IRE (Institute of Radio Engineers, formed in 1912). It is the world’s leading professional association for the advancement of technology.



# Perfecting new musical instrument an ongoing process

By Ryan Bicking

ECE Professor Lippold Haken has spent the last two decades designing, developing, and experimenting with a musical instrument like no other—the Continuum Fingerboard. It has no keys, buttons or strings. The playing surface is simply a soft, red fabric that stretches the length of the instrument, but it offers a wide range of possibilities for musical expression.

Although he began selling the instrument in 2000, Haken has continued to work on expanding those possibilities even further. Until recently, the Continuum played much like a piano, in the sense that each finger pressed down played its own note. But Haken recently added a feature that allows the instrument to also be played like a saxophone, where multiple fingers can be pressed down altogether to play one pitch.

At first glance, it may appear to be an expensive keyboard, but the Continuum provides much more control over what note is played. Pressing down on the playing surface produces a note depending not only on where the fingers are but also on how hard the fingers are pressed down. The position of the fingers controls the timbre of the note while the pressure used provides dynamic control. Sliding the fingers gives glissando while rocking provides vibrato.

Underneath the red fabric are 256 rods mounted on piano-wire springs. The rods, with magnets on both ends, are placed between two rows of sensors that measure the positions of the magnets. When pressure is applied on the playing surface, the affected rods underneath move, and the magnets attached to the rods move closer to the sensors. Software in the internal



Mark Smart, a musician and ECE staff member, demonstrates the Continuum Fingerboard for visitors at the 2006 Engineering Open House.

computer detects this movement and plays the corresponding note.

Jordan Rudess, a Julliard-trained keyboardist, has been touring with a Continuum Fingerboard while playing with the progressive metal band Dream Theater. In the past six months, Haken has also sold Continuum Fingerboards to John Paul Jones, the bass guitarist and keyboardist of Led Zeppelin, and Terry Lawless, a keyboard specialist who has toured with U2, David Bowie, Cher, and Bruce Springsteen. Still, Haken does not expect to hear them playing the Continuum Fingerboard anytime soon.

“All these people are extremely talented but extremely busy and perfectionists,” Haken said. “So you’re not going to see them until they get really good, and they’re

going to practice for a long time just like any other instrument before they’re on stage with it.”

Though the Continuum may not make it on stage with Jones or Lawless right away, it has already made it to the big screen. In last summer’s thriller *War of the Worlds*, the sound of the invading aliens was made using the Continuum Fingerboard.

But ultimately, financial success is not Haken’s major concern. The Continuum is a product of his passion for music and engineering, not a desire to get rich.

“I have realistic expectations,” Haken said. “I do this because I enjoy it. One of the reasons why I’ve been so successful is because I don’t have immediate goals of making money and the pressure of making investors happy.”

For more information on the Continuum Fingerboard, visit [www.hakenaudio.com](http://www.hakenaudio.com).

# New theory explains electronic and thermal behavior of nanotubes

By Jim Kloeppe, U of I News Bureau

Researchers at the University of Illinois at Urbana-Champaign have made an important theoretical breakthrough in the understanding of energy dissipation and thermal breakdown in metallic carbon nanotubes. Their discovery will help move nanotube wires from laboratory to marketplace.

The remarkable electrical and mechanical properties of metallic carbon nanotubes make them promising candidates for interconnects in future nanoscale electronic devices. But, like tiny metal wires, nanotubes grow hotter as electrical current is increased. At some point, a nanotube will burn apart like an element in a blown fuse.

“Heat dissipation is a fundamental problem of electronic transport at the nanoscale,” said Jean-Pierre Leburton, the Gregory Stillman Professor of Electrical and Computer Engineering and co-author of a paper published in the December 21 issue of the journal *Physical Review Letters*. “To fully utilize nanotubes as interconnects, we must characterize them and understand their behavior and operating limits.”

Up to now, no coherent interpretation had been proposed that reconciled heat dissipation and electronic transport and described thermal effects in metallic carbon nanotubes under electronic stress, said Leburton, who is also a researcher at the Beckman Institute for Advanced Science and Technology, at the Micro and Nanotechnology Laboratory and at the Frederick Seitz Materials Research Laboratory. “Our theoretical results not only reproduce experimental data for electronic transport, they also explain the odd behavior of thermal breakdown in these nanotubes.”



ECE Professor Jean-Pierre Leburton

For example, in both theory and experiment, the shorter the nanotube, the larger the current that can be carried before thermal breakdown occurs. Also, the longer the nanotube, the faster the rise in temperature as the threshold current for thermal heating is reduced.

In nanotubes, heat generated by electrical resistance creates atomic vibrations in the nanostructure, which causes more collisions with the charge carriers. The additional collisions generate more heat and more vibrations, followed by even more collisions in a vicious cycle that ends when the nanotube burns apart, breaking the circuit.

“Short nanotubes can carry more current before burning apart because they dissipate heat better than longer nanotubes,” Leburton said. “Although the entire nanotube experiences resis-

tance heating, the electrical contacts at each end act as heat sinks, which in short nanotubes are relatively close to one another, leading to efficient heat removal.”

This phenomenon also explains why the highest temperature always occurs in the middle of the nanostructure, Leburton said, “which is the furthest point away from the two ends, and where burning occurs in longer nanotubes under electrical stress.”

In another important finding, Leburton and his colleagues have revised the common belief that charge carriers go ballistic in short metallic nanotubes having high currents. Researchers had previously thought that charge carriers traveled from one terminal to the other like a rocket; that is, without experiencing collisions. “We have shown that the high current level in short metallic nanotubes is not due to ballistic transport but to reduced heating effects,” Leburton said. “Owing to their large concentration, the charge carriers collide efficiently among themselves, which prevent them from going ballistic. Even in short nanostructures, the current level is determined by a balance between the attractive force of the external electric field and the frictional force caused by the nanotube thermal vibrations. The collisions among charge carriers help the energy transfer to the nanotubes which results in heat dissipation.”

Co-authors of the paper are Leburton, ECE Professor Andreas Cangellaris, and physics graduate student Marcelo Kuroda.

The work was funded by the National Science Foundation and the Beckman Institute.

# Trusted ILLIAC will transform large-scale computing

By Rick Kubetz, College of Engineering



Photo by Rick Kubetz.

ECE Professor Bill Sanders addresses the audience at a news conference launching the Trusted ILLIAC Cluster on May 10.

The original ILLIAC computer, built by the University of Illinois at Urbana-Champaign in 1952, was the first computer in the world created and owned entirely by an educational institution. It weighed five tons and contained 2,800 vacuum tubes.

On May 10, the University officially launched the Trusted ILLIAC Cluster at a special event hosted by Chancellor Richard Herman at the University Club of Chicago. The launch announcement was followed by an executive roundtable discussion by national leaders in high-technology industries on the challenges and opportunities in next-generation large-scale computing infrastructures.

“For many years, the University of Illinois at Urbana-Champaign has played a leading role in the development of large-scale, high-performance computing systems, and Trusted ILLIAC represents the latest generation of such machines,” Herman said.

When completed, Trusted ILLIAC will incorporate a 500-processor pro-

grammable hardware/software cluster designed and built by researchers at the Information Trust Institute (ITI) and Coordinated Science Laboratory (CSL). It promises to make large-scale computing trustworthy, providing an application-specific level of reliability and security in a transparent manner while delivering high performance.

“Now Illinois is launching a project that again pushes computing forward,” said Wen-mei Hwu, the AMD Jerry Sanders Chair of Electrical and Computer Engineering who leads the Embedded and Enterprise Systems Theme at ITI. “With corporate support from Hewlett-Packard, Advanced Micro Devices, and Xilinx, as well as a National Science Foundation grant, Illinois explores a new frontier with Trusted ILLIAC.”

Back in the days of ILLIAC IV, which was the largest and fastest computer in the world in 1965, the challenge of large-scale computing was performance: creating computers that are faster and ever more powerful. But in today’s world, building large, fast systems is no longer the biggest challenge.

“Today, the greatest challenge is building large, fast systems that are secure and reliable—in a word, ‘trustworthy,’” explained ITI Director Bill Sanders, a Donald Biggar Willett Professor in Electrical and Computer Engineering. Established in 2004, ITI brings together more than 60 faculty and senior researchers and more than 200 graduate students to advance state-of-the-art building systems, making them resilient to both accidental failures and malicious attacks.

According to CSL Director and ITI Chief Scientist Ravi Iyer, who is a professor of electrical and computer engineering, the need for greater security and reliability in computing has intensified as the industry begins to shift to what some have called “utility computing.” Utility computing means different companies share the same powerful cluster of processors to get their work done, increasing the need for higher levels of reliability and security.

The ITI began work on the Trusted ILLIAC cluster in Fall 2005, with the goal of setting up a small cluster of roughly 32 processors by the end of the first year. By the end of the second year, researchers aim to establish a prototype large-scale system a 500-processor cluster.

“At the end of the third year, we’ll have a full-fledged system that allows us to begin innovating,” Iyer said. “Industry and other research collaborators will also be able to use the system as a testbed to develop a whole new set of ideas.”

The Information Trust Institute has hired Molly Tracy as its first associate director. As associate director, Tracy will be responsible for overseeing the day-to-day operations at ITI, managing stakeholder relationships and the acquisition of resources for research and education programs. Tracy previously served 11 years as assistant to the department head in the ECE Department.

## Provost

continued from page 1

courages interdisciplinary research, innovation in the education of students, and diversity in a broad sense (intellectual, racial, cultural, gender, etc). “I’ve always felt that diversity is an attribute of quality, and the lack of it in a number of disciplines, at the end of the day, really harms the ability of those disciplines to achieve the quality they aspire to,” she said.

As provost, Katehi is the chief academic and budget officer for the campus. In dealing with constrained budgets and competing demands, she stressed the need to stay focused, to set priorities “that we follow clearly and consistently,” and then to invest in the future.

Katehi’s honors include a Presidential Young Investigator Award from the National Science Foundation and a Humboldt Research Award. In 1995, she was named a fellow in the Institute of Electrical and Electronic Engineers (IEEE) and in 2002 received the Distinguished Educator Award from the IEEE Microwave Theory and Techniques Society.

Katehi also has received five best paper awards, including the Marconi Premium Prize in 2001 from the IEEE. She holds or has applied for 19 U.S. patents and has graduated 37 doctoral students. In 2004, she received the Leading Light Award for Women in High Tech from the state of Indiana.

## Dean

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Adesida joined the Illinois faculty in 1987, and currently holds appointments as a professor of electrical and computer engineering, and materials science and engineering. He is a researcher at the Coordinated Science Laboratory and the Beckman Institute for Advanced Science and Technology. His research interests include nanofabrication and nanotechnology, and high-speed semiconductor optoelectronic devices and circuits.

As a teacher and mentor, Adesida has graduated 24 PhDs and 20 master’s degree candidates, supervised 15 postdoctoral fellows, and supervised numerous undergraduate research projects. His research has been supported by both public and private entities. In addition to holding three patents, he has 250 refereed journal articles, 180 contributed, invited, and plenary conference presentations, plus numerous invited lectures and seminars.

Adesida is a Fellow of the American Association for the Advancement of Science, the American Vacuum Society, the Optical Society of America, and the Institute of Electrical and Electronic Engineers (IEEE). He is currently serving as president of the IEEE Electron Device Society.

## Adesida, Katehi named to NAE

By Brad Petersen

The National Academy of Engineering (NAE) earlier this year announced that Provost and Vice Chancellor for Academic Affairs Linda P.B. Katehi and College of Engineering Dean Ilesanmi Adesida have been elected to membership. Both administrators have appointments in the Department of Electrical and Computer Engineering. ECE Alumni Admiral Archie R. Clemins, Daniel W. Dobberpuhl, and Dusan Zrnic were also honored. NAE Membership is considered one of the highest engineering distinctions attainable.

Katehi was cited for her contributions to 3-D integrated circuits and on-wafer packaging and to engineering education.

Adesida, a Donald Biggar Willett Professor of Engineering, was cited for his contributions to the nanometer-scale processing of semiconductor structures and applications in high-performance electronic and optoelectronic devices.

Illinois native Admiral Archie R. Clemins earned both his bachelor’s and master’s degrees in electrical engineering from Illinois. Clemins served as commander of the United States Pacific Fleet from 1996 to 1999 and commander of the Seventh Fleet from 1994 to 1996. Clemins is credited with bringing Naval operations into the electronic age. He is a recipient of the ECE Distinguished Alumni Award, Distinguished Service Medal, Meritorious Service Medal, Navy Achievement Medal, 1998 Armed Forces Communications and Electronics Association Sarnoff Award, Navy Commendation Medal with one gold star, and Legion of Merit award with six gold stars.

Daniel W. Dobberpuhl, another Illinois native, earned his bachelor’s degree in electrical engineering from Illinois in 1967. He is the CEO and cofounder of P.A. Semi, Inc., a semiconductor company based in Santa Clara, California. Dobberpuhl is an IEEE Senior Member and a Digital Equipment Corporation Senior fellow. He is also recipient of the ECE Distinguished Alumni Award and the 2003 IEEE Solid State Circuits Technical Field Award for Pioneering Design of High-speed and Low-power Microprocessors.

Dusan Zrnic earned his bachelor’s degree in electrical engineering at the University of Belgrade in his native Yugoslavia prior to coming to Illinois, where he completed his master’s degree in 1966 and his PhD in 1969, both in electrical engineering. Zrnic is the leader of the Radar and Remote Sensing Research group at the National Severe Storms Laboratory. He played an instrumental role in the design of the national Doppler Weather Radio system. Zrnic is an IEEE Fellow and his awards include the Presidential Rank Award, IEEE Donald G. Fink Prize Award, IEEE Harry Diamond Award, and WMO Vaisala Award.

# Holonyak Jr., ECE alumni inducted into Consumer Electronics Hall of Fame

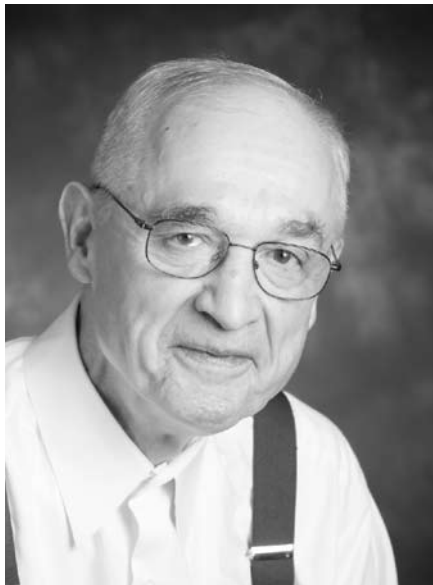
By Rick Kubetz, College of Engineering

Innovations and innovators are nothing new to the University of Illinois at Urbana-Champaign. That fact was reinforced recently when the Consumer Electronics Association (CEA) announced its new class of inductees into the Consumer Electronics (CE) Hall of Fame. Four of those honored—one-third of the 2006 class—hailed from ECE Illinois.

New inductee Nick Holonyak Jr., the John Bardeen Endowed Chair in Electrical and Computer Engineering and Physics, invented the first light-emitting diode in 1962 while at General Electric. He is internationally recognized for major contributions to elemental and compound semiconductors, including semiconductor lasers and incoherent light emitters.

In collaboration with ECE Professor Milton Feng, Holonyak co-invented the transistor laser that combines the functionality of both a transistor and a laser by converting electrical input signals into two output signals—one electrical and one optical. Holonyak is the first to make electron devices using III-V semiconductor alloys and to demonstrate quantum-well heterostructure lasers, now used in compact disc players and fiber-optic cables. He also was the first to demonstrate stable native oxides on aluminum-bearing III-V compounds, now the basis for vertical-cavity surface-emitting lasers.

With more than 500 journal papers and 34 patents to his credit, Holonyak is one of only 13 Americans to have won both the National Medal of Science (1990) and the National Medal of Technology, presented by President Bush in 2002. He is a member of the National Academy of Engineering and the National Academy of Sciences, and in 2004, he won the Lemelson-MIT Prize—the world's largest



Nick Holonyak Jr.

single cash prize for invention.

Three College of Engineering alumni—Donald Bitzer (BSEE '55, MSEE '56, PhD '60), Robert H. Willson (PhD '66), and the late H. Gene Slottow (PhD '64)—were inducted into the CE Hall of Fame for inventing the plasma display in 1960, the precursor to today's high-definition plasma televisions. The monitor was a result of work the faculty at the Coordinated Science Laboratory (CSL) had been doing in developing the first computer-assisted instructional program in the world: PLATO (Programmed Logic for Automatic Teaching Operations.)

As one of the most distinguished faculty members in the ECE Department, Bitzer realized early in PLATO's development that a display with memory was needed to make the system successful. He and his colleagues—Slottow, then a senior research engineer, and Willson, who was working as an assistant in the CSL help-

ing to develop PLATO—subsequently devised an electronic display in which each pixel on the screen glowed like a little neon sign. The plasma panel was both a display and a storage device.

The plasma monitor accepted digital information directly from the computer and stored it on the panel, solving the scalability problem that plagued the use of cathode ray tubes in computer display monitors. This invention has enabled the development of large-screen flat-panel televisions for modern TV and DVD technologies, which earned the inventors the Scientific and Technological Emmy from the National Academy of Television Arts and Sciences in 2002.

The 2006 class will be inducted at the annual CE Hall of Fame awards dinner during CEA's Industry Forum in October in San Francisco. The 12 inductees will join the 97 inventors, industry executives, engineers, retailers, and journalists already inducted since the CE Hall of Fame was created in 2000.

# Research leads to reduced power usage in laptop computers

By Brad Petersen

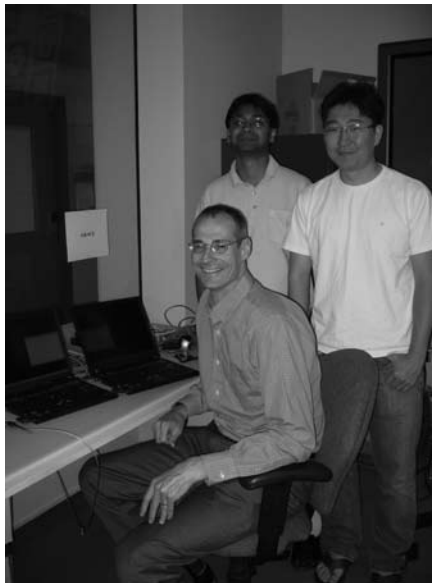
Researchers at the University of Illinois at Urbana-Champaign have found a way to reduce battery consumption in laptop computers while maintaining performance quality. The basic premise behind the Global Resource Adaptation through CoopEration (GRACE) Project is to make computer systems better coordinate interactions between hardware, network, and software allowing them to rapidly optimize resource usage.

“Suppose you’re sitting at Starbucks having a video conference with somebody using your laptop. Our system adjusts the speed of your processor, the amount of data compression, and other usage factors to maintain quality while using the least amount of energy possible,” said ECE Professor Doug Jones, one of the project’s researchers.

The GRACE system looks at all of the configuration choices for each component of the system and determines which will use the least energy at the best quality. The user provides input to help the system determine which functions are priorities, which impacts resource allocation.

This research is unique because “this is not just a hardware project, not just an operating systems project, but it encompasses hardware, applications, operating systems, and networks,” explained Sarita Adve, a computer science professor and the lead researcher on the project.

A laptop computer running the GRACE system is designed to adjust gracefully to change. “The system adapts as the environment changes. So if you move your laptop or somebody else starts using their laptop as well and creates wire-



*The GRACE Project’s interdisciplinary research team includes ECE Professor Doug Jones (seated) and Computer Science graduate students Vibhore Vardhan and Won Jeon.*

less interference, your computer will adapt and run at optimal power,” explained Jones.

So far researchers have demonstrated a typical energy savings of 24 percent across a wide range of scenarios, which means that a three-hour battery in a laptop computer with the GRACE system would run roughly 45 minutes longer than a non-GRACE laptop. Ultimately, the impact of the system is determined by the applications the user is running.

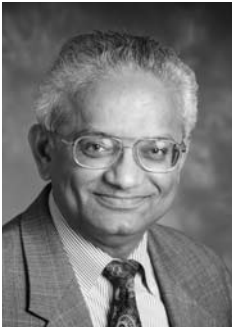
The GRACE system has the most impact for users who are running multimedia applications. “For example, if you’re on an airplane and are video conferencing on your laptop, the GRACE system will optimize your battery usage,” noted Adve.

Researchers say this is just the beginning for the GRACE Project. “As third-generation wireless phones continue to have more and more multimedia capabilities, the usefulness of this research will grow,” predicted Jones. “Wireless phones have even smaller batteries than laptops and with a smaller battery, the impact can be even greater.”

The GRACE Project has been underway since 2002 and involves an interdisciplinary team of scientists from ECE and Computer Science. Primary investigators are Adve, Jones, Robin Kravets, and Klara Nahrstedt. Student researchers are Albert Harris, Dan Sachs, Vibhore Vardhan, Chris Hughes, Won Jeon, and Wanghong Yuan. Primary funding for this research was provided by the National Science Foundation with additional funding from Texas Instruments.

# Kanti Jain returns to ECE

By Brad Petersen



ECE Professor Kanti Jain

Professor Kanti Jain has come full-circle. The newest member of ECE's faculty was once a student in this same department, completing his PhD in electrical engineering with thesis research in the physics department in 1975.

A passionate believer in the high quality of Illinois' ECE Department, Jain did not take a traditional path to becoming a professor. "I've spent most of my time in the corporate world, serving in a variety of management and technical positions," said Jain. "I'm excited because I have many experiences from my career in technology development and transitioning to industry that I would like to share with students as well as faculty and administration."

Jain's path back to the University of Illinois has gone through some of the world's top technology companies. After two years as a postdoctoral fellow at MIT, he was a member of the technical staff at Hewlett-Packard Laboratories from 1977 to 1979 in Palo Alto, California. From 1979 to 1988, he worked at IBM, where he was a manager at the Almaden Research Center in San Jose, California; a senior manager and senior scientist at the T.J. Watson Research Center in Yorktown Heights, New York; and served with the Corporate Technical Committee at IBM's Corporate Headquarters in Armonk, New York. From 1989 to 1991, he was director of technology development in advanced packaging systems at Raychem Corporation in San Jose.

In 1992, Jain added entrepreneur and business owner to his resume when he founded Anvik Corporation, a company for which he still serves as president. Based in Hawthorne, New York, Anvik produces advanced optical systems and equipment for diverse microelectronics, optoelectronics, microsystems, and biotechnology applications. Systems currently offered include large-area lithography, photoablation, and materials-processing systems for high-throughput production of flat-panel displays, multilayer circuits, optoelectronic systems, printed circuit boards, microsystems, flexible circuits, and biomolecular arrays. Anvik is in the process of opening a second facility in the University of Illinois Research Park.

At Illinois, the central theme of Jain's research is advancing the state of the art in microelectronic, optoelectronic, microsystem, and biophotonic devices by developing and exploiting novel micro- and nanofabrication technologies. These fabrication technologies enable patterning and microstructuring of a variety of organic and inorganic materials—including new polymers, semiconductors, metals, dielectrics, and biological materials—and the production of structures, devices and systems previously not deemed possible.

"We are developing the necessary combination of novel structures, materials, and processes in order to allow cost-effective fabrication of such devices that will make their implementation in a variety of scientific, commercial, and military applications practical," Jain explained.

From his discussions with faculty in several departments, Jain believes there is a broad, multidisciplinary interest in these areas, and hopes to promote several new collaborative programs. "In the short time

I've been here I've already found numerous students interested in research on these topics," noted Jain.

As a result of his 30 years of contributions to the advancement of optical imaging and microelectronics manufacturing technologies, Jain is an internationally renowned scientist and technologist. He is widely recognized for his pioneering development of excimer laser lithography, for which he received two Outstanding Innovation Awards from IBM. Excimer laser lithography is now used worldwide in semiconductor chip manufacturing and is a \$4 billion industry. Jain holds 53 patents (46 issued, seven pending) in microlithography systems and optics, and wrote the book *Excimer Laser Lithography*, published by The International Society for Optical Engineering (SPIE) in 1990. He is a fellow of IEEE, the Optical Society of America, and SPIE. He is also a former member of the Board of Directors and Executive Committee of SPIE.

# A “transporting” career

*Hess scrutinized the nanoscale while helping Illinois to build on a grand scale*

By Jamie Hutchinson

The fate of Viennese-born, ECE Professor Emeritus Karl Hess became entangled with Illinois before he knew what was happening. In the 1950s, when Hess was still a boy playing with electrical gadgets, German physicist Karlheinz Seeger visited Illinois for postdoctoral study of solid state physics with John Bardeen, the ECE professor who had invented the transistor a few years earlier and was destined for two Nobel Physics prizes. Hess went on to do his physics doctorate under Seeger at the University of Vienna, where he met Bardeen on a European lecture tour in 1971, shortly after finishing his thesis about electron transport in semiconductors. By 1973, thanks to Bardeen, Hess was transported to Illinois on a Fullbright scholarship. He was hired to the ECE faculty in 1977 and recently retired after a spectacular career, joining Bardeen among the ranks of ECE legends.

At Illinois, Hess would expand his repertoire to include computer simulations and computational electronics as applied to transistors, charge-coupled devices, lasers, nanostructures, and biomolecules. Along the way, he would mentor some of the world’s leading researchers in these fields, publish a widely respected textbook, play a key role in establishing the Beckman Institute, and win membership in the National Academy of Sciences and National Academy of Engineering. And now that he’s retired, he plans to pursue another, recently developed interest: quantum computing.

As a Fulbright scholar at Illinois in 1973, Hess collaborated with ECE Professor C.T. Sah on solving the Boltzmann transport equation for transistors. Sah

was another ECE legend who played a big role in Hess’ early career; he had come to prominence in the 1960s as a key developer of complementary metal-oxide semiconductor (CMOS) technology. Hess returned to Vienna during the mid-1970s before being offered a professorship in ECE and Physics at Illinois in 1977. Back at Illinois, Hess worked with ECE Professor Ben Streetman on “real space” electron transfer, which explained the mechanism of certain high-mobility (high-frequency) transistors.

By the early 1980s, Hess and his students were attacking electronics problems through simulation as well as traditional experiments. With H. Shichijo, Hess developed the full-band Monte Carlo method to simulate electron transport and impact ionization in transistors. The method improved on available techniques by taking better account of complex band structures at high energy. Commercial software produced by IBM and other companies would later incorporate full-band Monte Carlo.

In the latter half of his career, Hess continued to leverage the power of computers to model a wide range of electronic devices. He and his students developed the software program MiniLase, which



ECE Professor Emeritus Karl Hess’ (third from left) career was celebrated at a special symposium on May 1 and 2.

incorporated a new, fast algorithm for simulating quantum-well lasers. Design changes, which once took dozens of hours to test on a computer, could now be tested in minutes, thanks to the new approach that lent itself to parallel computation. Hess also began to apply computational approaches to nanostructures and biomolecules, reflecting the increasingly theoretical and interdisciplinary trajectory of his research.

Even so, a fruitful collaboration in the late 1990s with fellow ECE faculty member Joe Lyding demonstrates how Hess kept in touch with hands-on, patentable research. The two developed a new annealing process for silicon microchips, using deuterium rather than the conventional hydrogen, which greatly extended chip life. That work also harkened back to Hess’ research with Sah focusing on “hot carriers”—electrons or holes with very high kinetic energy in devices. The deuterium anneal reduces damage caused

Continued on page 15



# Professor Leon Frizzell retires

By Tom Moone



Leon Frizzell

On May 12, 2006, a retirement celebration was held in the Beckman Institute in honor of ECE Professor Leon Frizzell to commemorate both his long service to the

University and his many contributions to the field of ultrasound.

Frizzell came to Illinois in 1975 from the University of Rochester, where he had earned his master's and PhD degrees. "The whole reason I came to Illinois was the reputation of the Bioacoustics Research Lab," he said. For the next 31 years, Frizzell studied the interaction of ultrasound with biological materials.

Frizzell is particularly proud of some recent projects dealing with research on the lungs and on prostate cancer. For the lung work, Frizzell worked with colleagues to study what effects ultrasound has on lung tissue, looking particularly at lung hemorrhage. "We were determining at what levels you would get effects and trying to determine the mechanism," said Frizzell. The goal is to enhance safety for ultrasound applications. Although they saw effects on the lung tissue, the source was elusive. "Though we answered many important questions, there are always some questions that go unanswered," said Frizzell, "and new questions that come up as you move along."

Frizzell has also been working on developing new types of ultrasound

transducers for hyperthermia and surgical applications of ultrasound. "Most recently I was working on ultrasound phased arrays for treating the prostate with high-intensity focused ultrasound," said Frizzell. These applications could be used as part of cancer therapy.

For his research, Frizzell has been elected a Fellow of the American Institute of Ultrasound in Medicine and a Fellow of the Acoustical Society of America.

Though he is retiring as a full-time faculty member, Frizzell is not abandoning Illinois. This fall, he expects to be teaching a few classes, the number depending on departmental need. He also plans to do some research consulting. For this summer, though, he and his wife are enjoying, for the first time, three full months at their

Continued on page 34

## A "transporting" career

(continued from page 14)

by hot electrons.

Hess will also be remembered for his role in establishing the renowned Beckman Institute for Advanced Science and Technology. During the early 1980s he chaired the committee that developed the physical science component of the proposal for an interdisciplinary research center. After Arnold O. Beckman pledged \$40 million to make the proposal a reality, Hess remained instrumental in the creation of the Institute and served as its first co-associate director, along with psychology professor William Greenough, who had chaired the committee that developed the life science component of the original proposal.

Hess's most recent research interest,

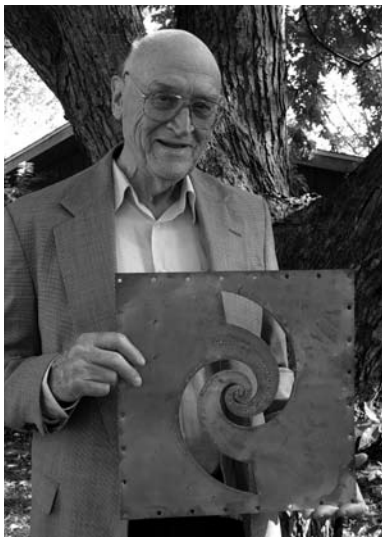
which he plans to continue in retirement, is quantum information and computing. He and Illinois mathematician Walter Philipp recently published a paper challenging the decades-old consensus on the famous Einstein-Bohr debate about the nature of quantum entanglement. In 1964, Irish physicist John Bell published a theorem supporting Bohr's position that "nonlocal" effects, or what Einstein dismissed as "spooky action at a distance," are a real and necessary consequence of quantum theory. Bell's theorem has since been established as conventional wisdom, but Hess and Philipp argue the theorem breaks down given certain parameters. Their paper is the subject of a hot debate in physics and quantum computing

circles, and the consequences for the future of information, not to mention the outcome of Einstein-Bohr, could be big.

Dozens of former students and colleagues shared their appreciations of Hess at a retirement symposium held in his honor in May. Shichijo, now at Texas Instruments, attended and recalled being Hess's first graduate student. "I was his only graduate student for awhile, so I got special attention," recalled Shichijo. "Normally, you think of the student going to the professor's office to discuss work, but with Karl it was the opposite. He would regularly stop by my office to check on my work and discuss things. Of course, I learned a lot about transport."

## Broadband innovator Dyson dies

By Jamie Hutchinson



John Dyson in 2003 with one of his early spiral antennas.

John Dyson (MSEE '50, PhD '57), an ECE faculty member from 1957 to 1985, died on April 28 in Urbana at age 87. Dyson was a key member of ECE's famed Antenna Lab, where broadband antennas were pioneered.

Dyson developed the "equiangular spiral antenna," which redefined the term broadband by operating efficiently over a range 10 times bigger than that achieved by the best broadband antennas

that preceded it. He later modified the spiral into a conical configuration, achieving greater directionality. The conical antennas served in many military and space applications, and they were used as reflector feeds for the large radio telescope at Illinois' Vermilion River Observatory.

Dyson's former student, colleague, and friend, ECE Professor Emeritus Preston Ransom (BSEE '62, MSEE '65, PhD '69), recalled Dyson as a kind man who was a born engineer. "The lab was primarily theoretical people, and John was the man for practical applications. He was the expert on building things, designing experiments, testing antennas. He knew all the components down to the connectors, and he could make them, fix them, take them apart and put them back together again, you name it."

Dyson was born in Lemmon, South Dakota, and went to college at South Dakota State University. He served in the Army during World War II, achieving the rank of lieutenant colonel. He became an IEEE Fellow in 1974. His wife of 65 years, Margaret, survives along with four children, seven grandchildren, and four great-grandchildren.

## Faculty news

**Ilesanmi Adesida** will serve as president of the IEEE Electron Device Society for 2006 and 2007. He served as president-elect for the last two years.

**Tamer Bassar** was presented with the Richard E. Bellman Control Heritage Award in June "for fundamental developments in and applications of dynamic games, multiple-person decision making, large scale systems analysis and robust control." It is the highest recognition of professional achievement for U.S. control systems engineers and scientists.

**Jennifer Bernhard** and **Farzad Kamalabadi** were chosen as recipients of the 2006 Xerox Award for Faculty Research.

**Jennifer Bernhard** and her husband, William, announced the birth of their son, Ezra Durham, born on May 1.

**Patrick Chapman** received the 2006 Richard M. Bass Outstanding Young Power Electronics Engineer Award from the IEEE Power Electronics Society in Jeju, Korea, in June 2006.

**Kent Choquette** was elected to the Board of Governors of the IEEE Laser and Electro Optics (LEOS) Society for 2006-2009.

**James Coleman** received the Cecil N. Coleman Award "in recognition and appreciation of outstanding contributions to campus safety at the university." Coleman also received the 2006 Nick Holonyak Jr. Award from the Optical Society of America.

**Karl Hess** was appointed to the National Science Board.

**Nick Holonyak Jr.** and **Milton Feng's** invention of the Laser Transistor was selected as #66 in the Top 100 Most Important Discoveries in *Discover Magazine* (January 2006 Special Issue - Year in Science).

**Thomas Huang** won the 2006 Electronic Imaging Scientist of the Year Award from the Society for Imaging Science and Technology and the International Society for Optical Engineering. Huang also received the Pioneering Research in Picture Coding Award at the 25th International Picture Coding Symposium in Beijing, China.

**Seth Hutchinson** has been named the first editor-in-chief of the Conference Editorial Board for the IEEE Robotics and Automation Society.

**Doug Jones** was named this year's recipient of the ECE Ronald W. Pratt Faculty Outstanding Teaching Award. He will be recognized at the ECE Fall Faculty Banquet.

**Kevin Kim** and **Hyungsoo Choi** won an Arnold O. Beckman Award from the Campus Research Board.

**Ehran Kudeki** was selected as the 2006 CEDAR Prize Lecturer in Sante Fe, New Mexico, in June for his achievements in advancing the Jicamarca ISR measurement capabilities.

**Fei-Fei Li** was named one of five outstanding young computer engineering professors in North America on April 14 by Microsoft. She will receive \$200,000 over the next two years to assist in her research. Li, whose computer vision focus is on helping machines see like humans, was chosen from among 100 nominees.

**Daniel Liberzon** and his wife, Olga, announced the birth of their first baby, Ada Liberzon, born on June 7.

**William O'Brien** is the recipient of the American Institute of Ultrasound in Medicine's 2007 William J. Fry Lecture Award.

**Naresh Shanbhag** and his graduate student, Ming Zhang, were selected as one of the "Jewels of IRPS" at the 2005 IEEE International Reliability Physics Symposium for the paper they co-authored, "A CMOS Design Style for Logic Circuit Hardening."

**Andrew Singer** and **Naresh Shanbhag's** semiconductor start-up company, Intersymbol Communications, Inc., co-founded in 2000, was recently acquired by Kodeos Communications, Inc. As a subsidiary of its parent company, Intersymbol will maintain its operations in Champaign-Urbana.

**Benjamin Wah** received the 2006 W. Wallace McDowell Award from the IEEE Computer Society in March 2006. Wah also will be awarded the Pan Wen Yuan Foundation Outstanding Research Award this year. The award is given by the



ECE Emeritus Professor Dan Hang (BSEE '41, MSEE '49) (center) recently traveled to Syracuse, New York, where he visited with fellow alumni George Kirkpatrick (BSEE '41) and Steve Tehen (BSEE '42, MSEE '47, PHD '58).

Pan Wen Yuan Foundation in Taiwan for "outstanding research in electronics, information science, communications or related files."

# Abracadabra ... apparata!

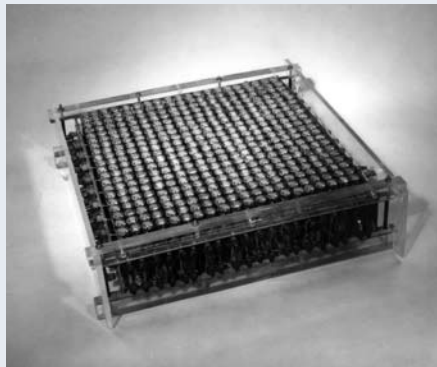
## *Early cybernetic machines in ECE's Bio Computer Lab*

By Jamie Hutchinson

"The Turk," one of history's most intriguing hoaxes, made the rounds of European courts during the late 18th century, seeming to defeat the aristocrats at chess when in fact the life-sized, mustached, turban-wearing mannequin was operated on the sly by a flesh-and-blood chess master. No question: The Turk's creator, Wolfgang von Kempelen, was an illusionist, a showman, you might even say a huckster. But The Turk was an important phase of von Kempelen's sincere and lifelong obsession with automata, or self-operating machines. Later von Kempelen would make a genuine, landmark contribution to the field with the first machine capable of producing whole words and even short sentences.

In former ECE Professor Heinz von Foerster (1911–2002), we find the same mix of illusionist and technological pioneer. A magician during his teen years in Vienna (the city where von Kempelen is buried), von Foerster would go on to found the Biological Computer Laboratory, which made Illinois a leading center of cybernetics research from 1958 until 1975. BCL under von Foerster attracted brilliant technical minds who produced some of the world's first parallel computers and analog-to-digital converters. Yet when the time came to fall back on illusion and showmanship, von Foerster was ready and willing.

One such occasion was a winter day in 1965 in the CBS television studios in New York City. Von Foerster and graduate student Paul Weston (PhD '70) had traveled from Urbana to demonstrate for a national audience Weston's "numa-rete," a photocell array that had gained widespread attention for its ability to instantly recognize the number of irregularly shaped objects placed upon it. But a baggage handler's goofup had dealt the machine a knockout blow. The unpacked numa-rete would not



Left: Photocell array and circuitry for Weston's numa-rete. Right: Fully assembled, the machine is tested with a collection of irregularly shaped objects.

count.

"So I said, 'We'll simply pretend that the machine is functioning,'" recalled von Foerster in a memoir published in 2002.<sup>1</sup> Because the numerical display still worked, the professor was able to transmit correct answers to it via wire from off camera; meanwhile, his student went through the motions of the demonstration on camera. The trick worked.

Von Foerster gleefully recalled demonstrating the numa-rete for BCL visitors who thought they could outwit the machine. One visitor thought he could hog-tie the counter with a particularly knotty geometry:

"He said, 'I will run a test right away. Please bring me a pretzel.' He lays the pretzel on the numa-rete, puts a coin in each curve of the pretzel, I think, and presses the button. The machine says, 'Three.' 'Wow,' he says, 'How did you do that?' Anyway, he tried to fool the machine. But the machine always gave the right answer."<sup>2</sup>

A skeptic might dismiss the actual, functioning numa-rete as a trick: the machine didn't really recognize the abstract quality of number. Nevertheless, underlying the photocell array was an ingenious network inspired by new knowledge about how neural networks exploit parallelism and threshold logic to work their magic.

The numa-rete was indeed a landmark in the history of biological computers, and von Foerster claimed it was the first parallel computer ever built.

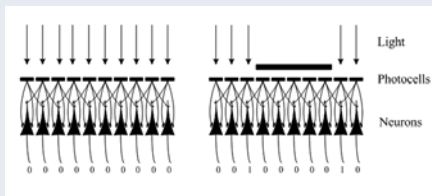
Weston likened the numa-rete to a biological retina connected to a set of "ganglion cells." The retina was the photocell array, while the ganglion cells were the underlying network of transistors. A shadow over a photocell would trigger its respective transistor to exceed a threshold voltage and send excitatory signals to its neighbors. Neighbors under lighted photocells would remain in a quiescent state below threshold, but neighbors under shaded cells would "fire," completing self-sustaining positive-feedback loops with each other. The result was a kind of parallel projection of objects on the retina onto the ganglion cells. Weston's system architecture drew on the theory of neural networks developed by Warren McCulloch and Walter Pitts, who showed that neurons were basically universal computers. The numa-rete realized just one small portion of the infinite computing possibilities of neural nets, but Weston would build on the idea in later years as he pursued a much more ambitious natural language processor.

While the numa-rete could be considered an "N-ness detector," other early research in BCL focused on different

kinds of detectors, or what they referred to as “property filters.” Most of this research was part of the Pentagon-initiated bionics ferment of the period, aimed at realizing far-flung goals like superhuman pilots and astronauts.

Another BCL parallel computer emulated the action of the ear rather than the eye. This was Murray Babcock’s dynamic signal analyzer, sometimes referred to as an “artificial ear.” Von Foerster and Babcock (BSEE ’48, MSEE ’49, PhD ’60) noted that the human ear violates a strict rule of acoustical engineering which states that the more precise a given resonator, the slower its reaction time. Quite the contrary: humans make quick, keen discriminations. So the researchers hypothesized that the ear works like a parallel computer, speedily calculating at what spot on the basal membrane a tone is most resonant. Babcock then set about building a proof of the concept. His machine employed banks of filters and parallel sensors to analyze the frequencies in an aural spectrum. It worked well, and it worked fast. As such, the dynamic signal analyzer not only mimicked the ear but also served as a tool for scientific sound analysis, forming the basis of Babcock’s later work in speech processing.

David Freedman (MSEE ’62, PhD ’65), a von Foerster student interested in analysis of musical instrument tones, extended Babcock’s dynamic signal analyzer into other application areas. Recalled von Foerster: “David Freedman built the first, very fast analog-to-digital translators. When you played any piece of music, it immediately came out on the other side in the form of digitals. You could then feed that into a computer and analyze it mathematically.” Freedman would go on to design a digital computer for the School of Music’s renowned Electronic Music Studios. The computer served as



*Edge detection using a McCulloch-Pitts network. Left: Each photocell delivers two excitatory stimuli to the idealized neuron directly below and one inhibitory stimulus to each adjacent neuron. Right: Neurons at the edges of an object respond to the lack of inhibition from shaded neighbors. Weston adapted this architecture for the numa-rete.*



*Von Foerster (left) and Babcock demonstrate the dynamic signal analyzer.*

a tool not only for analysis but also for music synthesis and editing.

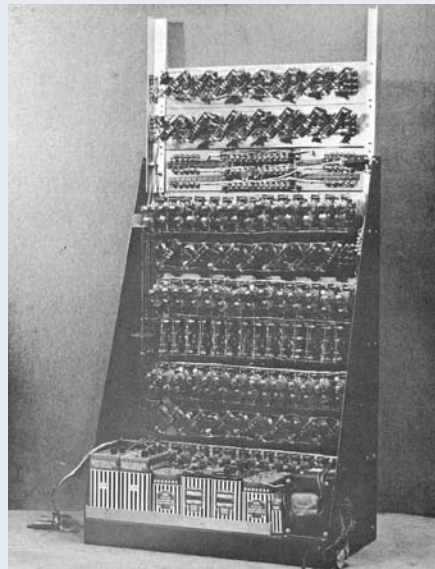
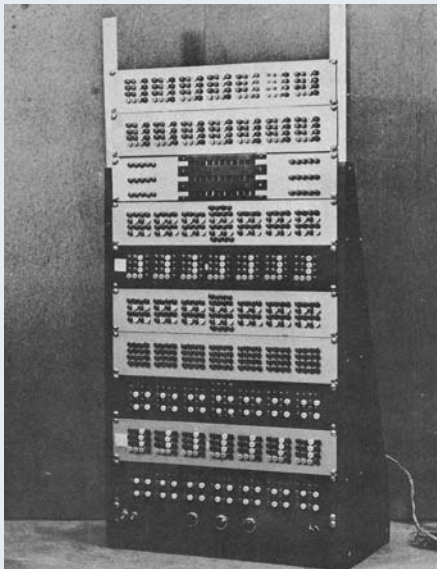
Babcock’s 1960 PhD dissertation described a more general biological computer than either the numa-rete or dynamic signal analyzer. For this doctoral work, he created an analog machine that exhibited basic properties of living nervous tissue, such as the capacity to adapt, self-organize, and self-reproduce. Babcock called it the adaptive reorganizing automaton. The device’s elementary components were artificial, electronic neurons networked through variable con-

ductance paths called “facilitators,” such that preferred paths of information flow would develop in accord with contingencies such as information content, code, source, and location. Babcock explicitly likened the facilitator components to synapses in biological neurons. “This malleable unit,” he wrote, “is the crux of the self-organizing system because it is the element which gives the automaton adaptability.” By “adaptability,” Babcock referred to the automaton’s ability to interact with an environment—or, more precisely, to incorporate the environment into its feedback loops—and to change state according to its own stimulus history.

The automaton demonstrated that electronic components and networks could be configured to exhibit interesting adaptive behavior. Babcock ran tests that yielded promising results for future pattern recognizers, order detectors, and more elaborate automatons. He discovered one surprising effect that was eerily lifelike: When he configured a system out of selected sectors of the automaton, sectors that were not actively connected would occasionally produce pulses in synchrony with the autonomous system. Babcock identified the engineering causes of the sympathetic pulsations and noted the correspondence of the phenomenon to certain biological systems; for example, the brain’s alpha rhythm can be detected in inactive parts of the organ.

Babcock and Weston both looked to pioneers like the English physiologists Gray Walter and Ross Ashby. Walter had developed a robot he called *Machina Speculatrix*, better known as the “tortoise” (for its appearance), which could roam autonomously, appearing to exhibit animal-like characteristics such as curiosity, foresight, and memory. Ashby’s famous invention, the Homeostat, exemplified

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Heinz von Foerster



Ross Ashby demonstrates an unidentified machine.

Front (left) and rear views of Babcock's adaptive reorganizing automaton. The front view clearly shows pin jacks by which connections between various parts were made. Rear view shows racks of energy transducers, "facilitators," indicator tubes, autonomous components, and batteries.

another basic characteristic of living systems: ultrastability. The self-regulating, electromechanical machine, consisting of four interconnected magnets, would react to perturbations in its operating conditions by reestablishing, through feedback, its original stable state. After making a name for himself with the Homeostat and two classic books on cybernetics, Ashby joined the BCL staff in 1960 and remained very productive until his retirement a decade later.

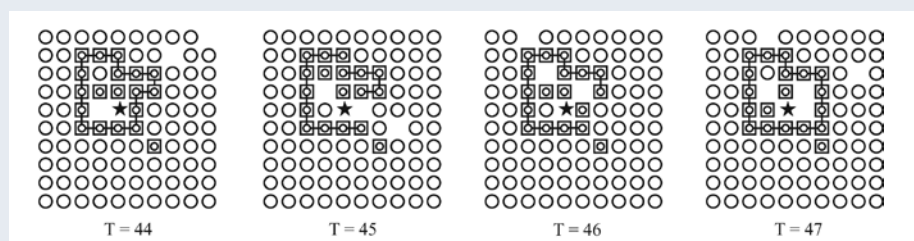
Over the years, cybernetic machines at BCL continued to probe age-old questions about living systems while reflecting the digital revolution that swept through the world of science. The culmination was Ricardo Uribe's 1974 computer program Autop—created with the PLATO network—which modeled the theory of autopoiesis developed by fellow Chileans Humberto Maturana and Francisco Varela, both close colleagues of von Foerster and frequent visitors to BCL. Autopoiesis (literally "self-production") starts by emphasizing the closure of living

systems, both in terms of production (they produce themselves) and space (they are distinct from their ambient). From this basis, elaborate investigations of computational autopoiesis have been pursued by life scientists for decades. It all started with Uribe's visualizations unfolding like magic, in glowing orange on the homegrown plasma displays at Illinois.

*ECE has commissioned an English translation of Albert Müller's essay A Brief History of BCL (originally in German), which is now published on the ECE Web site, along with other historical materials about BCL. Visit: [www.ece.uiuc.edu/pubs/bcl/](http://www.ece.uiuc.edu/pubs/bcl/).*

1. All von Foerster quotes are from Bröcker and von Foerster, *Teil der Welt*, Heidelberg, 2002. Monika Bröcker graciously provided translations.

2. Von Foerster recalled this visitor as being John von Neumann, but either his memory failed him or he was playing a bit of the showman. Von Neumann died in 1957, a year before the founding of BCL.



Visualizing autopoiesis. Maturana developed the theory, largely while working at BCL, along with his student Francisco Varela. Uribe modeled autopoiesis for the first time on computer, using the PLATO network. These frames visualize, from left to right, the ongoing decay and production of "links," preserving the system's unity even as its form and components change.

# Control course originators jog their memories

By Jamie Hutchinson

Much like other lab-based courses offered in the department, ECE 486 (Control Systems) directed by Professor Sean Meyn is the envy of engineering campuses nationwide. In addition to superb instructors, students take advantage of world-class facilities in the College of Engineering Control Systems Laboratory, located in Everitt Lab. The course has come a long way since its beginnings—so far that two men who had a hand in starting it all nearly a half-century ago can't recall quite how it happened. But one thing remains the same: control students in the department had great teachers.

Before the undergraduate course, there was a graduate servomechanisms course taught by Gilbert H. Fett (now deceased), dating back to before anyone can remember but likely into the 1940s. Fett advised two graduate students, John Kreer (MSEE '54, PhD '56) and Benjamin Kuo (MSEE '56, PhD '58), who both joined the ECE faculty after earning their doctorates. It was around this time that the undergrad control course was begun.

Kuo guesses he first taught the undergrad control course upon joining the faculty in 1958. "I might have originated the course, but I'm not sure," said Kuo. "It might have been John [Kreer], who was senior to me." Kreer's response to that: "The course probably originated sometime around when Ben says, but I don't remember my role." Most likely, both men and their old adviser deserve some credit for establishing the course.

Kreer, who left Illinois in 1959 and is now retired from Michigan State, describes Fett fondly as "feared and respected," the type of professor who would put a student on the spot in class with a difficult question. Fett made a big impact

on the teaching of both his students.

While Fett was the guiding spirit behind the birth of the control course, Kuo was the teacher who raised it into maturity. He taught the course for 30 years, using his own textbook just as Fett had done. "I wasn't too impressed with the bestseller at the time, and I thought I could do better," said Kuo of the first edition of his book, *Automatic Control Systems*. Kuo has continued revising the book into his retirement. The eighth edition was published by Wiley in 2002. "Fett's teaching had a big influence on the book," he said.

One student who has kept his copy of Kuo's textbook—not as a memento, but as a practical reference—is Jim Espy (MSEE '78), now a hardware system architect in Massachusetts. "It's practically falling apart—it's one of my most referenced books," said Espy. "I consider it a seminal book on control systems. I've recommended it to many people, and they've gone out and bought it and agreed."

"He lived and breathed the information," recalled alumnus Duane Hanselman (MSEE '83, PhD '85) of Kuo. "He always brought a notebook to class, but the only time he ever opened it was when he covered material that would be in the next edition of the book." Hanselman is now an electrical engineering professor at the University of Maine. "When you teach the subject yourself, you come to appreciate all



Gilbert H. Fett



Benjamin Kuo

that Professor Kuo knew," he said.

With changes in technology, the lab portion of the control course has evolved considerably. In the early years, Kuo recalls buying project kits from a company in England. "It was a box with gear trains and motors. You could do servo analysis and simulate control algorithms. There was some assembly required." Computers and software were incorporated later, and today the lab remains on the cutting edge of undergraduate control education.

Perhaps the biggest step in the lab's evolution was its transfer to the College of Engineering in 1994, when it began serving control students not only in ECE but also in Aerospace Engineering, General Engineering, and Mechanical and Industrial Engineering. By that time, Kuo had passed the torch to ECE Professors Bill Perkins (now retired) and Meyn, who believed, together with other engineering faculty on campus, that departments should pool resources dedicated to their various control labs. That way, students across the college could avail themselves

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## Control course

Continued from page 21

of one state-of-the-art lab. Meyn, Perkins, and other Illinois control faculty explained their philosophy and its success in an article in the February 2005 issue of the *IEEE Control Systems Magazine*.

Today, the lab consists of 18 benches, each equipped with a modular DC motor apparatus that introduces students to core concepts in control; “inverted pendulum” equipment for more advanced experiments; hardware for testing, measurement, and data acquisition; and PC workstations loaded with MATLAB, Mathematica, AgilentVee, and other software. All the equipment and student work are overseen by a full-time lab manager, Dan Block.

An alumnus of the new era of the control course is Andrew Saxsma (BSEE '97), who speaks for many in his appreciation of the experience. “The lab offers you a chance to apply what you learn with the guidance of people who really know what they are doing,” said Saxsma, now with Caterpillar. “Everything in the lab worked and I always had access to the right equipment.”

# Illinois Eta Kappa Nu chapter receives outstanding chapter award

By Tom Moone



Photo courtesy of Eta Kappa Nu.

In March, ECE Department Head Richard Blahut (center) accepted the Outstanding Chapter Award on behalf of the Illinois chapter of Eta Kappa Nu at the ECE Department Heads Association meeting in Hawaii.

Eta Kappa Nu, the honor society for electrical engineering that was founded on the Illinois campus in 1904, announced that the local chapter of HKN is a recipient of the Outstanding Chapter Award (OCA) for 2004–2005.

One reason for the chapter's success, said HKN President David Kao, was the emphasis the members have placed on community and departmental involvement. “We're trying to focus a little more on the part of the organization that stresses character and leadership,” he said. As a result, members of the organization are actively involved in community and departmental activities.

The philanthropic activities that the members of Eta Kappa Nu have been involved in include volunteering at the Swann Special Care Center in Champaign, a school for children with disabilities, and volunteering for the Relay for Life. “Each semester we come out to about 200 person hours of community service,” said Kao.

The most visible activities that they have done for the department are the test files that the organization maintains and sells and the peer tutoring that they offer.

One thing that may have contributed greatly to their receiving this award was the centennial leadership conference that the local HKN chapter hosted last year. “We had about 15 to 20 other chapters come here,” said Kao. In addition to leadership workshops and team building activities, ECE alumnus and AMD founder Jerry Sanders was a featured speaker.

Like all national chapters of Eta Kappa Nu, the Illinois chapter is limited to the top echelon of students. Juniors who are in the top 25 percent of their class, and seniors in the top third of their class are eligible for membership. However, the Illinois chapter looks at more than just grades. Prospective members are interviewed to determine that students bring something of themselves to society. “We are evaluating their level of commitment and interest in contributing something to the organization,” said Kao.

### Calling all HKN alumni:

Visit [www.hkn.org](http://www.hkn.org) today to update your contact information.



## A different kind of jam session

By Brad Petersen

Three students at the University of Illinois at Urbana-Champaign are into jamming, but they don't play instruments. These electrical engineering students recently completed ECE 445, a senior design course centered on a semester-long project. For Al Rhee, Ben Niemoeller, and Larry Dietrick, the task was to create a signal jamming device that would allow them to control someone else's equipment, in their case a radio-controlled toy car.

The students determined early on that they could jam the signal from the toy remote control and assert control of the motorcycle using one device. We used "one component, one circuit that was capable of doing both the jamming and controlling," explained Dietrick. "Basically the control signal is a binary pattern, or ones and zeros, modulated onto a carrier frequency. We jammed the car by sending out a constant signal on that frequency, which confused the toy into doing nothing. We took control of the car by sending out the right pattern of ones and zeros, but at higher power to override the signal from the original remote."

Before they could control the motorcycle, the students had to first understand how it worked. "This was a challenging project because these students had to do a lot of background work," said Jennifer Bernhard, professor of electrical and computer engineering and adviser to the students.

The project presented a variety of learning experiences for the three seniors. "We had to locate the chip inside the remote control that showed what frequency the car was operating at," explained Dietrick. "Getting our oscillator to work, which



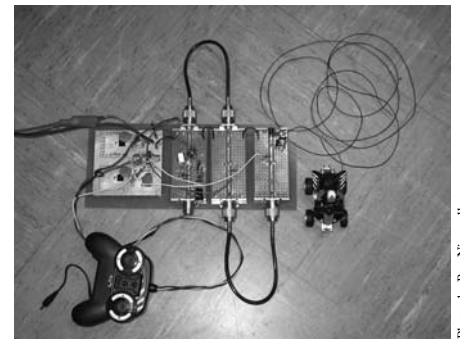
Larry Dietrick, Al Rhee, and Ben Niemoeller won the "Best Engineered" award for the signal-jamming device they designed in ECE 445 during the fall 2005 semester.

made our device transmit ones and zeros on the right carrier frequency, was one of the biggest challenges. After we got it to work, getting connected to the output circuit was the next hurdle."

The idea for the project was proposed by Northrop Grumman, one of the nation's largest defense contractors and a source of funding for projects in applied electromagnetics in the senior design class. The students consulted with engineers from the company to create their device.

"They helped us figure out where to start," said Dietrick. "It would have taken us a lot more time to get going without input from Northrop Grumman."

The collaboration between students and industry adds an excellent dimension to the class, allowing students exposure to real world problems and timelines. "We kept e-mail going back and forth with the Northrop Grumman engineers throughout the semester," explained Niemoeller. "It really helped us when they told us we should keep up the pace. We were way ahead of ourselves, and then something happened and we slid a month back, just in a day."



Photos by Ben Niemoeller.

The senior design class is set up to encourage students to apply what they're learning in the classroom. It also allows for creative problem solving. "This class is very freeform and real world," said Bernhard. "Engineering is a creative process. It takes imagination to be a good engineer, and this class makes that clear."

Rhee, Niemoeller, and Dietrick gained invaluable hands-on experience while working on the project, utilizing their knowledge of radio frequency communication, signal process, power amplification, and antenna fundamentals. They also managed to pick up the "Best Engineered" award along the way.

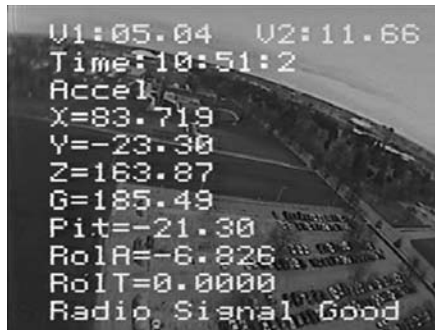
"Students are sometimes intimidated at the beginning of this class, but ultimately the class shows them what they can do. It's the perfect opportunity for them to take what they've learned and apply it," noted Bernhard.

"I've probably learned more out of this class than any of my other classes," said Niemoeller.

# “Look, Ma, no pilot!”

## Students’ model airplane flies itself

By Jamie Hutchinson



Two stills from the aerial video taken by the GPS-guided, autonomous, model airplane built by ECE seniors Chris Hansen and Mark Inderhees. Left: Hansen and Inderhees are visible in the upper left. Right: Video overlay reports GPS and other critical data about the aircraft.

Hansen (left) and Inderhees received the Instructors Award for best Senior Design project of the Fall 2005 semester.

Among the smash hits of the War on Terror have been unmanned aerial vehicles (UAVs) like the MQ-1 Predator, which can rain death on possible terrorists with no risk to the good guys who control it from perhaps thousands of miles away.

Now, two ECE undergrads have entered the demanding field of UAV technology with their Senior Design project. Chris Hansen and Mark Inderhees collaborated last fall on a GPS-guided, autonomous, model aircraft. Unlike the remotely controlled Predator, which can deliver a mean payload, their craft is designed with economy, autonomous control, and reconnaissance in mind.

In addition to the basic aircraft and video/transmission equipment, the plane consists of a lithium polymer battery pack, DSP chip, GPS sensor, accelerometer, and digital compass. “The project is essentially about bringing together multiple devices and making them work well in an embedded system,” said Inderhees.

Hansen said the biggest challenge was making all this happen within the heavy constraints on testing and revision

that were presented by the nature of the project. “It’s not like an autonomous car where you can just set it on the ground and see if it goes, fix something, and then try again,” he said. “Any little mistake could cause a crash and destroy a lot of work.”

“We also had to do a lot of work just to get meaningful data back from the aircraft while in flight,” added Hansen (see video overlay in the photo above). “With most electronics projects you can test the circuit right in front of you and have any number of instruments hooked up to it—not quite the case here.”

That’s an understatement. The plane’s maiden voyage took place in anything but ideal conditions: on a gusty November day over a field at the south end of campus. An experienced radio control pilot, Hansen directed the plane to 100–200 feet, waited for the air to settle, then turned control over to the craft’s onboard processor. After a dozen or so iterations of this handoff, the craft did achieve several periods of sustained autonomous control, the longest lasting perhaps 10 seconds. “We could see from the data that the plane was really

getting knocked around. We saw forces of up to 5 Gs,” said Hansen.

Testing ended when a powerful downdraft abruptly reintroduced the plane to terra firma, cracking a wing. “Plus we got kicked off the field a few minutes later by the groundskeeper,” reported Hansen.

Inderhees had a co-op this spring and summer with Boeing, which is a subcontractor for the Predator and prime contractor for the ScanEagle UAV. He looks to graduate in 2007. Hansen graduated in May and already works part time at SmartSpark, the power electronics startup founded by ECE Professor Phil Krein, and at his own e-business, Hansen Hobbies (hansenhobbies.com). He demonstrated the model at Engineering Open House in March and hopes to make more improvements during the summer.

# A hands-on experience

By Brad Petersen

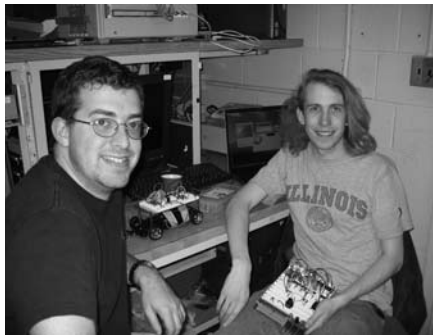
A proud tradition for ECE Illinois is the combination of learning theory in the classroom and putting that theory into practice in the lab. ECE 395 is one of more than 30 lab courses offered by the department. Also known as the ADSL lab, students in this class typically do some pretty interesting work. That work was on display at the Advanced Digital Systems Lab end-of-semester open house.

Among the fourteen projects on display were a Bluetooth-controlled car, MIDI-controlled slide whistle, MIDI-outputting slide whistle, programmable remote control, six-legged robot, and ground mapping weather balloon.

One project that stood out was the Bluetooth-controlled car. "Their vehicle control worked very well and will be a good starting point for future projects wishing to use Bluetooth. Their experience with compressed video over Bluetooth also gives future students an idea of Bluetooth limitations (realistic expectations of the technology) and a starting point for dealing with the complexities of inexpensive NTSC video cameras," said ECE Professor Lippold Haken, class instructor. "Motorola reps had interest in this project, and how it relates to their Bluetooth /Java-capable cell phone."

Students enjoy ECE 395 because it presents real-world constraints. "We had to deal with issues like timelines and finding parts. Occasionally, the ECE parts shop was closed when we were working on our project, so we had to come up with other solutions," explained Matt Davis, co-creator of the Bluetooth-controlled car.

"Doing this project was like assembling



Abe Rozental and Matt Davis proudly display their Bluetooth-controlled car at the ADSL Open House.

a puzzle, except we didn't know what the pieces were when we started," said Davis' partner, Abe Rozental.

According to Haken, Rozental and Davis were the first group to experiment with Bluetooth communications in the lab.

Another stand-out project, according to Haken, was the six-legged robot. Haken explained: "The beautifully machined parts were all custom-designed by Mike Noone. The mechanical design and the electronic motor control was also all his work; I was impressed with how lightweight the robot was, and how 'snappy' its motions were. The wireless control of the robot was also quite impressive: many of the students have trouble getting wireless control working in the electrically noisy Everitt Lab environment."

The ADSL lab is an exciting opportunity for students to pursue any project they are interested in. They can use any technology they like. Of course, such freedom presents major challenges. "It is up to the students to determine what kind of processor to use (should they use a CPU or a FPGA or DSP), what computer

language to use, what connection technologies, what kinds of sensors, output devices, motors, etc.," explained Haken. "They learn how to select and order parts. For many of the projects, they need to learn how to work with other experts, such as the machine shop, to complete their project. They learn the importance of carefully reading datasheets and electrical requirements, often after many hours of frustrating experimentation."

Ultimately, ADSL provides a great hands-on experience for students, one that only furthers their growth as engineers.

## Advanced Projects Lab

By Maureen Wilkey

ECE students can look forward to a new and improved lab for working on robotics projects for ECE 395. The Advanced Digital System Lab is changing its name to the Advanced Projects Lab and received a \$50,000 renovation this summer and should be completed by the start of the 2007 school year. The renovation includes removing a wall that separated the lab into two rooms, rearranging the work benches with an island in the middle and benches on either side to improve traffic flow, and redirecting power to eliminate the need for extension cords to certain lab stations. The lab will also include a projection screen and new whiteboards to replace the old chalkboards. New shelves and corkboards will adorn the walls for displaying projects from previous classes. The lab will be repainted and broken tiles will be replaced.

## ECE remains a top-ranked department

The ECE Department maintained its standard of high rankings at both the graduate and undergraduate level in this year's *U.S. News and World Reports* ratings. Undergraduate and graduate electrical engineering both ranked fourth in 2006, while undergraduate and graduate computer engineering both came in fifth.

The rankings nearly match last year's rankings, with the exception of undergraduate computer engineering dropping slightly from fourth to fifth. The graduate program in computer engineering was ranked immediately after MIT, Stanford,

Carnegie Mellon, and the University of California at Berkeley, and just ahead of the University of Michigan. The electrical engineering graduate program is competing with top three schools MIT, Stanford, and the University of California at Berkeley. It is just ahead of the California Institute of Technology and the University of Michigan.

In the undergraduate ranking, computer engineering trails MIT, Stanford, Carnegie Mellon, and the University of California at Berkeley. Electrical engineering competes with MIT, Stanford,

and the University of California at Berkeley for the top spots, and is just ahead of the University of Michigan.

The ratings are consistent with the overall rating of the college of engineering at Illinois, which is tied for fourth with the California Institute of Technology, behind only MIT, Stanford, and the University of California at Berkeley. The University as a whole is ranked as the 11th best public university and the 42nd best university nationally.

## Petersen named assistant director of communications



Brad Petersen

Brad Petersen has joined the ECE department as assistant director of communications. Petersen is responsible for the external communications of the department as well as assisting in implementing the strategic marketing plan. He will also oversee production of publications, Web content, and promotional material and will write breaking news stories and press releases.

Petersen graduated from the University of Illinois in 1998 with a bachelor's degree in English. He grew up in Flossmoor, Illinois, and has resided in Champaign since 1994.

"I'm excited to be working for the University," Petersen said. "It's nice to be

back on campus after 7 years. I'm looking forward to increasing the department's visibility and sharing the story of the great work being done here."

One specific task for Petersen is improving ECE's overall marketing and communications efforts. Newsletters, including Alumni News, the department Web site, and materials used for recruitment are currently being revamped.

"ECE has such a rich and storied history and today continues to be one of the top programs worldwide for electrical and computer engineering teaching and research," noted Petersen. "It's my job to make sure that we are accurately conveying this stature."

Petersen joined the ECE department in November 2005. Prior to joining ECE, he worked as the communications manager for PersonalCare, a health maintenance organization in Champaign, for four and a half years and as Interim Director of

Marketing for Provena Covenant Medical Center in Urbana for two years.

In his spare time, Petersen enjoys hockey, baseball and Illini basketball. He has been supportive of Champaign County Big Brothers Big Sisters since 1997. He is engaged to be married later this year.

Petersen can be reached by phone at (217) 244-6376, by e-mail at [bradp@uiuc.edu](mailto:bradp@uiuc.edu) or in his office at 56 Everitt Laboratory.

# The Hassebrock Distinguished Lecture: Trusting Edison

By Brad Petersen

Charles Bazerman, a professor of English and education and chair of the Department of Education at the University of California, Santa Barbara, came to campus on March 27 to present a Center for Advanced Study/MillerComm talk: “Trusting Edison: Speculative Belief to Reliably Reconstitutable Phenomena.” Bazerman is an expert on writing about science and technology and has won several awards for his scholarship. He is the author of *The Languages of Edison’s Light*, a book that examines the rhetoric used by Edison to promote his invention of electric lighting. His visit was sponsored by ECE.

In opening his lecture, Bazerman described Edison and his work colorfully. “He made premature claims which became undeliverable promises against impossibly short timelines. He filed endless patents—you think the light bulb is a pretty simple idea—but in the project there were 245 or so patents for light and power of which 109 were around the light bulb, lights, filaments, and manufacturing processes for them. He misrepresented the state of his work.”

Bazerman also noted that Edison knew how to manipulate the media. Not only would he invite them to fake demonstrations of his work, but he would provide them shares of stock in exchange for glowing reviews of his latest work.

To enhance the visibility of his invention, Edison made sure that the first areas to get power were the financial district, city hall, and the newspapers. “Electricity became ubiquitous. This is the point that electricity began to come out of the walls,” said Bazerman.



Professor Charles Bazerman

Despite his transgressions, Edison’s contributions were undeniable. “He built a system that turned on lights and power around the world, laid the foundation for a corporate giant, and created the need for electrical engineering education in the United States,” noted Bazerman.

Ultimately, Bazerman argued that by studying Edison, we can try to understand the way in which inventions become part of our lives. “We should understand the uncertain and hazy status of symbols, words, inscriptions as phenomena begin to emerge into our knowledge, into our world, into our experience and we learn to locate and create them robustly to even see them robustly, let alone to be able to manufacture them. We should try to understand better that process by which emergent phenomena get drawn into symbolic represented experience, get cast into data and evidence and then into theory and become part of scientific accounts and part of technological designs

and the means by which we come to trust the accounts for they align us so closely with the world we experience.”

Charles Bazerman earned a Bachelor of Arts degree at Cornell University in 1967, and master’s and PhD degrees in English and American literature at Brandeis University in 1968 and 1971. From 1972 to 1990, he taught at Baruch College, City University of New York, and from 1990 to 1994, he taught at the Georgia Institute of Technology. In 1994, he joined the University of California, Santa Barbara. He held distinguished visiting appointments at the University of Louisville in 1997 and at Cornell University in 1999.

Professor Bazerman’s visit to Illinois was co-sponsored by ECE alumnus Melvin Hassebrock and his wife Anne Louise. The Hassebrocks offered a generous donation to the ECE department to enhance the professional development of engineering students in critical thinking and effective writing.

### College of Engineering Connects Alumni through Exclusive Online Community

ECE and the College of Engineering are pleased to announce a new online community exclusively for Illinois Engineering alumni called Always Illinois. Always Illinois will help engineering alumni maintain friendships, network with each other in a secure online community, and stay connected with the college, department, and student organizations.

All College of Engineering alumni will be given access to the service, meaning you can potentially connect with approximately 70,000 fellow alumni. The network will be password protected and available to Illinois Engineering alumni only.

One-time, customized authentication numbers will be mailed (e-mailed if we have your e-mail address) to alumni this summer. Once registered, users create a password for future login.

In this user-driven community, participants can create groups that allow alumni to discuss any variety of topics. Forums are a place to ask and offer advice or post a job to fellow alums. Users communicate through messaging, photo albums, and blogs and search to find other alumni who share acquaintances, professions, and locations.

With user-friendly profiles, it is easy to control what information is available to others. The network grows quickly by alumni inviting fellow Illinois engineering friends to partake in the virtual community.

Watch for your registration information so that you can login to Always Illinois!

If you have questions about Always Illinois, send them to [alwaysillinois@engineering.uiuc.edu](mailto:alwaysillinois@engineering.uiuc.edu) or contact Angie Dimit, associate director of development for the College, at (217) 244-1610.

### New ECE Alumni Board member: Erica Hausfeld



*Erica Hausfeld*

"It was an honor to be asked," said Erica Hausfeld (formerly Messinger, BSEE '98) of being invited to join the ECE Alumni Board. "I feel a sense of loyalty to the department, and I look forward to engaging with the faculty and administration in this new capacity."

For several years after joining Hewlett-Packard (now Agilent Technologies) as a sales support engineer in Loveland, Colorado, Hausfeld kept in close touch with campus. As the company's "campus manager," she was a liaison to the University and led a team of engineers back to campus for regular visits until 2004, when she moved on to other volunteer activities. This spring, ECE Professor Jim Coleman phoned her about the board opening, and Hausfeld seized the opportunity to renew her involvement with Illinois.

The chance to help the department chart strategy also appeals to Hausfeld.

This fall, she will begin an executive MBA program at the University of Colorado, and she's always been an engineer with an inclination toward leadership. At Illinois she took an international minor in Japanese studies, traveling abroad after her freshman year. And she was active in the Society of Women Engineers (SWE) and Engineering 100, a student-directed program introducing freshmen to the world of engineering.

At Agilent, she launched a corporate SWE task force to support female employees within the company and to engage in outreach programs. She is also a member of SWE's Corporate Partnership Council, which advises the organization and provides an opportunity to share best practices among member companies.

Hausfeld draws on her international studies every day at work. Since fall 2005, she's been a product support engineer for Agilent's System Products Division, responsible for supporting the company's global customer base. Agilent came into being in 2000 when H-P shed its test and measurement equipment divisions to focus on computers. Today, most of the new company's revenues flow from beyond the United States.

Continued on page 29

## New ECE Alumni Board member: Ebrahim Andideh

Hausfeld said her ECE degree has given her “instant credibility” in her career. “People know you graduated from a top school,” she said. But the appreciation runs deeper: “I think about the access to resources and opportunities that I had. It was tremendous.”

She recalled a long conversation during her freshman year with ECE Professor Bruce Wheeler, who was then associate head in charge of advising. “We really mapped out who I wanted to be and what I wanted to do,” she recalled. The following year, Wheeler offered her a job helping create and maintain the Web site for an online course he taught. “I appreciated that follow-through and his belief in me. We still keep in touch.”

Hausfeld’s husband Ayal is an artist who works with Judaic themes in watercolor and calligraphy. She likes reading, movies, the performing and visual arts, practicing Pilates, public speaking, and spending time with family and friends.



*Ebrahim Andideh*

When asked to share his fondest memory of ECE, new Alumni Board member Ebrahim Andideh (PhD ’90) doesn’t come up with anything specific. Rather, he simply recalls “learning and interacting with some of the smartest people in the world.” Those people include his adviser, Engineering Dean Ilesanmi Adesida, as well as ECE legends Nick Holonyak Jr. and Greg Stillman—all of whom helped him develop the expertise in physical electronics that has propelled him to his current position of R & D Senior Principal Engineer with Intel.

“The ECE graduate program has been the foundation of my career at Intel,” said Andideh. “It helped me develop critical thinking skills and the discipline to focus on problems.”

Andideh also developed an interdisciplinary perspective while studying at

Illinois. His dissertation work, which focused on reactive ion etching of III-V compound semiconductor materials, brought him into close contact with faculty and students in physics, materials science, and chemical engineering in addition to ECE. “This interaction has given me a broad perspective in engineering,” he said.

With more than 20 years of industry experience, Andideh has valuable insights into the “real-world” side of research areas that are important to ECE. He joined Intel as a thin films development engineer and has worked on projects involving interlevel dielectric deposition (ILD), chemical-mechanical planarization, selective silicon/silicon-germanium epitaxy, low-k ILD material development and integration, and organic microelectronics technology. His expertise is in microfabrication processes and development, and in his current position he is responsible for quality and reliability assessment of future-generation technologies.

“It is an honor to serve on the board, and I would like to contribute to the organization that has helped me to succeed in my career,” said Andideh, an IEEE senior member who holds 44 U.S. patents.

Andideh’s return visits to campus have underscored

his interest in developing industry–university relations. Last spring he lectured at the Coordinated Science Laboratory (CSL) about 65-nanometer process technology currently being developed at Intel. The new process technology increases the number of transistors on a single chip, enabling Intel to deliver future multicore processors and to design innovative features into future products. The features may include virtualization and security capabilities. The technology also includes several unique power-saving and performance-enhancing features, addressing the challenges inherent in Moore’s law.

The CSL lecture was not Andideh’s first return visit to lecture about his work at Intel. In 1996 the Physics Department invited him to speak about trends in integrated circuit fabrication.

By joining the ECE Alumni Board, then, Andideh strengthens a connection with the campus and community that has remained strong ever since his student days. “We have many friends in Illinois with lots of fond memories,” he said. He and his wife have two teenage daughters, the older of whom was born in Urbana. The family lives in Portland, Oregon, near Intel’s Hillsboro laboratory, where Andideh works.

### Distinguished alumnus honored with medal

By Alexis Terrell



The president of India, Abdul Kalam (right), presented Rahmat-Samii with the 2005 URSI (International Union of Radio Science) Booker Gold Medal at the 2005 URSI General Assembly

From an early age, the vastness of the universe fascinated him. When Yahya Rahmat-Samii first became exposed to Einstein's theory that the speed of light is the ultimate speed and to Maxwell's discovery that all electromagnetic phenomena could be captured in four simple mathematical equations, he knew that this was the area of study he should focus upon.

Now ECE Distinguished Alumnus Rahmat-Samii (MSEE '72, PhD '75) has received the 2005 URSI (International Union of Radio Science) Booker Gold Medal. The medal is awarded for outstanding contributions to telecommunications. Rahmat-Samii's award was "for fundamental contributions to reflector antenna design and practice, near-field measurements

and diagnostic techniques, handheld antennas and human interactions, genetic algorithms in electromagnetics and the spectral theory of diffraction."

Rahmat-Samii was presented with the award at the 2005 URSI General Assembly, which was held in New Delhi, India, October 23-29, 2005. The president of India, Abdul Kalam, attended the opening ceremony and presentation of awards with nearly 1,300 participants from all corners of the world.

"We are at the dawn of a new millennium, bound to evolve and progress by advances in science and technology as at no time in history," Rahmat-Samii said. "Science and engineering have played a central role in creating wealth, prosperity and freedom. I strongly believe that electromagnetic

phenomena and antennas are key components in this progress."

Rahmat-Samii, born in Tehran, Iran, obtained his bachelor's degree in electrical engineering from the University of Tehran and his master's and doctorate degrees in electrical engineering from Illinois.

He is a distinguished professor and past chairman of the Electrical Engineering Department at the University of California at Los Angeles (UCLA). Before joining UCLA, he was a senior research scientist at NASA Jet Propulsion Laboratory (JPL). He became a fellow of IEEE in 1985 and was elected president of the IEEE Antennas and Propagation Society (AP-S) in 1995. He also designed their logo. Rahmat-Samii has published more than 650 journal and conference papers and more than 20 books/book chapters in the areas of electromagnetics and antennas.

He was the recipient of the ECE Distinguished Alumni Award in 1999. The next year, Rahmat-Samii received the IEEE Third Millennium Medal and the AMTA Distinguished Achievement Award. In 2001, he received an honorary doctorate in physics from one of the oldest universities in Europe, the University of Santiago de Compostela, Spain. In 2001, he was elected as the Foreign

Member of the Royal Academy of Belgium for Science and the Arts, and in 2002, he received the Technical Excellence Award from JPL.

The Booker Gold Medal honors the memory of Professor Henry G. Booker, who served as URSI vice president, 1969-1975, and honorary president until his death in 1988. The award is normally made at intervals of three years, on the occasion of the General Assembly of URSI.

"There are certain moments in one's life that spark the ultimate satisfaction," Rahmat-Samii said in his acceptance speech. "There is no doubt that today's award ceremony is such a moment. My sincere appreciation to the University of Illinois, which challenged me to learn about new frontiers in science and engineering and created an environment in which my research could flourish."



## Featured alumni careers

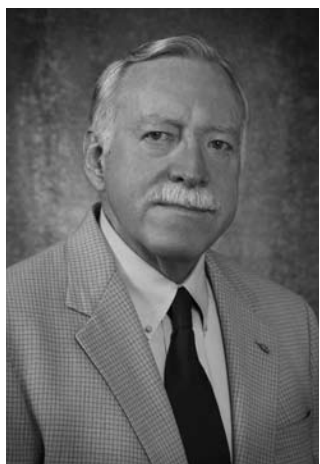
### Alum's space career launched from Illinois

By Jamie Hutchinson

"That's what made life interesting," said ECE alumnus Dave Berrier (BSEE '57) of the many challenges he faced during his 40-year career in the aerospace industry. He started out as a design and project engineer, bouncing from General Electric to McDonnell-Douglas to TRW, before settling in at Hughes aircraft for 10 years as a manufacturing program manager of air defense systems.

In 1979 he moved to The Aerospace Corporation, an R & D center for the Air Force space program, where he spent the second half of his career, climbing the ladder from program manager to systems director of spaceflight programs. After retirement, he stayed on at Aerospace for three years as a consultant, helping the company implement its space test programs.

One project that stands out both for its technical and managerial challenges—not to mention a horrific tragedy that intervened—is the Combined Release and Radiation Effects Satellite (CRRES), whose primary purpose was to map the Earth's Van Allen radiation belt, a vast region composed of high-energy charged particles from the solar wind that are trapped by



Dave Berrier

the planet's magnetic field. As program manager for Aerospace working on the NASA/Air Force-sponsored project, Berrier collaborated with government scientists and engineers, as well as those based at several universities, to make sure that scientific payloads were completed on time, properly tested, and verified to be compatible with the electrical and mechanical systems of the satellite.

By late 1985, all systems were "go" for launch on an upcoming space shuttle mission. But the anticipated mission was not to be. The Challenger and its crew were destroyed seconds after launching from Kennedy Space Center on January 28, 1986, temporarily grounding the program. The CRRES had to be modified and retested for launch on an Air Force Atlas Centaur vehicle,

which finally happened in 1990. Ultimately, the mission was successful in gathering much valuable data about the Van Allen belt and the near-Earth space environment. And Berrier credits CRRES with demonstrating "that new satellites could be designed with just enough radiation shielding for the onboard electronics. Too much shielding cost unnecessary weight, and weight is a serious consideration in the space industry."

As a kid growing up in Murphysboro in Southern Illinois, Berrier liked science, engineering, and—like so many American boys in the 1950s—space. Thanks to his aptitudes, high grades, and physical fitness, he won a Navy ROTC scholarship, and he put Illinois at the top of his college wish list because of its reputation in electrical engineering.

During his Navy service after college, Berrier was involved in the Quemoy-Matsu crisis of 1958, in which nationalist Taiwan and communist China came to blows over possession of two islands in the straits off the mainland. Tense as the situation was, Berrier is not given to bluster in telling his war story. "Our ship went to three-section watches (four hours on and eight off) during those few days, participating in a show of force.

I can't remember feeling any sense of danger at all."

His duty done, Berrier signed on at General Electric and launched his successful space career. Berrier recalled: "The GE recruiter told me that an EE degree from ... Illinois gave me a leg up." Now fully retired, Berrier lives in San Marcos, California. His three sons and five grandchildren all live nearby in southern California.

## Alumni class notes

### 1950

Harold "Gene" Shutt (BSEE) celebrated his 80th birthday on April 10 in Springfield. Shutt worked for the Illinois Commerce Commission as a gas and electrical engineer for 35 years.

### 1957

Robert Janowiak (BSEE) was posthumously inducted into the Navy Pier Hall of Fame at the University of Illinois Alumni Association of Chicago's 60th anniversary celebration on February 3. (Editor's note: Janowiak passed away on January 29. See story page 34.)

### 1984

Sergio Verdu (PhD) was awarded a doctorate honoris causa from the Polytechnic University of Catalonia, Barcelona, Spain, in October 2005. He is a professor of electrical engineering at Princeton University.

### 1985

Kathy Clevenger (BSEE) was promoted to vice president of Microchip Technology, a leading provider of microcontroller and analog semiconductors. Clevenger was responsible for Microchip's wafer-fabrication manufacturing facility in Gresham, Oregon, which is called Fab 4.

### 1987

John Barnicle (BSEE) became president and CEO of Lynch Interactive Corporation in November 2005. The Delaware holding company has subsidiaries in multimedia and telecommunications services. Previously, Barnicle served as president and CEO of Neutral Tandem, Inc.

### 1990

Gregory T. Huang (BSEE) co-authored a book, "Guanxi (The Art of Relationships): Microsoft, China, and Bill Gates' Plan to Win the Road Ahead," with Robert Buder, Simon and Schuster, 2006. Huang received his PhD in EECS from MIT. He is currently a feature editor for *The New Scientist*, a London-based journal.

### 1995

Jay Malin (MSEE '93, PhD) joined CableMatrix in 2005 following the company's acquisition of Xinnia Technology, which he cofounded and where he served as CEO. Malin will serve as vice president for business development at CableMatrix, a broadband networking software firm located in Deerfield, Illinois.

### 1996

Tim Miller (BSEE) is co-owner of the Champaign-based company Artisan Scientific. The company sells used scientific equipment and repair services at low prices.

### 2001

Michael Ivan Portscheller (BSEE) married Stacey Anne Holland on December 3, 2005. He is employed as an electrical engineer at Caterpillar, Inc., in Mossville, Illinois.

### 2002

Justin Holder (BSEE) received his master's in systems engineering from Virginia Tech in December 2005. He works for the Department of Defense as an electronics engineer design-

ing, building, and testing a hardened informational awareness system for the U.S. Navy in Virginia Beach, Virginia.

Jeff Vyduna (BSEE) married Rebecca Friedman on October 22, 2005. The couple currently resides in Chicago.

## Obituaries

Mark Leon Inboden (BSEE '79) died May 19, 2006. He was 50. Inboden was an electrical engineer at Ratheon Co.

James Frank Kauffman (MSEE '64) died December 12, 2005. He was 68. Kauffman served in the Army Reserves for seven years and was honorably discharged as a 1st Lieutenant. He earned his PhD in electrical engineering at North Carolina State University, where he became a professor and was recognized as an outstanding teacher by the students in the Department of Computer and Electrical Engineering.

Frank W. Linder (BSEE '40) died April 11, 2006. He was 88. Linder worked as an electrical engineer for Dairyland Power Cooperative in La Crosse, Wisconsin, from 1947 to 1985, when he retired as Dairyland's general manager. He served on the first board of directors of the Institute of Nuclear Power Operations.

Thomas G. McCullough (BSEE '51) died April 9, 2006. He was 78. McCullough served in the U.S. Army Signal Corps in Japan during World War II. He began his career with Union Electric in St. Louis, Missouri,

before returning to Watseka, Illinois, in 1952 to become partners with his brother in the McCullough Implement Company.

D. Thomas Montella (BSEE '55) died February 20, 2006. He was 73. Montella served two years with the Army Signal Corps at Ft. Meade, Maryland, before accepting a position with Hewlett-Packard, where he worked until his retirement in 1988.

John Warren (BSEE '57) died February 20, 2006. He was 76. Warren spent 20 years working in the aerospace/missile industry and the United States Department of Agriculture Forest Fire Laboratory. He spent the next 17 years as an electronics engineer at the National Interagency Fire Center in Boise, Idaho.



The College of Engineering and Department of Electrical and Computer Engineering presented Donald H. Lackowski (BSEE '51) with a Golden Anniversary Diploma to celebrate the 50th anniversary of his degree on campus last fall. Mr. Lackowski is a retired systems engineer, Naval Ocean Systems Center, San Diego, California. He is pictured with ECE Emeritus Professor Paul Coleman, Department Head Richard Blahut, and ECE Professor Pete Sauer.



ECE students Praveen Bommannavar and Diana Liu attended the Orange and Blue Alumni-Student Reception on March 31. The annual event provides an opportunity for students to mingle with alumni.



Sergio Verdu (PhD '84) receives a doctorate honoris causa from the Polytechnic University of Catalonia, Barcelona, Spain.



Chicago-area ECE alumni gathered in Oak Brook on April 7 to renew acquaintances. Jack Farley (BSEE '48) and his daughter, Daryl Farley Varney (BSEE '83 MSEE '85), visit with ECE Alumni Board member Richard Williams (BSEE '80).

## Stay in touch

Your fellow alums would like to know what you are doing. Visit [www.ece.uiuc.edu/alumni/alumnews.html](http://www.ece.uiuc.edu/alumni/alumnews.html) to send us news about your job, your family, awards you've won, or any interesting activities you are involved in.

## Recipients of the 2006 Distinguished Alumni Awards

Per K. Enge (MSEE '79, PhD '83)  
Professor at Stanford University  
Stanford, California

Arydas J. Kliore (BSEE '56)  
Senior Research Scientist  
California Institute of Technology  
Jet Propulsion Laboratory

Leon A. Newman (MSEE '73, PhD '76)  
President/General Manager  
Coherent, Inc.  
Bloomington, Connecticut

Michael L. Van Blaricum (BSEE '72, MSEE '74, PhD '76)  
Chief Scientist and Director  
Toyon Research Corporation  
Goleta, California

Larry F. Weber (BSEE '69, MSEE '71, PhD '75)  
President  
Society for Information Display  
San Jose, California

### Recipients of the ECE Young Alumni Achievement Award

Scott Mahlke (BSEE '88, MSEE '91, PhD '97)  
Assistant Professor at the University of Michigan  
Ann Arbor, Michigan

Steve Sullivan (MSEE '91, PhD '97)  
R & D Director  
Industrial Light & Magic  
San Rafael, California

### Recipient of the Marcia Peterman ECE Award

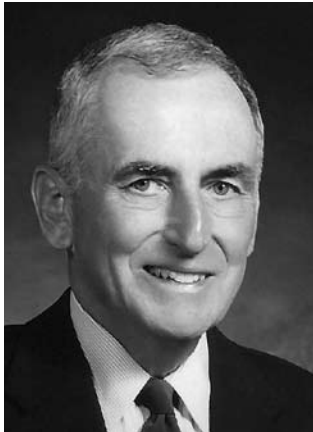
Jennifer Sterling (BSEE '89, MSEE '90)  
Director, Transmission Planning  
Exelon  
Oak Brook Terrace, Illinois

### Know an exceptional alumnus?

Know an ECE alumnus who deserves to be recognized? Go to [www.ece.uiuc.edu](http://www.ece.uiuc.edu) and select "Alumni" for more information on the nomination process and the awards.

### Robert Janowiak, advocate for engineering education, dies

By Tom Moone



Robert Janowiak, 1936-2006

When Robert Janowiak (BSEE '57) passed away on January 29, 2006, at age 70, the electrical engineering field lost a strong advocate, and ECE lost a loyal friend.

Following his graduation from Illinois, Janowiak began his career at IIT Research Institute, where he was responsible for research and software development. He later became a vice president at Rockwell International and then president of Federal Signal Corporation.

Having always been a strong supporter of electrical engineering education, Janowiak became the Executive Director of the International Engineering Consortium (IEC) in 1982. IEC is a nonprofit organization dedicated to continuing education in the electronics industry. There he oversaw IEC's work in bridging aca-

demia and industry in order to develop high-quality, innovative forms of continuing education for engineering professionals.

His great interest in university education led Janowiak to also take on the role of executive director for two major organizations in the electrical and computer engineering field. As executive director of Eta Kappa Nu (HKN), the electrical and computer engineering honor society, he oversaw programs for HKN's 200 university chapters and 100,000 members. With the Electrical and Computer Engineering Department Heads Association (ECEDHA), he worked with the 300 member institutions to enhance student education and facilitate interactions with industry and government organizations.

Janowiak left a strong impression on those who worked with him. ECE Department Head Dick Blahut said, "Bob was a unique and wonderful man who, with a nod and a wink, could inspire anyone to be more productive. He could combine work and play, and enjoyed every moment of life." ECE Professor Tim Trick, who worked with Janowiak through both the ECEDHA and IEC, said, "He was a visionary and a

natural-born leader." Trick went on to say, "Bob's leadership will be greatly missed by all of us who benefited from his influence."

Prior to taking on his role with IEC, Janowiak was an active member of the ECE Alumni Board, serving on the board from 1973 to 1982. He served as president of the Board from 1979 to 1981. He received ECE's Distinguished Alumni Award in 1984 and the Marcia Peterman Award in 1988.

The IEC has provided a gift to the ECE Department to establish the Robert M. Janowiak Memorial Endowment Fund, which will be used to support the ECE Department, faculty, and students. Additional contributions to this fund are welcome and can be made by contacting Jonathan Hill in the ECE Development Office at (217) 265-6285 or by e-mail at jonahill@uiuc.edu.

### Professor Leon Frizzell retires

Continued from page 15

cabin in northern Vermont.

Looking back over his time at Illinois, Frizzell said, "It is certainly easy to say it was really a privilege to have been a part of a department that is as renowned as this one is and to work with colleagues who are of such high caliber. I consider myself lucky to have been able to do that."

## DONORS: January 2005 through April 2006

ECE is extremely grateful to the alumni, friends, and partners who have made charitable contributions to the department. This list includes financial donations, but we are just as grateful to for the countless volunteer hours and the ongoing support you lend in other ways. ECE could not maintain its position as a great educational and research institution without you.

### GIFTS OF \$500 OR MORE

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 J. K. 'Jake' Aggarwal and Shanti Aggarwal  
 John J. Allemong  
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 Richard M. Barth  
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 Joseph A. and Constance M. Beatty  
 William S. Bennett  
 Frank A. and Kathleen A. Bernatowicz  
 Randal T. Beste  
 David Edward and Mary McCarthy Borth  
 James B. Briggs  
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 Milton M. T. and Rosalind P. Chang  
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 Michael J. Fogarty III  
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 James Y. Fujitani  
 Dennis E. Fuoss  
 Sorab K. and Cecilia B. Ghandhi  
 Merle and Lisa Gilmore  
 Scott B. Gough  
 Marvin C. Greer  
 Aran Hegarty  
 Chien and Nancy Tseng Ho  
 Kurt S. Hollenbeck  
 John R. Holm  
 Se June Hong  
 Sherel D. Horsley  
 Robert M. Janowiak  
 Carl J. and Margot A. Johnson  
 Roger L. Johnson  
 David H. Julifs and Roxann M. Marumoto  
 Robert Jung and Lisa Chan  
 David A. Kamm  
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 Dharmvir S. and Maria B. Verma  
 Zhonghui A. Wang and Liping J. Zhu  
 You-Pang Wei and Tsu-Jane Lai  
 George H. Weichsel  
 Robert P. Wiegand  
 Casey Richard Wold and Julia Ericson Wold  
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## Upcoming Events

**September 14-16**  
UI Foundation Weekend  
Campus

**September 21-22**  
ECE Fall Alumni Board Meeting  
and Activities  
Campus

**Week of September 25**  
Silicon Valley Event (TBA)  
Northern California

**October 7**  
College of Engineering  
Homecoming Pre-Game Party  
Illinois vs. Indiana Football  
Campus

**October 12**  
Alumni Gathering at National  
Academy of Engineering  
Washington, DC

**November (TBA)**  
UI Day at IBM  
Yorktown Heights, NY

**March 9-10, 2007**  
Engineering Open House  
Campus

**March 9, 2007**  
ECE Spring Alumni Board  
Meeting  
Campus

**March 29, 2007**  
Alumni Reception at Oakbrook  
Oakbrook, IL

**May 13, 2007**  
ECE Graduation Brunch  
Hawthorne Suites, Champaign

**For more information, contact Emma Marshall, ECE Alumni  
Relations Coordinator, at [emarshal@uiuc.edu](mailto:emarshal@uiuc.edu) or (217) 333-5817.**

## Fighting Illinis Football Schedule

**September 2,**  
versus Eastern Illinois

**September 9,**  
at Rutgers (Piscataway, NJ)

**September 16,**  
versus Syracuse

**September 23,**  
versus Iowa

**September 30,**  
at Michigan State (E. Lansing, MI)

**October 7,**  
versus Indiana (Homecoming)

**October 14,**  
versus Ohio

**October 21,**  
at Penn State (State College, PA)

**October 28,**  
at Wisconsin (Madison, WI)

**November 4,**  
versus Ohio State

**November 11,**  
versus Purdue

**November 18,**  
at Northwestern (Evanston, IL)

University of Illinois  
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