

# ECE ILLINOIS

## Electrical and Computer Engineering Alumni News

ECE Alumni Association newsletter

University of Illinois at Urbana-Champaign

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## New Illinois institute focuses expertise on "trust"

By Jamie Hutchinson

One of the newest interdisciplinary initiatives at the University of Illinois addresses the threats of a networked world—from spyware and automated computer attacks, to identity theft and information warfare, to power blackouts, and more. And like so many other such enterprises on campus, this one puts ECE faculty, students, and facilities at the center of the action.

Engineering Dean David Daniel established the Information Trust Institute (ITI) in 2004 and appointed ECE Professor Bill Sanders as director. Seventeen ECE faculty are listed among the 40 ITI faculty and senior researchers. The institute brings together under one banner such diverse areas of Illinois engineering expertise as information protection; authentication protocols; secure compiler technologies; intrusion-tolerant middleware; reliability, security, and dependability assessment; validation technologies; and security policy analysis. ITI also draws on security- and systems-related expertise in campus units such as finance, economics, geography, and agriculture, as well as industry partnerships.

Put it all together, and you have a notion of "trust" that encompasses a lot more than simply protecting computers from hackers. "Trust" encompasses information correctness and survivability, system reliability and availability, privacy, and, most importantly, general public confidence. Needless to say, the stakes are high, as noted by ECE Professor David Nicol, an ITI steering committee

member, who represented ITI at a homeland security conference on campus last spring. According to Nicol, a massive failure of U. S. financial computer networks—whether caused by malicious attack, faulty internal design, or a combination of factors—could have horrific effects on the economy. The same goes for the power grid and national defense, both of which rely heavily on big, complex computer networks. (ECE power engineering faculty Pete Sauer and Tom New Illinois institute, continued on page 30)



Would you trust this man? Boeing does. Bill Sanders, director of the Information Trust Institute, and his students will help the aerospace giant develop trustworthy software systems.

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## Department head's message

It seems quite certain that this is the first time our ECE Department Head's message was written in Asia. The pressures of my job are such that the only way this letter can make the publication deadline is to write on the road and send it in electronically. And write on the road means to write it on the trip to Taiwan, Korea, and Hong Kong. Writing this letter is yet another task in a busy schedule, yet I welcome it because it creates an opening to discuss an important topic: the topic of globalization and international departmental relations.

Globalization is inevitable and unstoppable. Although, as in all such large social changes, there may be some negative consequences, there are also many positive consequences. I choose here to focus on the rich opportunities to enrich our department's mission of teaching, research, and service.

The conventional view is that engineering jobs are now being exported, mostly to Asia. At the same time, however, many experts claim that other

engineering jobs are being created domestically at the same rate.

However one sees this, most would agree that our engineering graduates should know much more about the world economy and the cultures of the world. Our College of Engineering has in place an excellent study-abroad program. Our undergraduates can spend a semester or summer abroad, often taking the same courses out of the same books that we use here. Exchange programs are available in countries such as Korea, Taiwan, Sweden, Singapore, Australia, and many other countries.

I believe that this is an opportunity to learn the elements of a new language or to practice one already known, to experience a new culture, or to understand how business is done in another country. This semester abroad will change the student's outlook, and will enable our graduates to make their engineering decisions in the context of a world market.



## ECE graduate program #4 in survey

The Illinois electrical engineering and computer engineering programs ranked fourth in the latest U.S. News & World Report survey released in April. According to U.S. News, engineering departmental rankings are based on input from engineering department heads nationwide.

### Electrical engineering

1. MIT and Berkeley (tie)
3. Stanford
4. Illinois

### Computer engineering

1. MIT
2. Stanford and Berkeley (tie)
4. Illinois and Carnegie Mellon (tie)

## Symposium brings MRI into focus

By Jamie Hutchinson

Between its new Department of Bioengineering, its Institute for Genomic Biology under construction on the south campus, and dozens of bio-savvy faculty hires in departments campus-wide, it's clear Illinois administrators see big opportunities for research and education in the growing field of biotechnology. Within that field, U of I is particularly well positioned as a hub of cutting-edge bioimaging technologies.

A recent symposium at the Beckman Institute for Advanced Science and Technology underscored U of I's strength in imaging research by gathering a select group of imaging experts from campus and beyond in order to celebrate Professor Paul Lauterbur's 2003 Nobel Prize in Physiology or Medicine, awarded for his contribution to the development of magnetic resonance imaging (MRI), and to discuss promising directions for future research in MRI and other imaging techniques.

ECE Professors Zhi-Pei Liang, a long-time student and colleague of Lauterbur, and Bruce Wheeler, who also serves as head of the Department of Bioengineering, played major roles in planning the symposium. At the poster session, several of Liang's students in the Computational Bioimaging Group at Beckman presented results of their research. ECE students also presented posters of work done under the direction of Professors Steve Boppart, Yoram Bresler, Doug Jones, Farzad Kamalabadi, Bill O'Brien, and Andrew Webb. Bresler gave an invited talk on new advances in signal processing that can increase the speed and resolution of real-time, dy-



Photo by Jamie Hutchinson

ECE graduate student Nitin Agarwal (left) and his advisor Yoram Bresler displayed research results at the MRI symposium poster session. Agarwal's dissertation work explores sampling methods that can enhance the kinds of parallel imaging done with multiple MRI receiver coils. "The symposium gave me a sense of the breadth of research by scholars all around this field," said Agarwal.

namic MRI. Webb gave an invited talk on his work toward more effective contrast agents, microcoils for mass-limited MRI, and combining MRI with other imaging modalities such as near infrared imaging.

Webb's new approaches to MRI from the physical angle often require new approaches from the signal processing angle, creating opportunities for collaboration among ECE research groups. "I'm always looking for ways that we can apply image processing and the kind of math that we do to imaging problems," said Bresler. "It's good to see that there are more and more such problems where we can contribute."

Liang said organizing the conference was easy because of the widespread enthusiasm for the idea of celebrating

Lauterbur's work. "Paul has done so much for science and for medicine, and the social impact that goes with that," he said. "Also, this is a way for us to showcase what we have at Illinois. We've gathered the pioneers and the leaders in the field; let them see what we have here."

In his opening remarks at the symposium, Beckman Institute Director Pierre Wiltzius acknowledged Illinois ultrasound pioneers William Frye and Floyd Dunn, both of ECE. College of Engineering Dean David Daniel, in his remarks, looked to the future by sharing his interactions with high school students considering majors in engineering. "I always tell them that you

# Professor's work may fix many of life's glitches

By Greg Kline, News-Gazette staff writer



Princeton University Professor Joe Taylor's field is physics—he won the Nobel Prize in 1993—but the passion he engages in for fun is bouncing radio signals off the moon.

Illinois ECE Professor Ralk Koetter and former Illinois colleague Alexander Vardy have made the pastime even more fun for Taylor and other amateur radio operators. In the process, they may affect the rest of us in myriad ways—from our CD and DVD players and the hard drives in our computers to the pictures we see on the television screen and of Saturn and its moons—although we're likely to remain largely unaware of it.

Amateur radio operators bounce signals off the moon to vastly extend the range of their transmissions and make contact with peers around the globe. Federal rules limit the power of the units, often referred to as ham radios, making it barely possible to send a signal to the moon and back, Taylor said recently.

"It's kind of the black belt of amateur radio to be able to do it," he said.

The signal is extremely weak after its long journey and difficult to pick out of the radio spectrum. Radio operators, in their efforts to overcome the limitation, use "error-correcting codes," mathematical formulas designed to separate the signals from the background "noise."

While bouncing signals off the moon may be a nifty application of them,

error-correcting codes are everywhere in, and a linchpin of, our digital world. They factor out smudges on a CD that might otherwise turn a symphony into a screech. They account for problems on less-than-perfect computer disks that could render our files unusable. They overcome interference on telephone lines to get our faxes through and make our high-speed Internet connections work, and in space to get digital TV pictures and photos from Mars across, among other things.

"Really everybody uses them constantly, and they're somewhat hidden away," Koetter said.

One of the simplest ways to check for errors is to transmit the information three times. That way, if one transmission arrives differently, you have, in essence, a two-to-one majority vote on the correct configuration, said Koetter, a Coordinated Sciences Lab professor whose specialty is methods for coding information to transmit it as efficiently as possible.

The problem is that transmitting information multiple times involves a lot of overhead and it's slow. So scientists have developed mathematically based strategies for sending as little redundant material as possible to catch mistakes at an acceptable level.

For a long time, doing that has centered on the Reed-Solomon codes laid out by University of Southern California Professor Irving Reed and the late Gustave Solomon in the 1960s.

"They are probably the most used codes out there in the real world," said Koetter, who related a story about being awed when as a student he met Solomon at a conference.

In the 1990s, researchers showed that the Reed-Solomon codes could be tweaked to catch more errors than had been widely accepted as possible almost since their creation. If the number of errors exceeded the limit, the assumption was the information—a weak radio signal from the moon, for example—would be lost.

But the improvements suggested by Madhu Sudan, an MIT computer scientist, and his then-graduate student Venkatesan Guruswami, were intended for proof of concept, not practical application.

The research opened up an avenue for improvement that would be practical, however, and Koetter and colleague Vardy, who originally brought Koetter to Illinois as a post-doctoral researcher, headed down it. Vardy is now a professor at the University of California, San

Koetter, continued on page 20

## A century later, HKN still nurtures

By Janet Krenn

A recurring theme in W. J. "Jerry" Sanders's keynote address at the Eta Kappa Nu (HKN) Centennial Leadership Conference was, "People first. Products and profits will follow." Sanders (BSEE '58), who is a cofounder of Advanced Micro Devices, emphasized that good leaders respect their staff and understand the importance of their staff in the production process. Creating good leaders is what this conference was all about.

Part of the mission of this centennial conference, held October 22-24, 2004, on campus, was to explore the foundation of HKN and ways to ensure it remains relevant within the engineering field. The conference focused on teaching HKN board members how to improve their leadership skills, how to build organizations, and how to use their technical skills to develop technology and create new business opportunities.

HKN was founded on the Illinois campus in 1904. The brainchild of Maurice L. Carr, HKN was originally envisioned as an engineering society to promote job placement for students. A few years later the organization was changed to an electrical engineering honor society. HKN chapters are now found on hundreds of campuses across the nation.

One conference panel addressed "From Learner to Leader: Applying Your Skills to Any Discipline." The panel discussed leadership and emphasized ethics in the workplace. In light of recent high-profile corporate scandals, the panelists felt strongly that leaders should keep their teams motivated and honest.

"As a leader, you need to know when,



ECE students and HKN members take a break for lunch during the centennial conference in October. Included here are centennial organizers Grace Wang (far left), Alex Spektor (mid right), and Gary Yen (far right).

where, and what to provide to your team with respect to ethical background," said panelist Richard J. Gowen, eminent member of HKN and former HKN national director (1994-1996).

More than 100 students attended the conference, representing HKN chapters from as far away as Miami, Berkeley, and New York City. ECE alumni Bradley McCredie (BSCE '86, MSEE '87, PhD '91) and David Lemson (BSCE '94) also participated in panel discussions. A team of Illinois HKN students organized the conference. "We hope that the students who came here got something out of it. We hope they can go back to their chapters with some new ideas on how to do things," said ECE student Scott Hannan (BSEE '04), HKN centennial planning chair.

Other conference activities included a chapter design competition, campus tours, and the induction of three new eminent members, including alumnus Sanders. Among the other distinguished

guest speakers were Steve Watkins, ECE professor at the University of Missouri-Rolla and Nick Triantos, chief software

### Share your memories of ECE

ECE alumni are invited to submit memories of their time on campus, which we will share with all our alumni through the ECE Alumni Web site. Please visit [www.ece.uiuc.edu/alumni/remember/index.html](http://www.ece.uiuc.edu/alumni/remember/index.html) to learn more.

# The Vermilion River Observatory

## Two decades of radio astronomy in ECE

By Jamie Hutchinson

On a brilliant Sunday afternoon last October, ECE faculty, staff, and their families gathered for a picnic amid the fall colors of a University of Illinois-owned natural area near the banks of the Vermilion River just southeast of Danville, IL. Children and adults ate, hiked, socialized, and learned about U of I ecological research at the site. Entomology students delighted youngsters with butterfly displays, giant hissing cockroaches, even a tarantula.

“Facilities like this are what put Illinois on the map,” remarked picnicker Narayana Rao, ECE’s associate department head. But Rao wasn’t referring to current studies of West Nile Virus, or tree physiology, or wasp breeding going on at the Vermilion River site. The work that put Illinois on the map was itself a map—a map of the universe.

For over two decades, ECE Professor Emeritus George Swenson oversaw radio astronomy research at the site, still called the Vermilion River Observatory (VRO) though its telescopes were dismantled long ago. Swenson supervised the building of two major radio telescopes at VRO. One instrument cataloged over 1,000 discrete radio sources beyond the Milky Way, helping astronomers understand the geometry of an expanding universe. The other, smaller instrument worked in coordination with radio telescopes worldwide in performing high-resolution observations of cosmic sources, and outfitted with a microwave spectrometer it was ideal for analyzing the molecular makeup of interstellar gas in the Milky Way.

No wonder, then, that the picnic’s feature presentation was delivered by George Swenson. Now 82 and retired from radio astronomy, Swenson still advises graduate students and conducts research in more earthly subjects like acoustics and wildlife telemetry. And he



The Illinois 400-foot radio telescope. Cut by nature, polished by man.

loves nothing more than to recount the adventures of researches past. On this day, he was reunited with old astronomy colleagues Arno Schrieffer Jr., the VRO site manager, and U of I astronomy professors John and Helene Dickel. So after a meal of barbecue sandwiches, Swenson pulled out a few slides and made himself comfortable in the main room of a humble building, dubbed informally by its new denizens as “Swenson Hall,” where decades ago he spent much of his life. As he projected the slides onto a wall once hidden by racks full of electronics for processing cosmic signals, Swenson told the story of the Vermilion River Observatory.

Radio astronomy returns to Illinois As early as 1954, ECE Department Head Edward C. Jordan and Department of Astronomy Head G. C. McVittie were discussing building a radio astronomy program at Illinois. Radio astronomy called out for collaborations between

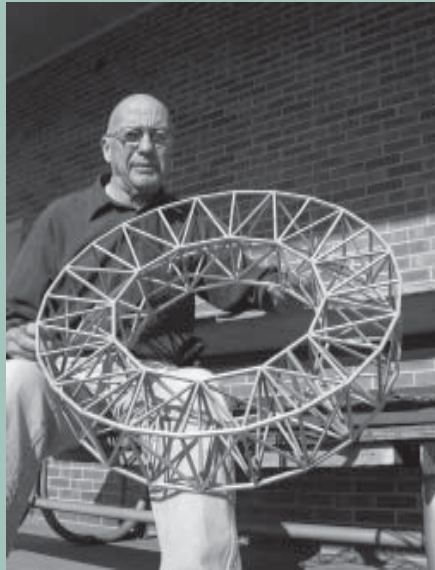
astronomers and electrical engineers, and the state of Illinois already had an important place in the history of the new science. Bell Labs engineer Karl Jansky, investigating short-wave transatlantic communication in 1932, discovered a periodic source of radio noise, which he was able to identify with the nucleus of the Milky Way. But it was Grote Reber of Wheaton, IL, another radio engineer, who during the late 1930s and early 1940s adopted that noise as his signal, building the first radio telescope and conducting the first systematic survey of the radio sky—all during his spare time in the back yard of his suburban home. Following World War II, radio astronomy emerged full-fledged as a “big science,” capitalizing on wartime advances in radar and communications. The major observatories, however, were located in England, France, the Netherlands, and Australia, and a more complete map of the radio universe began emerging from researchers in these countries, not

the United States. During the 1950s, U.S. scientists, academics, and government officials began reversing the trend with increased investments in radio astronomy.

In 1956, Swenson was an electrical engineering professor at Michigan State specializing in radio science. During a visit to the Illinois campus, he met with Jordan and told him of antenna engineering work he had done in Alaska for an ionospheric research program that used decameter radio waves from the Milky Way as a reference signal, thus combining radio astronomy with geophysics. Jordan and McVittie had run into dead ends with first a physicist, then an astronomer, heading up their radio astronomy efforts. They decided to give an engineer a shot at the job, offering Swenson a joint appointment in astronomy and electrical engineering with much more opportunity (and responsibility) for research than he enjoyed at Michigan State. The engineer would not disappoint them.

McVittie, like other cosmologists, depended on accurate, complete catalogs of cosmic radio sources in order to develop descriptions of the structure and evolution of the universe. The best-known catalogs at the time, published by researchers at Cambridge, England, and Sydney, Australia, disagreed in their accounts of particular sources and regions of the sky, and the instruments at these sites were incapable of resolving the discrepancies. In 1957, McVittie dispatched Swenson on a grand tour of these and other prominent radio observatories. He and Jordan charged Swenson with developing the conceptual design of a new telescope at Illinois that would best complement those used elsewhere in the radio astronomy community.

After the trip, and much study and consultation, Swenson designed the



Arno Schriefer still keeps a model he built of the backup structure for the 120-foot dish. The model was used for a stress analysis that was performed to enhance the telescope's range of reception to the south.

first major telescope to be built at VRO, the Illinois 400-foot radio telescope (see photo on p.6). The new instrument would improve on the sensitivity and resolution of other radio telescopes by incorporating a huge collecting area, or reflector—a parabolic cylinder 600 feet long and 400 feet in diameter. It would reduce the confusion of radio sources inherent in other instruments by reducing the sidelobes of its beam, or directivity pattern. It would operate at a higher frequency, 610 megahertz (49 centimeters wavelength), in order to gather useful spectral data. And to compensate for the noise inherent in broadband amplifiers, it would rely on state-of-the-art, low-noise receiving equipment.

These design constraints posed significant engineering problems, to which Swenson and colleagues took fresh yet determined approaches. Their solutions were quintessentially "Illinois."

Cataloging the sky: The Illinois 400-foot

radio telescope

"The cheapest building material is earth," commented Swenson on the most obvious problem presented by the design: how to build a 400 by 600 foot reflector. Still, scooping a parabolic cylinder that size out of the earth would have required moving about 150,000 cubic yards of dirt—no mean feat, to say nothing of the drainage problem left over from the task. Swenson wagered that somewhere nearby, nature likely had done much of that work for him already. Sure enough, an aerial survey of the Vermilion River system revealed a stream bed of the proper dimensions and north-south orientation, about 45 miles east of campus, five miles southeast of Danville. The university bought the land, and construction began in September 1959. (Adjoining parcels were purchased in subsequent years.) Crews cleared the ravine of trees and brush, graded the slopes, built a dam upstream to guard against flash floods, and dug a new section of the stream channel centered precisely on the meridian and on the center line of the parabolic cylinder. The entire reflector was sealed with asphalt liner, then covered with a galvanized wire mesh, which would bounce incoming waves to the focal line 153 feet above the center line. Along the focal line, feed elements were arrayed underneath a truss supported by four 153-foot towers made of Douglas fir.

Swenson also found a homegrown solution to the problem of steering this giant, stationary receiver. Whereas a telescope intended for sustaining lengthy observations of a fixed source requires an axis of motion parallel to that of Earth in order to compensate for the planet's rotation, an instrument intended for the more sweeping, survey-type observations of cosmic cataloging requires no such compensatory motion. Earth's

Continued on next page

rotation alone is sufficient to provide the east-west motion of such a “meridian transit” instrument. Nevertheless, capturing more than a narrow swath of sky requires steering the instrument in the north-south direction on the sky, called declination. During his grand tour, Swenson had studied meridian transit systems in which declination steerability was provided not by tilting the reflector (obviously impossible in this case) but by manipulating the phasing of the feed elements in the focal line. Researchers in France and the U.S. had achieved some success at declination steering via phase adjustment of dipole and helical feed elements. Swenson sought to outdo these schemes, and for help he turned to ECE’s famed Antenna Laboratory.

The Antenna Lab had developed powerful new broadband antennas during these years by exploiting the log periodic principle. (See p. 8 of last summer’s Alumni News for a fuller story about U of I broadband antennas.) The Lab’s Professor John Dyson (MSEE '50, PhD '57) had developed a logarithmic conical spiral antenna that fit the bill for the 400-foot telescope not only because of its broadband characteristic, but also because its radiation pattern was suitable and because the phase of its output signal was a linear function of azimuth about its axis of symmetry. The focal line array, consisting of 276 of Dyson’s antennas, was designed by the late Professor Y. T. Lo of the Antenna Lab. Lo’s array employed an unusual, nonuniform spacing among elements, which reduced the total number of elements needed and simplified the daily operation of the instrument. And with the aid of the original ILLIAC computer, Lo created a schedule according to which each feed element was manually phase-adjusted (rotated) once a day to



Kwang-Shi Yang (left), assisted by Kenneth Sieb (MSEE'63) (right), designed the system of receivers and recording equipment for the 400-foot telescope. Later, Yang would design and build the electronics and motor drives of the 120-foot telescope, in addition to the computer used to control the instrument.

change the declination of the telescope’s reception beam, enabling the instrument to observe a 60-degree-wide band of sky over a period of years.

Swenson and senior research engineer Kwang-Shi Yang teamed up to design the transmission-line system between the feed elements and the reception and recording electronics. This aspect of the design proved surprisingly difficult, with most components having to be built from scratch to meet the special needs of low loss, high bandwidth, and phase adjustability. Lo pitched in by figuring out a branching scheme for the lines that eliminated a spurious lobe in the reception pattern. Yang and Kenneth Seib (MSEE '63) designed and built the receivers and recording system, for which off-the-shelf commercial components proved more

suitable. Zenith Radio Corporation, for example, donated low-noise electron-beam parametric amplifiers.

The original dam proved insufficient on two occasions during the summers of 1961 and 1962, when flash floods destroyed sections of the reflector surface, requiring a bigger dam to be built further upstream. And for two or three weeks every summer throughout the life of the telescope, Schriefer supervised a team of students in battling the subtler, erosive forces of nature that distorted the reflector. Equipped with rakes, hoes, shovels, and a tar kettle, students repaired and smoothed the surface, ensuring that every point on the reflecting area was within about an inch of the specified figure. Tedious as that may seem, the facility’s maintenance

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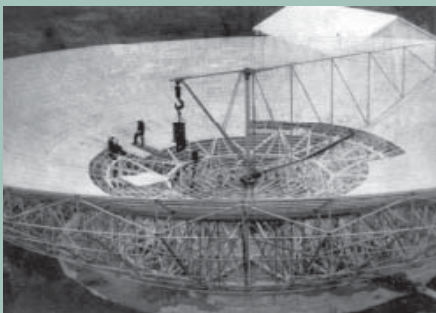


budget, about two percent of the capital investment, was equal to or less than those of other major radio telescopes.

Other obstacles to be surmounted were man made. As early as 50 years ago, radio astronomers were alerted to the problem of noise pollution in the radio spectrum. Swenson discovered that VRO, despite its sparsely populated surroundings, was subject to interference from transmitters of other services, as well as radio-frequency noise from road traffic, electric fences, and other sources. The 400-foot telescope was built with the expectation that an effort on the part of the scientific community to secure bandwidth for research would eventually succeed. That lengthy, worldwide, legal and political effort—“a story all by itself,” according to Swenson—did succeed in setting aside television channel 37 (608-614 megahertz) for radio astronomy.

The Illinois 400-foot telescope catalogued the sky from 1959 to 1970, with the first published account of its findings coming in the PhD dissertation of John MacLeod (PhD 1964). John Dickel oversaw the mapping of extra-galactic sources within 30 degrees of the zenith, as well as many distant sources within the galaxy. Astronomy Professor John C. Webber and ECE Professor Harold Webb also mapped regions of the Milky Way. Perhaps the most famous discovery made by VRO was the source “VRO 42.22.01,” the prototype of a class of active galactic nuclei. Swenson also points with pride to two previously unknown supernova remnants discovered by VRO, as well as new maps of the Milky Way’s Cygnus X region and many ionized hydrogen regions within the galaxy.

By 1970, steady erosion had caused the telescope’s focal length to increase beyond any adjustment that could be made to the focal line array, fixed as it



(1)

Photo by Arno Schrieffer



(2)

Photo by Arno Schrieffer



(3)

Photo by Arno Schrieffer

Construction of the 120-foot telescope. (1): While the parabolic dish is still on the ground, its mesh is installed using a pivoted template to gauge the surface. (2) and (3): The dish is hoisted atop its mounting pedestal with a 200-ton stationary guy derrick borrowed from the government. (4) The load blocks hanging from the derrick boom handled 9000 feet of cable. (5) The underside of the dish as seen from the base of the mounting. The dark arc is the track of the chain drive for lateral, or hour angle, motion, allowing the instrument to follow a fixed celestial body for five hours of Earth’s rotation.



(4)

Photo by Arno Schrieffer



(5)

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The Illinois 120-foot radio telescope. Built from scratch by staff and students.

was at 153 feet. What's more, interest in the astronomy community had shifted away from source cataloging to more detailed investigations of individual sources. The staggering variety of those sources became ever more apparent, along with the need for instruments and observations that would help discriminate among the variety of sources. McVittie had retired, and Swenson had expanded his horizons as chairman of the conceptual development team for the Very Large Array, a huge radio interferometry project of the National Radio Astronomy Observatory. He had also secured National Science Foundation funding for the first stage of a radio interferometry facility at VRO. The Illinois 400-foot telescope had served well through rain, snow, ice, and even an earthquake. But it was time to retire the venerable instrument and move on to new projects.

Focusing in: The Illinois 120-foot radio telescope

Swenson hoped his grant from NSF in 1967 was only the initial installment of support for a radio interferometry array comprising three 120-foot-diameter parabolic telescopes that would be movable along two intersecting lengths of railroad track—one a mile long and oriented east-west, the other a half-mile long and oriented north-south. The main idea behind applying interferometry to radio astronomy was to achieve the high angular resolution available through optical telescopes, but without having to construct the gigantic reflectors called for by long radio wavelengths. Better angular resolution would allow radio astronomers to accurately match newly discovered radio sources to their corresponding optical sources. In the 1950s Martin Ryle of Cambridge University had pioneered the technique of

"aperture synthesis," by which two small, inexpensive antennas could emulate a single, giant, expensive one with its high angular resolution. The technique was now practiced successfully with telescopes separated by thousands of miles, and was the driving idea behind the VLA.

Construction proceeded on the first 120-foot telescope at VRO with as much ingenuity as had been demonstrated in building the 400-foot telescope. Schriefer oversaw the detailed design, including a stress analysis that accounted for 100-mile-per-hour winds. Because of the tight budget, staff and students performed the labor and built the telescope from scratch, using materials and equipment from military surplus. For example, they fashioned the traversing mechanism for the feed antenna at the dish's focus from the gun turret of a World War II bomber. They built their own shop and equipped it. They learned the skills of machinist, millwright, carpenter, welder, surveyor, and rigger in order to make the components of the telescope. Then they borrowed a crane, bulldozer, trucks, hoists, and a 200-ton derrick from the government, and they put the components together (see photo sequence on p.9).

The new instrument was mounted equatorially, meaning that, unlike the 400-foot telescope, it could compensate for Earth's rotation and sustain observation of a discrete source for five hours. It could operate at the 49-centimeter wavelength of the old telescope, in addition to 18 centimeters, with the capability to accommodate more wavelengths in the future. And it was highly automated. An operator could control the telescope interactively via computer either at the site or from a remote location, or stored computer programs could run the system automatically. Perhaps

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most importantly, the telescope was equipped with a 50-channel, frequency-filter spectrometer, designed by Yang and Webber, which permitted its use in spectrographic investigations of our galaxy's chemical makeup.

As it happens, spectroscopy—not interferometry—would be the primary occupation of the Illinois 120-foot telescope, at least in the early years of its life. In the midst of construction of the first dish, Swenson learned that it would be the last—NSF would not fund two more. So when the telescope began operations in 1970, it was used productively as a spectrometer by Astronomy Professor Lewis Snyder, who measured the spectra of hydroxyl molecules in star-forming regions of the Milky Way. In 1974, a terminal was built that permitted the 120-foot telescope to perform interferometric observations in coordination with other, far-flung instruments engaged in very long baseline interferometry (VLBI). Using the VLBI technique, telescopes around the world were connected electronically in order to carry out extremely high-resolution image synthesis. From 1974 to 1981, the VRO dish contributed significantly to many VLBI observing campaigns of galactic and extragalactic sources.

“It was a temporary instrument for a specific job,” recalled Swenson of the 120-foot telescope. And by 1981 it was clear that job was done. Government funding for the project continued to decline. Increasingly, astronomers at Illinois and elsewhere preferred to use government facilities such as the VLA. And certain misfortunes, while not debilitating, had also disrupted work at VRO. Lightning struck the shop building, burning it down and destroying all the equipment. The university paid for a new, smaller building and some replace-

ment equipment. On another occasion, vandals entered the VRO by night on horseback, climbed into the 120-foot dish, and seriously damaged the reflecting surface, putting the observatory out of commission for almost a year. The university footed the bill for repairs, but the telescope never recovered its former precision. And so VRO was closed in 1981.

A sentimental attachment ECE still retains custody of VRO and benefits from the revenue of crops harvested on portions of the 420-acre site. Ecological research at the site dates back to 1970 with the master's thesis of Leonard Smock, a zoologist who surveyed the mammals, birds, fish, amphibians, and reptiles living at VRO. Beginning in 1996, the U of I Committee on Natural Areas began coordinating ecological

research at the site, and since then it has been used for classes in plant and animal biology, integrative biology, forestry, and entomology. The Illinois Natural History Survey has conducted biodiversity surveys at the site, which is considered important as a western outpost of the Eastern deciduous forest ecology; cross the Vermilion River to the west, and you find prairie ecology. In addition to such research, VRO has been used as a training site by the U of I Fire Service Institute, U of I Police Bomb Squad, and Danville National Guard.

Radio astronomy research at Illinois is nowadays conducted through a university consortium called the Berkeley-Illinois-Maryland Association (BIMA), as well as at observatories operated by the National Radio Astronomy Observatory and other U.S. and foreign agencies. Il-



Doing engineering the old fashioned way. George Swenson helps with construction of the 120-foot telescope.

## Etched in stone

By Doug Peterson

John Tucker remembers walking into the laboratories at the California Institute of Technology in the early 1980s, carrying with him a box loaded with computer cards. “Well, why didn’t you just bring stone tablets?” joked one professor good-naturedly after spotting Tucker’s computer cards, which by then were as out of style as disco music and mood rings.

The irony is that perhaps Tucker’s cards actually should have been etched in stone, for they turned out to be a landmark. Those cards, which Tucker was transferring to Caltech’s computers at the time, carried the program for a theory that helped to transform the world of radio astronomy.

His theory laid the groundwork for superconductor-insulator-superconductor (SIS) mixers, which made it possible for radio telescope arrays to pick up weak signals coming from deep space without any loss. These SIS mixers revolutionized radio astronomy.

With 2004 being a landmark year for radio astronomy, it is only fitting to revisit the work of Tucker, who has been an ECE professor since 1981, when he was recruited by the two-time Nobel prize winner John Bardeen.

Within the span of just six months, there have been groundbreaking ceremonies for two major radio telescopes: ALMA, which will eventually become the largest radio telescope array in the world; and CARMA, a smaller-scale project that will put into place the largest array in the northern hemisphere. Neither project would have come to pass without the work of Tucker.

Tucker remains characteristically modest about his accomplishment, but



Photo by Thompson-McClellan Photography

ECE Professor John Tucker’s theory laid the groundwork for superconductor-insulator-superconductor (SIS) mixers, which made it possible for radio telescope arrays to pick up weak signals coming from deep space without any loss. These SIS mixers revolutionized radio astronomy.

others underscore the significance of his research.

“John’s theory was indispensable to the development of millimeter and submillimeter astronomy,” said Fred Lo, former chair of the Department of Astronomy at Illinois and current director of the National Radio Astronomy Observatory, which is responsible for the North American part of the construction and operation of ALMA. In fact, Lo said Tucker’s work is almost directly responsible for making ALMA possible.

ALMA, or the Atacama Large Millimeter Array, is an international effort involving North America and Europe, and the result will be a fitting companion to the better-known Hubble Telescope. The European Union and U. S. National Science Foundation have committed \$600 million for its construction, but ALMA is not scheduled to be fully operational until 2012. Until then, one of the largest

arrays will be CARMA, or the Combined Array for Research in Millimeter-Wave Astronomy, which will be located in the eastern Sierra Nevadas. Scientists and other dignitaries, including representatives from the University of Illinois, broke ground on CARMA in early 2004.

But exactly how did Tucker’s theory make powerful radio telescope arrays such as ALMA and CARMA possible? To answer this question, it’s necessary to revisit the world of radio astronomy in the 1970s, as well as the years leading up to that point.

As the name implies, radio telescopes pick up radio waves coming from deep space. Radio waves can penetrate gas and dust in space significantly better than can light waves; what’s more, the “radio-maps” created from these signals can peer deeper into space and further back in time than is possible with optical telescopes.

Physicist Karl Jansky first detected radio noise coming from the center of the Milky Way Galaxy as early as 1932, but it wasn’t until the 1950s and 60s that “the real activity in radio astronomy started,” said Lo. Beginning in the 50s, as technology progressed, radio astronomers steadily moved from detecting radio signals with long wavelengths and low frequencies to shorter wavelengths and higher frequencies. However, by the 1970s, as astronomers tried to detect signals in the millimeter range, Lo said they came up against a big limitation—the detector.

“We needed very sensitive receivers so you could fish out from the noise the weak signal coming from space,” he said.

Unfortunately, the detectors being

used in the 1970s were not nearly sensitive enough in the millimeter wavelength range. Noise coming from the receiver overwhelmed the weak radio signals, making it impossible for the signals to be “fished out” and analyzed. But the SIS mixers, developed in the wake of Tucker’s theory, changed all of that.

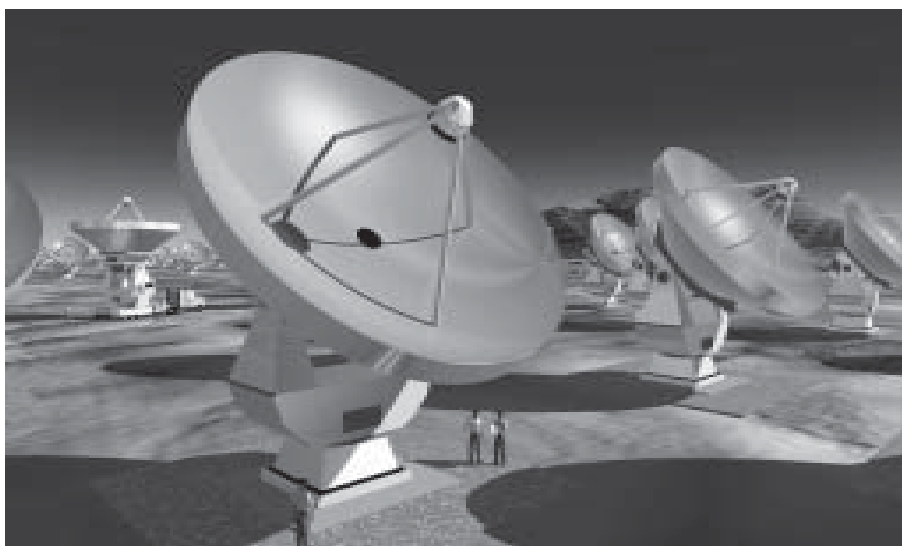
Tucker’s theory shattered the common belief that “you had to lose at least half of a signal’s power in a mixer,” said Ed Sutton, a professor of astronomy at Illinois. In fact, according to Tucker’s theory, by using quantum tunneling between superconductors in the signal mixer, “you not only don’t have to lose any signal, but in theory you can actually gain signal,” Sutton added. “This was an unexpected result and an exciting one because in astronomy we’re always dealing with such weak signals.”

“The magic was that you can actually amplify the signal without adding any noise to it,” said Tucker. In other words, he had discovered that SIS mixers could reach the quantum limit—the fundamental limit—of sensitivity.

“It sent astronomers to the top of the world,” he said.

When telescope receivers were less sensitive, it didn’t always pay to mount arrays at the highest altitudes because the increase in signal strength wasn’t significant in proportion to the receiver noise. But when SIS receivers increased sensitivity by ten-fold, it suddenly paid off to get that extra boost in sensitivity by mounting telescopes in higher altitudes, where the atmosphere would degrade the signal less.

“Once they had receivers that approached the quantum limit in sensitivity, it made a huge difference to get up



An artist’s conception of the antennas for the Atacama Large Millimeter Array (ALMA). Up to 64 12-meter antennas will be placed on the Chajnantor site, a high plateau at an altitude of more than 16,000 ft. among the Andean mountains in Chile.

above the atmosphere,” Tucker pointed out.

Today, telescope arrays are scattered all around the world at high elevations. CARMA will be built at 7,200 feet, while ALMA is being built at a staggering 16,500 feet at Llano de Chajnantor in Chile—an elevation that can cause brain damage in short order, unless special precautions are taken, said Sutton.

With an unprecedented 64 telescopes linked together in the ALMA array, scientists will be able to “see back in time and far away, to where the earliest and most distant galaxies were forming,” said Wayne van Citters of the U.S. National Science Foundation at the ALMA groundbreaking.

As Lo explained, the millimeter and submillimeter range of the electromagnetic spectrum yields a wealth of information from the “cold universe”—the space between stars known as the interstellar medium. Over the years,

radio telescopes have revealed that a lot is going on in this vast blanket of space, once thought to be devoid of activity.

For example, stars and galaxies are born in interstellar space. By peering deep in space, you actually look further back in time and can observe the processes that went into creating the first stars and galaxies. It’s a window back in time.

According to Lo, ALMA will allow them to “peer into the beginnings of the Universe, galaxies, stars and planets and perhaps life itself.”

As radio astronomy takes this giant leap forward, Tucker continues to explore the mysterious properties of quantum theory as it applies to electronics. However, instead of looking outward into space, his current work looks inward to the microcosmic world of nanotechnology. He’s studying the uses of quantum tunneling in creating atom-scale devices and faster transistors.

Meanwhile, the result of his earliest superconductor work remains solid and continues to have significant implica-

# Sparking a power electronics revolution

By Laura

During the last decade, ECE Professor Phil Krein (MSEE '80, PhD '82) has supervised several student team projects, including national collegiate solar and hybrid car competitions and a worldwide design challenge to reduce residential energy consumption. While the projects primarily gave students valuable practical engineering experience, they also resulted in some innovative technology developments.

In January 2004, Krein, fellow ECE faculty member Patrick Chapman, and ECE Research Engineer Jonathan Kimball (MSEE '96) launched a company to capitalize on some of these technologies and other power electronics discoveries from their labs. Located in the University of Illinois Research Park, SmartSpark Energy Systems is developing power electronics technologies and products that use energy more effectively and efficiently.

According to Krein, SmartSpark is introducing revolutionary "energy middleware" products to meet 21st-century electricity needs. Their technologies address electricity conversion and control between energy sources—such as fuel cells, batteries, solar panels, wind systems, and even the electrical grid system—and energy uses—such as computers, cell phones, hybrid cars, battery packs, electronically controlled motors, appliances, security systems, or home theater products.

BattEQ™, a battery management technology, can extend the life of batteries used in high-voltage applications such as electric scooters and golf carts. BattEQ, which is close to production, originated from ECE students' work on the FutureCar project, a national collegiate competition to convert a regular car into a hybrid electric vehicle.

According to Krein, one reason these

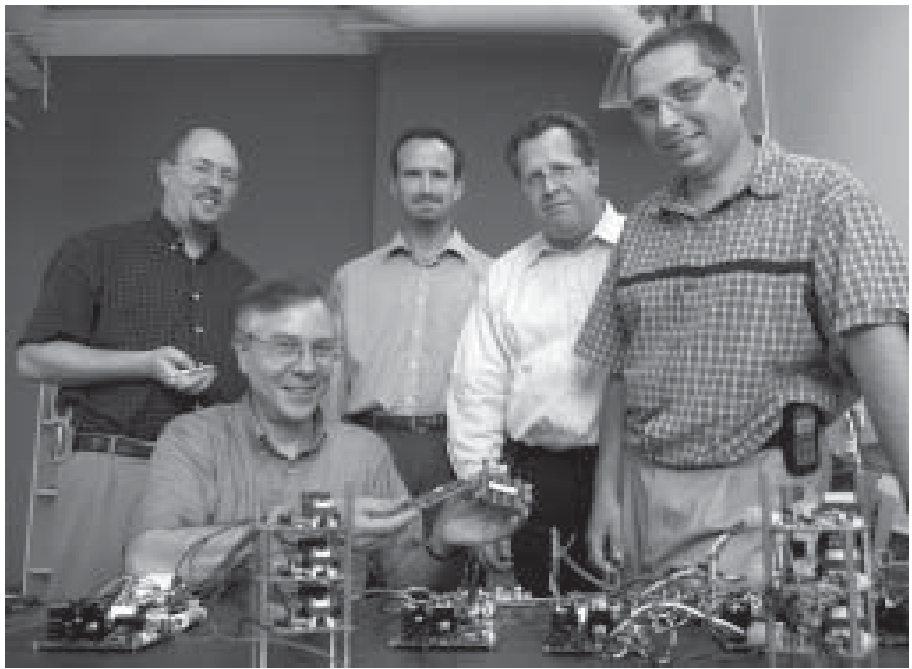


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ECE Professor Phil Krein (seated), displays batteries from SmartSpark Energy Systems in the company's lab at Enterprise Works in Champaign in 2004. Other SmartSpark employees are, from left, ECE Assistant Professor Patrick Chapman, vice president and chief technology officer; Brian Kuhn, senior engineer; Interim CEO Neil Kane; and Jonathan Kimball, vice president of engineering.

batteries don't always meet their expectations is because it's difficult to manage the charging process. These batteries are actually a string of individual batteries. "You're trying to charge them as a single unit, sort of hoping that they'll take care of matching by themselves," said Krein. "What we have is an active electronic method that keeps the batteries balanced as they charge or discharge."

PulseLink™, another SmartSpark development, is an energy conversion technology that is more reliable, has fewer parts, and costs less than existing conversion technologies. PulseLink could be used to convert energy from solar panels or fuel cells to ac form.

PulseLink originated from students' work on the 2001 Future Energy Challenge project, which was a national col-

legiate competition to design and build a low-cost fuel-cell component.

A third technology is a control method that optimizes energy flows automatically in a circuit. Called RipCord™, it can run an electric motor at optimal efficiency, squeeze the most possible energy out of a solar panel, or tune a power supply automatically for the maximum efficiency. RipCord was developed during the national Sunrayce '95 and '97 projects, collegiate cross-country solar car competitions sponsored by the Department of Energy.

According to Kimball, vice president of engineering, PulseLink and RipCord may combine to make residential solar energy affordable and viable. Smart-

SmartSpark, continued on page 20

## TV or not TV?

If that is the question, Mitch Altman may have the answer

By Tom Moone



Photo by Peter DeSilva

Mitch Altman (BSEE '80, MSEE '84) came up with the idea for the TV-B-Gone universal remote control 12 years ago while eating at a restaurant with friends.

Mitch Altman (BSEE '80, MSEE '84) describes his latest venture as "a personal project and a dream of mine that came to fruition. It was a conscious choice to focus on what I really love."

What is this venture Altman speaks of? Well, Altman is the inventor of the TV-B-Gone universal remote control, which will turn off virtually any TV in the United States and Europe. Since the product was first announced in October 2004, Altman has sold more than 25,000 units. Not bad for someone who originally thought that he would be lucky to sell enough to maybe break even.

The TV-B-Gone remote control had its origins 12 years ago when Altman was visiting some friends in Palo Alto, CA. Since they hadn't seen each other in a while, they went to a restaurant to catch

up and enjoy each other's company. There, a TV in the corner was a continual distraction. "We kept paying attention to it rather than to each other," recalled Altman. One particular annoyance of the TV was that no one in the restaurant was watching it. It was simply on.

"We started talking about the power of the medium," said Altman. Eventually someone mentioned how great it would be if someone could make something that would turn off any TV wherever you are that was distracting you. "And I said, 'Well, you can,'" said Altman. "That's where the idea was born."

The idea kicked around in Altman's head for 10 years before he acted on it. During this time, Altman continued running his own consulting business, Cornfield Electronics, which Altman started while living in Urbana. "The first

time I had to talk with a vendor to buy parts for a consulting project, they asked me, 'What's your company name?' And this seemed appropriate," said Altman.

Though he worked for a few companies as an employee, Altman found that he preferred the lifestyle that consulting offered him. "I could design these really cool projects, work really hard at it to make it into a reality, and then take a bunch of time to travel or hang out or do other things that I enjoy," said Altman. His consulting was primarily in the area of embedded systems, writing the firmware for microcomputers.

Altman was also a founding member of 3ware, a company started in 1997 that developed high-capacity computer storage solutions. Applied Micro Circuits Corporation bought 3ware in 2004. Though by that time Altman's stake in the company was relatively small, the sale did provide him with half the funds needed to develop and produce the TV-B-Gone remote controls. The rest was made up from his personal savings.

It took two years of work to bring the idea of the TV-B-Gone remote controls to fruition. Much of the first year was spent trying to acquire a database of the power codes for all U.S. and European television models. After many labor-intensive hours trying to develop this database on his own, Altman discovered that he could license a workable database from one of his vendors. Even with this database, Altman had to painstakingly go through the database to eliminate any duplicates. If there were duplicates, explained Altman,

TV or not TV?, continued on page 21

# Connexions shares educational materials

By Erin Lukehart

Richard Baraniuk (PhD '92) has always strived to look at the big picture. His exposure to interdisciplinary endeavors at the University of Illinois through the Coordinated Science Laboratory and Beckman Institute helped to cultivate that "big picture" thinking, says Baraniuk, the Victor E. Cameron professor of electrical and computer engineering at Rice University. That interdisciplinary spirit in part inspired Baraniuk to create Connexions (<http://cnx.rice.edu>), an open-access Web site that allows both educators and learners to access course materials on everything from signal processing to elementary music education.

As an instructor in signal processing, Baraniuk was frustrated by the difficulty in finding published materials demonstrating to students the interconnectedness between theory and everyday applications.

"The best way to write a book of this sort is to enlist communities to get involved, and that was really hard. That was in 1999—there were all kinds of great Web sites but it was still very hard to be able to get people to work together in a way that was globally distributed," he explained.

Baraniuk aimed to create a Web site that was free, easy to use, and global in scope, so that anyone interested in accessing the courses could learn something new or adapt the material for their own use.

Along with a group of Rice University colleagues, Baraniuk began to piece together the site in 1999. By 2001 they had begun posting material, and then the site officially launched in February 2004 for public use.



Rice University Professor Richard Baraniuk (PhD '92) is director of the Connexions project, a Web-based, collaborative approach to sharing and advancing knowledge for the benefit of the global educational community.

Around the same time that Baraniuk was first developing Connexions, ECE Professor Doug Jones was also contemplating publishing ECE course materials on the Web. Jones had been Baraniuk's PhD advisor, and the two kept in touch regularly after graduation.

Baraniuk recalls of his advisor, "He really challenged me to broaden myself and be more than just a student writing a thesis. He pushed me to become a scholar."

Jones was excited to hear about the idea for Connexions and was eager to participate. He has since posted course materials for ECE 420 (Digital Signal Processing Lab) on the site, and is preparing to add ECE 551 (Digital Signal Processing II) with the assistance of Pierre Moulin and Andrew Singer. Jones remembers Baraniuk as a hard-working student and is proud of how far he has taken Connexions. "We had a big vision of what could be done with this," says Jones. "He really went out and made it happen."

Jones sees Connexions as an opportunity to serve a larger community. "We are after all a public university, and so I think as an employee of the state, part of my job is service," says Jones. "Connexions is a useful service that we can provide to the state, the community, and the world."

Connexions is similar to MIT's well-known OpenCourseWare initiative, but is broader in scope. Where MIT only posts their own courses for use, Connexions allows any instructor to post modules. These modules—small informational components that can be pulled together to form courses—are textbook-quality in their appearance, so that a user could print off the information and have clean, high-quality copies for personal use or distribution.

Connexions operates under an open-content license from Creative Commons (<http://creativecommons.org>), which allows users to distribute or modify the course information, as long as proper attribution is given.

While instructors find the site useful in developing curricula or mining for new ideas in their lessons, Baraniuk said a growing number of the site's visitors are industry professionals who need to brush up on their knowledge. Rather than spend hours at the library trying to find the information, engineers can just search the site to find whatever information they need.

In some cases, students use the site simply because their textbooks are too costly. "I've had feedback from people in Pakistan and India who say they're taking a class and they couldn't afford

Connexions, continued on page 22



# Bardeen Quadrangle and Garden dedicated

By Rick Kubetz, College of Engineering writer

Although the morning began gray and blustery, the sun emerged and shown brightly as Dean David Daniel and Professor Nick Holonyak Jr. unveiled the bronze plaque officially dedicating the John Bardeen Quadrangle and Memorial Garden on the north campus of the University of Illinois.

Theoretical physicist John Bardeen was the first person to win two Nobel Prizes in the same field—for the invention of the transistor (1956) and the explanation of superconductivity (1972). Over 100 people gathered on Thursday, October 14, 2004, to honor the late professor of physics and electrical and computer engineering, and share their memories of one of the 20th century's great minds.

The dedication ceremony included remarks from Illinois President James Stukel, Trustee Marjorie Sodeman, Chancellor Richard Herman, University of Illinois Foundation President Sidney Micek, College of Engineering Dean David Daniel, and Professor Nick Holonyak Jr., the John Bardeen Endowed Chair in Electrical and Computer Engineering and Physics, and Bardeen's first graduate student. More than a dozen members of the Bardeen family also attended the ceremony.

The Bardeen Quadrangle is located in the heart of the Engineering campus—bounded by the Grainger Engineering Library on the north, the Mechanical Engineering Laboratory on the east, Engineering Hall on the south, and Talbot Laboratory on the west. Site improvements include new concrete walks, decorative plaza pavements, bicycle parking, service courtyards, dry-laid stone retaining walls along the Boneyard

Creek, and a fountain. A newly landscaped garden outside the north entrance to Engineering Hall has also been named in Bardeen's honor.

The project was made possible by The Grainger Foundation, and the dedication was held in conjunction with the annual meeting of the University of Illinois Foundation. The Grainger Foundation, a private foundation established by electrical engineering alumnus William Wallace Grainger (B.S. '19) and headed by his son, David, made the gift to create the engineering quad and garden.

John Bardeen was born in Madison, Wisconsin, on May 23, 1908. He received his PhD in physics from Princeton University, which was followed by several postdoctoral and teaching assignments. In the fall of 1945, he joined the newly formed research group in solid state physics at the Bell Telephone Laboratories in Murray Hill, New Jersey. It was there that he became interested in semiconductors, and with W.H. Brattain, invented the transistor in late 1947. In 1951, he left Bell Labs to become a professor of Physics and Electrical Engineering at Illinois. He received his first Nobel Prize in physics in 1956 for the invention.

At Illinois, Bardeen established two major research programs, one in the



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Electrical Engineering Department dealing with both experimental and theoretical aspects of semiconductors, and one in the Department of Physics which dealt with theoretical aspects of macroscopic quantum systems, particularly superconductivity and quantum liquids. The microscopic theory of superconductivity, developed in collaboration with L.N. Cooper and J.R. Schrieffer in 1956 and 1957, has had profound implications for nearly every field of physics from elementary particle to nuclear and the helium liquids to neutron stars. Bardeen received his second Nobel Prize in physics in 1972 for this work.

During his 60-year scientific career, he made significant contributions to almost every aspect of condensed matter physics from his early work on the electronic behavior of metals, the surface properties of semiconductors and the theory of diffusion of atoms in crystals, to his most

## EM course is gateway to many career paths

By Erin Lukehart



Developed more than 50 years ago with the advent of electrical communication and high frequency electronics, ECE 350 (recently changed to 450)—Lines, Fields, and Waves—has been a longstanding staple of the department and continues to challenge and inspire the students who take it.

Associate Department Head N. Narayana Rao taught the course regularly from his arrival to the department in 1965 through the 1980s, and infrequently later on. “This course was developed as a fundamental subject for electrical engineers,” said Rao, the Edward C. Jordan Professor of ECE. “It is still fundamental because all electrical engineering has become very broad now. All courses having to do with wave phenomena branch off from this course.”

that govern the interaction of electromagnetic waves with matter,” said current course director Professor Andreas Cangellaris, who has been teaching the class off and on for the past seven years.

The aim of ECE 350 is to present students with the application of electromagnetic theory and electromagnetic fields. For their homework, students use computer-based visualization aids designed by Professor Umberto Ravaioli, who also teaches ECE 350.

“We use the applets so students can probe a bit further into some of the application- and design-driven quantitative manipulation of electromagnetic field equations and concepts that we don’t have time to work through in

Considering the course’s emphasis on mathematics and theoretical concepts, you’d be hard-pressed to find a student who would describe ECE 350 as easy. “The course requires very good skills in mathematics, especially calculus and vector calculus, and in addition requires the willingness of the student to intuitively think about the physical phenomena

detail in class; this allows students to see how these concepts apply in the real world,” said Cangellaris.

Although ECE 350 is not required, Cangellaris noted it is in many ways a “gateway” course, essential to any students wishing to pursue a career in fields such as communications, microwave engineering, or solid-state electronics.

Cangellaris suggested the course could also be relevant to students pursuing digital circuit design. “Many of the concepts described in this course are extremely useful to understanding how the millions of transistors in high speed CPUs—the chips that Intel makes for our computers—transmit information between each other,” he said. “They also explain how sometimes undesirable noise generated by these transistors causes all sorts of interference problems that may actually prevent the processor from working at its best.”

Like many other alumni, Tony Zuccarino (BSEE ’83), Entrepreneur in Residence at Benchmark Capital, said the concepts he learned from ECE 350 proved valuable after graduation. “[This course] definitely was of high practical value in my very first engineering job out of school,” explained Zuccarino. “Most of my time has been spent in communications and networking, and so understanding of lines, fields, and waves proved absolutely fundamental to understanding the technical landscape.”

John Cioffi (BSEE ’78), Hitachi America Professor of Engineering at Stanford University, has returned to principles learned from ECE 350 in his work with

ECE course, continued on page 22

## Former head Trick retires

By Laura Schmitt

Tim Trick came to the University of Illinois in the fall of 1965 thinking the Urbana campus might be the first stop in his career. "But after I got here I could see that the research activity was much stronger than at many of the other Big 10 universities," said Trick, who completed his master's degree and PhD at Purdue. "I quickly learned that I had made the right career choice."

Hired by Professor Mac Van Valkenburg—who was acting head while EE Head Ed Jordan was on sabbatical—Trick was among the faculty brought in to strengthen the systems research area. "The thing that appealed to me at the time was being able to work with Mac Van Valkenburg," recalled Trick. "I always was very impressed with the books that Mac wrote on network analysis and synthesis of filters. I felt it was really a great honor to come to Illinois and interview and meet him."

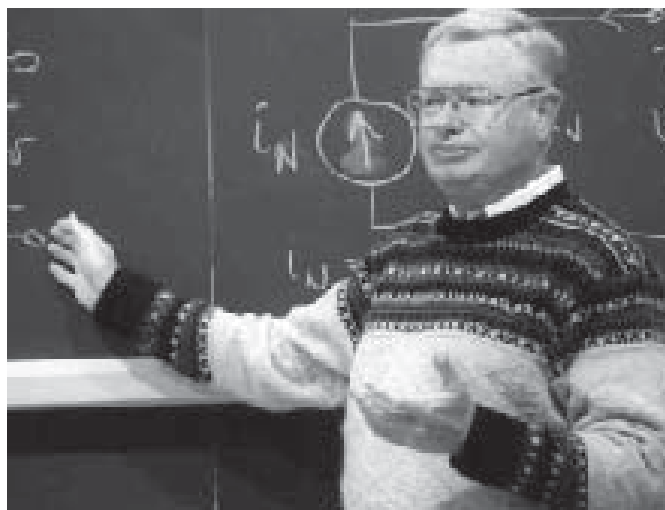
During the next 39 years, Trick would conduct research on integrated circuits and computer-aided circuit analysis and design, supervising the master's and doctoral theses of more than 60 students; serve as department head for a decade; and play a key role in using technology to enhance engineering education.

Trick's early research included collaboration with the department's famed Antenna Laboratory faculty, who were trying to design broadband microwave amplifiers without the benefit of good design methodologies. Trick and one of his doctoral students developed computer-aided analysis techniques for their circuits.

This work drew the attention of

some University of California, Berkeley faculty, who invited Trick to spend the 1973-74 academic year on sabbatical there. At Berkeley, Trick worked with some of the pioneers of IC design, including Don Pederson, Paul Gray, and David Hodges. He also taught a computer-aided design course and sat in on all the integrated circuit courses he could. When he returned to Illinois, Trick developed some new courses in IC analysis and design, and he wrote the textbook, "Introduction to Circuit Analysis."

In 1983, Trick took on administrative duties at the Coordinated Science Lab on campus when the lab's director, Robert Chien, became ill. Two years later, he became ECE department head at the beginning of a new era of exciting building and research projects on the engineering campus—all providing benefits to ECE faculty and students. Between 1985 and 1992, the Beckman Institute, Microelectronics Laboratory, and new Coordinated Science Laboratory were constructed and opened. The National Center for Supercomputing Applications (NCSA), Center for Compound Semiconductor Microelectronics, and the Center for Supercomputing Research and Development were established, bringing millions of dollars in research



funding to campus.

All of this activity made Trick's job of recruiting faculty much easier. "We were so far ahead of other campuses in terms of facilities—instructional and research—that just about everyone I made an offer to that visited our campus wanted to come here," Trick said. "They wanted to be part of the excitement. There was a lot of outstanding research and the facilities to make that feasible, and of course high quality students. I found recruiting was not a tough sell at that point."

Looking back on his 10 years as department head, Trick is pleased with several major accomplishments in faculty recruitment, curriculum revision, and instructional lab renewal. "We had a 40% turnover of faculty during my 10 years as department head," Trick said. "With support from the College and faculty participation we were able to recruit outstanding new faculty to maintain excellence in our traditional

Trick retires, continued on page 22

### Koetter, continued from page 4

Diego.

Error-correcting systems based on Reed-Solomon codes basically decide what pieces of data are most likely to be correct and discard the rest as probably being in error.

Koetter, who gleefully described his work as solving puzzles, and Vardy found they could use the discarded probabilities to identify the most likely error patterns and catch errors more efficiently as a result. In effect, their method can handle substantially more noise and still get the message.

Moreover, they refined and simpli-

fied the math underlying the method to make it orders of magnitude faster and, hence, useful in real-world applications.

One of the first people to contact them was Taylor, who said their algorithm is probably in use now by a few hundred amateur radio operators around the world.

The radio operators aren't the only ones interested. The IEEE recently selected Koetter's and Vardy's paper outlining the method as the top publication in information theory during the past two years. The work also has been

highlighted by the National Science Foundation, which funded part of it. The two have formed a company to promote its use, and Koetter said they're in talks with several potential commercial users.

Koetter said its applications could, for instance, lead to faster, larger and less expensive disks by allowing cheaper materials to be used in manufacturing and improving yields since the method makes errors less of a concern. In communications, it could allow more information to be moved at higher speed and

### SmartSpark, continued from page 14

Spark envisions simple units that use RipCord to extract maximum power from the solar panels and use PulseLink to simplify connection to the electric outlets in a home. Solar modules that just hook into a 110 volt wall outlet would eliminate expensive professional installation issues.

Currently, conventional electricity sources are significantly less expensive than solar energy panels on homes. "[Solar] is something you might do if you have a cabin way out in the woods and there's no power to it or if you really want to be a green consumer," explained Krein. "We're trying to make it to the point that it's feasible economically."

"There's a lot of work on covering a whole commercial building with solar panels," said Kimball. "But nobody is really targeting the small modular system to make it affordable to the average homeowner. We're working on a modular approach so you can get into it for a few hundred dollars. Then whenever you have a few hundred dollars you put up another panel and you expand your system. This way a lot more people can get into solar power."

RipCord's applications go beyond residential solar power. Krein estimates

RipCord could cut energy consumption of existing and new motors by about 15 percent on average. "Since motors use about two-thirds of all electricity, the potential savings is 10 percent of all electricity consumption," Krein said.

Although most motors simply plug into an ac wall source, many new motors are moving toward electronic controls. For example, new refrigerators and air conditioners use electronic controls. SmartSpark aims to partner with manufacturers of motors and motor controllers so RipCord can be implemented as part of the control software in appliances and other systems.

RipCord may be the technology furthest from production, but Krein predicts it may be the most lucrative product for the company. "It's going to take a long time to get there because it's a lot different than what other people do, but in the very long run I think it will make a big difference."

SmartSpark currently has one full-time employee—Senior Engineer Brian Kuhn, who helped co-found the company last year. Kuhn is a former research engineer from Purdue University. Krein is the company's president and Chapman, an ECE assistant professor, serves

as vice president and chief technology officer. Interim CEO Neil Kane, an Illinois mechanical engineering graduate, works part time for SmartSpark; he is the entrepreneur in residence for Illinois Ventures, a university program that provides funding, business expertise, and other assistance for faculty start-up companies. SmartSpark plans to hire two or three engineers during the coming year.

Becoming entrepreneurs has helped Krein and Chapman be better teachers and researchers. "I've made a lot of industry contacts and gained some really valuable experience as to what is important to them," said Chapman, who also has learned a lot about intellectual property through the licensing agreements between SmartSpark and the university. "I regularly cite examples from the company when I teach now, to show problems we face in taking theoretical concepts from the classroom and get them to work in practice."

Added Krein: "In power electronics, and there's no question about it, academic work has very limited value until you're actually making stuff and implementing it [because] you're not really solving the engineering problems. I think over the years, we've been trying very

## TV or not TV?,

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“the first one transmitted will turn the TV off, and the next one will turn it back on again. That wouldn’t be cool, would it? The intent is to turn it off and it stays off.”

Altman discovered during the stages of manufacturing, package design, and a host of other small details, that his friends were among his greatest business assets. “Luckily for me,” said Altman, “I have a small number of very talented friends in disparate fields with disparate realms of what they’re great at creatively. And it just came together perfectly.” A graphic artist friend created the package design, which is also used for the Web site. Another friend with industrial design experience helped design the plastic case. Other friends helped with needed technical drawings for injection molds and with Web programming.

October 2004 was when things really became exciting and when Altman found his life greatly changing. Through a friend of a friend, Altman met a reporter who wanted to write an article on TV-B-Gone remote controls for Wired.com. Given less than a day’s notice, Altman learned the article would appear on Wired.com’s Web site early on Tuesday, October 19. “I figured I should get my Web site ready to actually accept orders,” said Altman. “I spent all night, literally. It was just like being in school finishing a project.”

The Wired.com article was posted at 2:00 a.m. Altman finished work on his Web page around 5:00 a.m. Within an hour, he had 30 orders. By 2:00 p.m., there were 1,200 orders. At that point, said Altman, “the Web site was so overwhelmed, it shut down due to too much traffic. I was not prepared for this kind of



Mitch Altman sells versions of the TV-B-Gone universal remote control that can be used to turn off virtually any television in either North America or Europe.

onslaught of popularity.”

The article on Wired.com led to more media attention. That same afternoon, Altman was interviewed on National Public Radio’s All Things Considered. Also, by that time he had an appointment to meet a photographer from the Associated Press. Once the article was on the news wire, the rest, as the cliché goes, is history. Altman has been interviewed in segments on the CBS Evening News and Fox News, and articles about him and TV-B-Gone remote controls have appeared in a host of newspapers and magazines.

Over the past months, after selling more than 25,000 units, Altman still finds himself scrambling at times to keep up with the continuing demand. And it has changed the way Altman views himself. “I’ve never looked at myself as a businessman,” he said. “Suddenly I’ve had to play businessman, president, CTO, plus engineer. This is all-consuming.” What had started out as a personal project that was, in many respects, just for fun had turned into a

startup company. Originally planning to simply work out of his San Francisco apartment, Altman found that he had to rent office space. Recently he hired someone to take on the role of company president and they have been more formal setting up contracts and clarifying job descriptions. “It’s still not your typical business,” said Altman. “But it’s getting closer to that and not so much an organic anarchic blob, as it has been.”

Though TV-B-Gone has added more pressure to his life than he’s experienced in quite a while, Altman still maintains other important aspects of his life. “I still do a lot of volunteer work,” he said. “That’s an important part of my life.” He continues to do phone counseling for people with HIV, and he repairs old, donated computers and gives them away free to nonprofit organizations.

Altman is quick to point out that his TV-B-Gone remote controls are not part of some radical plan to eliminate all television viewing in public places. “I don’t go around turning TVs off when people are choosing to watch it,” he said. “But there are so many situations in public, like Laundromats and restaurants, where people don’t go there to watch TV. If they’re looking at it at all, they’re being distracted by it. Now people have a little power over that situation, over the media in our lives.”

You can find out more about TV-B-Gone remote controls and Cornfield Electronics at [www.tvbgone.com](http://www.tvbgone.com).

### Connexions,

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the books,” explains Baraniuk. “But they found Connexions and it helped them to learn the material.” There has also been an interest in translating the material into other languages, such as Chinese, Japanese, Thai, and Spanish.

Baraniuk’s approach to Connexions is interdisciplinary, and he hopes in turn to cultivate a sense of interconnectedness between subject areas through the site. This type of approach is not new to Baraniuk, whose graduate research fused engineering with applied mathematics. Under Professor Jones, he worked in time-frequency analysis.

“In time-frequency analysis, the idea is try to build mathematical tools that allow you to look at signals in the same way that a musical score lets you look at music,” he explains. “We built mathematical representations for other kinds of signals that have that same kind of visual character. And they get used all the time in everything from speech processing and speech recognition to cell phones, sonar, and radar.”

Through Connexions, Baraniuk ultimately dreams of creating a global community of authors—a free intellectual exchange of information between contributors and learners. Baraniuk happily notes that 96 percent of the site’s traffic comes from outside of Rice University. “Currently we get over 300,000 hits on our server per day,” he says. “We’d like to be up to about 3 million hits next year.”

Connexions currently hosts more than 2,500 modules and 50 courses, and it only continues to grow. “It wasn’t just pie-in-the-sky educational technology for its own sake, and I think that’s one of the reasons why it’s been a success,” says Baraniuk. “It actually tries to solve real problems.”

### EM course,

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DSL technology, a field that he helped to pioneer and has been working in for 25 years.

“[DSL] uses twisted pair telephone lines to send high-speed digital data to the normal home at the end of the telephone line. You need to be able to model what the telephone line looks like, and that type of modeling is what was taught in Professor Rao’s class,” Cioffi said.

Not only is the course itself woven into ECE tradition, so is the course’s textbook. “Elements of Engineering Electromagnetics,” authored by Rao and first published in 1977, has been used as the ECE 350 textbook for many years. The book is also utilized for ECE 229, Introduction to Electromagnetic Fields, which is a required course and a prerequisite for ECE 350. Rao’s textbook recently reached its sixth edition, and has the distinction of being the first book to kick off the new Illinois ECE Series for Prentice-Hall.

Cioffi took ECE 350 when Rao had just finished the first edition of his textbook. “I remember him passing it out [as] hand-typed notes in the class,” Cioffi recalled. “It was a difficult subject, but pretty easy to take given the level of care that he put into it.”

ECE 350 is a course known for its great challenges, but it also reaps many rewards. “While it is oftentimes challenging for the students to combine the rigorous math with the intuitive physical thinking about waves and fields,” said

### Trick retires,

continued from page 19

areas in the department as well as to expand and strengthen the faculty in the higher growth areas of computer, signal processing, and VLSI engineering.”

He oversaw a major curriculum change in the early 1990s. He also pushed for a new introductory engineering course that would, for the first time, allow freshman students to discover what electrical and computer engineering were all about.

The ECE 110 course that Trick helped develop has become very popular and has been copied on many other campuses nationwide. ECE Professor Ricardo Uribe developed the lab portion of the course.

“I didn’t want 110 to be an easy seminar course where students just attend and maybe read some stuff and write a report,” said Trick. “I wanted to really teach students about electrical devices, circuits, and the systems in which they are used.”

Students learn concepts in circuits, electromagnetics, electronics, control, and digital systems during lectures. In the lab, they design and build the circuitry necessary to transform an electric chassis into an autonomous vehicle that can follow a path on a track.

Another accomplishment was the redesign/renovation of ECE’s 20 instructional labs in the early 1990s. Working with ECE Associate Head Narayana Rao, Trick invited the faculty to submit proposals showing how they’d modernize their teaching labs. With industry booming, Trick presented the department’s wish list to the university liaisons at various companies. The result: the department received more than \$10

## Faculty news

Ilesanmi Adesida has been named a Fellow of AVS for contributions to nanofabrication technologies and advances in high-speed compound semiconductor devices. He also has been elected Fellow of the Optical Society of America for contributions to high sensitivity optoelectronic devices and integrated circuits and the methods for their fabrication. In April, Adesida was named interim dean of the College of Engineering. He will replace David Daniel, who is leaving in May to become president of the University of Texas at Dallas.

Tamer Basar has been selected to receive the prestigious Giorgio Quazza Medal, awarded by the International Federation of Automatic Control (IFAC). This international award is given only once every three years and will be presented to Basar at the 2005 IFAC World Congress in Prague, Czech Republic.

Jennifer Bernhard and her students Steven Weigand (now at WJ Communications), Gregory Huff (a current PhD student) and Helen Pan (now at Maxim Integrated Products) received the H.A. Wheeler Applications Prize Paper

Award from the IEEE Antennas and Propagation Society for their paper "Analysis and Design of Broad-band Single-Layer Rectangular U-slot Microstrip Patch Antennas." The award was presented at the IEEE International Symposium on Antennas and Propagation in Monterey, CA, in June 2004.

Stephen Boppart has been awarded an NSF CAREER Award for a project entitled "Functional Optical Coherence Tomography for Neural Imaging."

Richard Blahut was announced as the Shannon Award winner at the 2004 ISIT Conference in Chicago. This is the highest honor accorded by the IEEE Information Theory Society. He will present his Shannon Lecture at the 2005 ISIT Conference in Adelaide, Australia. In July 2004, Blahut received the title of honorary professor of electrical engineering at the National Chiao-Tung University.

Andreas Cangellaris has been elected to receive the Alexander von Humboldt Award for Senior U.S. Scientists from Germany.

Yun Chiu and co-authors, Paul Gray and Bora Nikolic, have been awarded the



Jack Kilby best student paper award for their paper published at ISSCC 2004. The award was presented at ISSCC 2005 in San Francisco, CA.

Shun-Lien Chuang received the 2004 Engineering Excellence Award from the Optical Society of America at the OSA Frontiers in Optics annual meeting on October 12, 2004, in Rochester, NY. Chuang was also selected for the IEEE Lasers and Electro-Optics Society (LEOS) Distinguished Lecture Award for Year 2004-2005. The lecture will cover the physics of quantum-well and quantum-dot lasers.

Kent Choquette was named a 2004 Fellow of the Optical Society of America for

contributions to the development of semiconductor vertical-cavity surface-emitting laser diodes.

Jim Coleman received the 2004 Heinrich Welker Award for the demonstration of reliable strained-layer lasers leading to 980-nm Er fiber pumps. The award, which honors outstanding research in the area of III-V compound semiconductors, was presented at the 31st International Symposium on Compound Semiconductors in Seoul, Korea, in September.

Steve Franke has been elected an IEEE Fellow for contributions to wave propagation, atmospheric sensing, and to engineering education.

Nick Holonyak Jr. received the 2004 Von Hippel Award from the Materials Research Society at its meeting in Boston in December. He has also been elected laureate of The Lincoln Academy of Illinois. He received the Order of Lincoln, Illinois' highest award for achievement, on April 30, at a ceremony on the Southern Illinois University campus. In the nearly 40 years of its existence, more than 200 distinguished people have been elected laureates, including leaders in all branches of the arts, scientists, physicians, lawyers, jurists, government officials, financiers, industrialists, and masters in the many fields of communication and technology. Three other laureates have ties to ECE: the late John Bardeen, Donald Bitzer, and Paul Lauterbur.

Philip Krein has been appointed an IEEE Power Electronics Society Distinguished Lecturer. He is one of five new appointees this year.

Jean-Pierre Leburton received the 2004 Quantum Device Award by the ISCS for his outstanding achievements in the area of compound semiconductor research. He also received a Gold Medal for scientific achievement from his alma mater, the University of

Liege, in Belgium on October 23, 2004.

Zhi-Pei Liang has been appointed for a three-year term to chair the technical committee on medical imaging and image processing of the IEEE Engineering in Medicine & Biology Society.

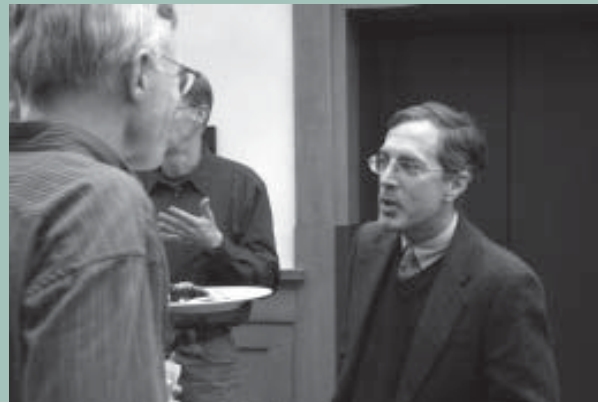
Michael Loui has been elected to another three-year term on the Board of Governors of the IEEE Society on Social Implications of Technology. He has also been appointed to the Editorial Board of College Teaching, a scholarly journal that provides an interdisciplinary forum on issues related to teaching at the undergraduate and graduate levels.

Pierre Moulin was elected to the Signal Processing Society Board of Governors as a member-at-large for a three-year term.

David Nicol and Michael Liljenstam (post-doctoral research associate) received the Best Paper Award in June at the 2004 Internal Conference on Advances in Internet Processing, Systems, and Interdisciplinary Research for their paper "Models of Active Worm Defense."

Tom Overbye was awarded the first Alexander Schwarzkopf Prize for Technological

## Farewell reception



ECE Professor Mark Kushner talks with a colleague at the College of Engineering reception in his honor December 17, 2004. An Illinois faculty member since 1986, Kushner became dean of engineering at Iowa State University on January 1, 2005. He is also the inaugural holder of the James L. and Katherine S. Melsa Professorship there. An expert in the study of plasmas, laser physics, and spectroscopy, Kushner held various administrative roles at Illinois, including College of Engineering assistant dean of academic programs and interim associate dean of administrative affairs; ECE interim head; and interim head of chemical and biomolecular engineering.

Innovation for creation, development, and technological transfer of the power system visualization software known as PowerWorld.

M.A. Pai, professor emeritus, has published a new book, "Small Signal Analysis of Power Systems," which he cowrote with Sen Gupta and K.R. Padiyar. It was published by Narosa Publishing House in New Delhi, India.

Ricardo Uribe received a campus Excellence in Undergraduate Teaching award for instructional staff members April 26, 2004, at

the annual Instructional Awards banquet.

Nitin Vaidya has been invited to serve as the next Editor-in-Chief of the IEEE Transactions on Mobile Computing.

Ben Wah and computer science graduate students Yix-in Chen and Chih-Wei Hsu won two prizes for their SGPlan integrated planner at the 4th International Conference on Automated Planning and Scheduling in June 2004: 1st prize for the suboptimal temporal metric track and 2nd prize



## ECE welcomes new faculty members

By Tom Moone and Laura

In the past seven months, the ECE department has welcomed four new faculty members, strengthening its expertise in circuits, bioMEMs, remote sensing and ultrasound imaging.



A native of China, Yun Chiu comes to Illinois from the University of California, Berkeley, having completed his dissertation last year. Chiu first came to the United States for the master's electrical engineering program at UCLA, which he completed in 1997. He joined CondorVision Technology Inc., a Silicon Valley startup company, where, as the head of a development team, he was in charge of developing data converters for CMOS digital imaging products.

"I wanted to take a short break before I continued for the PhD," he said. "To really be in the practical, multidisciplinary field of engineering, you need to have some seasoning from industry.

That was a very good experience that has provided me a lot of first-hand experience on the practical side of circuit design."

In 1999 Chiu returned to graduate school at Berkeley. His doctoral research involved investigating the impact of CMOS scaling on high-performance base-band switched-capacitor circuits. In particular, he focused on analog and digital calibration techniques for low-power, high-resolution analog-to-digital converters.

Following on his graduate work, Chiu has expanded his research interests to cover the broader topic of enhancing the performance of precision analog, mixed signal, and even radio frequency circuits using novel adaptive digital signal processing techniques. "Building 'intelligence' into high-performance CMOS analog integrated circuits is the focus of my research for the next few years," he said. "This is in line with the technology scaling trend of the semiconductor industry, commonly known as Moore's law."

Currently, he is still collaborating with one of his professors from Berkeley on a project he initiated more than two years ago.

The project is a 12-bit, 500 megasample per second pipeline analog-to-digital converter. Additional new projects that he would like to initiate here at Illinois include digital predistortion generalization of radio frequency power amplifiers. Another project would be interleaved parallel analog-to-digital converter banks with digital postprocessing categorization.

This semester Chiu is teaching ECE 483 (Analog Integrated Circuit Design), a senior-level course that introduces analog circuit design using bipolar and CMOS technologies. For the Fall 2005 semester, he would like to create a new, graduate-level course to cover advanced topics in analog IC design, including switched-capacitor filters and data converters. Next spring, he may create another new graduate class on radio frequency CMOS integrated circuits.

Brian Cunningham (BSEE



'86, MSEE '87, PhD '90), who joined the ECE department in the summer 2004 as an associate professor, is the chief technology officer at SRU Biosystems near Boston. Cunningham founded the company in 2000 to develop optical methods for biodetection that would be more sensitive, faster, and less expensive than the prevailing approaches used in pharmaceutical research. Today, SRU employs 40 in Woburn, MA, and the company manufactures plastic optical biosensors and associated readout instrumentation used by pharmaceutical companies to discover and test new drugs.

The sensor utilizes a photonic crystal that, when illuminated with white light, reflects back only a single wavelength. The crystal is designed to interact with a biological test sample so when a molecule, cell, or protein comes into contact with the sensor surface,

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## new faculty members,

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it shifts the color of the reflected light. The readout instrument then measures the changes in the reflected peak.

"One of the key things is that the sensor structure can be manufactured from plastic material on a continuous roll that is thousands of meters long,"

Cunningham said, "I believe this is the only biosensor that is manufactured on a square yardage basis. The sensors are incorporated into conventional single-use disposable microplates that are used in every life science research laboratory." He was awarded a National Science Foundation research grant to push the resolution of label-free biosensors to the level of a single protein molecule.

As a faculty member, Cunningham is exploring other facets of biosensor technology. For example, he is conducting research to detect the interaction of proteins with other agents such as bacteria, which would be useful for detecting anthrax spores or other kinds of dangerous pathogens. Cunningham is also working to create new devices using the same fabrication methods that he developed for making plastic nanometer-

scale devices.

"Imagine having a process that can make high sensitivity gyroscopes out of continuous sheets of plastic film," he said.

"Or, being able to design nanostructures that can be programmed to alter the color of fabrics at will." In addition to making a fashion statement, color-changing fabric may have utility as adaptable camouflage for soldiers who move from one environment to another.

In the fall, Cunningham taught a junior-level electromagnetics class [ECE 329, formerly known as ECE 229], and he plans to develop new courses on biosensors and nanotechnology for future semesters.

Before founding SRU Biosystems, Cunningham was the manager of biomedical technology at Draper Laboratory in Cambridge, MA. He earned his PhD degree in 1990 under the supervision of the late Illinois ECE Professor Gregory Stillman.

"Greg had the most influence on my career among the faculty that I worked with and took classes from while I was a student," Cunningham said. "Greg was a very patient advisor, who enabled me to choose the research direc-

tion that seemed promising to me at the time. I was very fortunate to have the opportunity to work under the guidance of a mentor with his experience."

Cunningham decided to join the Illinois ECE department for three reasons: he wanted to teach, establish a new research program, and raise his two children near his and his wife's extended family.

"I don't think there is any other school that I would go to," he said. "Illinois is one of the top one or two electrical and computer engineering programs in the country, so having the opportunity to come here is really quite an honor."



Jonathan Makela, who received his PhD from Cornell University in 2003, comes to Illinois from the Naval Research Laboratory (NRL) in Washington, DC, where he worked in the Thermospheric and Ionospheric Research and Applications

group. He was there as a National Research Council research associate. His research focused on optical and radio remote sensing of the ionosphere, the region 300 km above the earth, which contains ionized plasma. He looks at optical signatures that originate in this area. He works on the areas in the mid-latitudes and near the equator.

He is currently working with some colleagues at NRL to perform computer simulations of irregularities that occur in the ionosphere over the magnetic equator. These irregularities bring about the loss of a satellite signal. Makela and his colleagues are trying to develop an understanding of when these irregularities occur and what effects they have on the signals. He has also started working on similar phenomena at mid-latitudes over the Caribbean and the United States.

Makela's research focuses on communication and navigation systems. One system he works with is WAAS (Wide Area Augmentation System), a system of satellites and ground stations that provide GPS signal corrections, providing better position accuracy. One use of this system is for improved air-

plane navigation, with use of WAAS enabling planes to get within a few hundred feet of the runway.

"Over the past year, there have been events when the WAAS system was knocked out by an ionospheric storm," said Makela. "So, we need to understand when those occur so that the WAAS system is better prepared to deal with those type of effects."

As could be guessed by Makela's research interests, there is a lot of travel to remote locations to set up optical and radio equipment to study the ionosphere. This semester Makela will be teaching ECE 450 (Lines, Fields, and Waves). In the future he would like to develop a course on the Global Positioning System, not just on the user side, but more on signal structure, receiver hardware—a course that is more engineering, systems-based approach rather than just a "how to use it" course.

"I'm happy to be at Illinois," said Makela. "Everyone's been very nice and welcoming. Illinois' reputation precedes itself, and this research group is fantastic."



Lab located in the Beckman Institute prior to being offered a faculty position. He did his graduate work at the National Center for Physical Acoustics at the University of Mississippi, receiving his PhD from there in 2000.

The projects he has been involved in include work in very high frequency tissue characterization using ultrasound backscatter. He received an individual fellowship from the National Institutes of Health to continue this backscatter work. His work has included efforts to distinguish different kinds of tumors using ultrasound, as well as distinguishing between normal and cancerous tissues. He completed that fellowship this year and was offered a faculty position in ECE.

"I'll also be looking at very high frequency ultrasound for detection of things like apoptosis [programmed cell death] and cellular necrosis, and treatment monitoring using

ultrasound." He will also examine the use of ultrasound for sonoporation in which the permeability of cellular membranes can be changed to allow drugs or other substances to be delivered to the cell. One possible area of future development for this type of research would be the development of probes that could perform a minimally invasive procedure.

He has also been involved in research at the U of I on the propagation of sound through soils for the purposes of detecting buried objects. Such research has potential use for finding archeological artifacts or land mines, as well as agricultural uses for determining the condition of soil. "It's another noninvasive means of testing soil rapidly, assessing their state acoustically," said Oelze. "So that is another interest that I have." He has been collaborating with faculty members in the agricultural engineering department on this research. This semester Oelze will be teaching ECE 329 (Introduction to Electromagnetic Fields). In the past, he has also taught ECE 473 (Fundamentals of Engineering Acoustics). In the future he would like to look into

developing an acoustic engineering laboratory course.

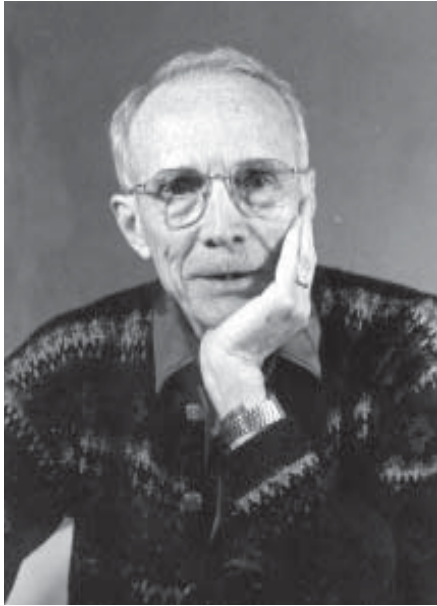
Oelze enjoys some other aspects of U of I life. "I'm very excited about the Illinois basketball team," he said. "It makes winter go a bit more quickly here." He also participates in the annual ECE Basketball Jam. In 2004, his team came in second, losing by only two points. This year, his team finished with a respectable 2-1 record in the tournament.

## 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, honors or awards you've won, or any interesting activities you are involved in.

## Fab Lab course pioneer Anner dies

By Erin Luke-



George Anner

George Anner, ECE Professor Emeritus, died May 11, 2004. He was 86. Anner left a lasting mark in ECE as a forward-thinking professor who helped to develop ECE 344 Theory and Fabrication of Integrated Circuit Devices in the late 1960s and early 1970s.

Anner's push for the department to move into solid-state electronics in the 1960s was seen as visionary. "George was one to recognize that he had to move with the times," said John Hughes, principal research engineer for the Micro and Nanotechnology Laboratory on campus. Working with researchers Robert Pierret, Ben Streetman, Frank Hielscher (PhD '66), and Leo Yau (PhD '69), Anner helped to develop one of the first undergraduate semiconductor fabrication laboratory courses in the country.

As the laboratory director from 1968-1982, Anner focused on obtaining lab equipment donations from industry. His

efforts resulted in donations from Texas Instruments, Motorola, Delco, and Harris, but most significantly from National Semiconductor.

Hughes, who first encountered Anner as a student in the late 1970s, recalled, "He had a very stern demeanor; he was a really hardcore professor-type." He added, "He was pretty demanding as a professor but he certainly was a very warm-hearted guy as soon as you got to know him in any capacity outside of the classroom." Colleagues have also described Anner as a humble man who was modest about his achievements.

Hughes remembers Anner as a professor who placed emphasis on teaching over research. Indeed, Anner won the Everitt Award for Excellence in Undergraduate Teaching in 1972 and 1980, and the Campus Award for Excellence in Undergraduate teaching in 1975.

Hughes first met Anner as a student in his electrical engineering classes, and then came to know him later as a colleague and close friend. In 1980 Hughes took over supervision of the solid-state teaching lab and the hybrid circuits lab. As they began working together, Hughes discovered that Anner had a ritual of getting an ice cream cone at the Illini Union every day after lunch. Hughes remembers fondly how one day Anner invited him along and they soon began going together every day. Even after retiring in 1983, Anner shared an office with Hughes and continued the tradition. Hughes and his wife also established the tradition of eating out with Anner and his wife every Thursday. "It wasn't long before they were like family," he said.

In addition to his many professional achievements, Anner was well-known

for his vivid, colorful stories. He certainly had unique experiences—growing up in China, then moving to Massachusetts and Virginia as a young adult, and traveling all over the world.

Anner received his bachelor's degree in physics from the College of William and Mary in 1938, and then completed a master's in electrical engineering at Harvard. He taught at New York University in 1940 but then was called to active duty in the Marine Corps in 1941. During his years of service, Anner established and served as officer in charge of the Marine Corps Radar School, then served two tours of duty in the Pacific Theatre.

He finally returned to teaching at NYU in 1946. In 1952, Anner was chosen to represent the University of Illinois in a two-year appointment as visiting professor at the Indian Institute of Technology in Kharagpur, India.

More recently, Anner was chairman of the board of the National Electronics Conference in 1995 and was a member of two panels of the Television Allocation Study Organization.

Anner's influence on the department is far-reaching. The ECE 344 "Fab Lab" that he helped to develop has become recognized as one of the best undergraduate instructional facilities in the country, and remains a staple of the ECE curriculum. More importantly, he will be remembered as a superlative teacher

## Early woman graduate fondly recalls student days



Like most new students coming to the university, Tressa (Kimble) Mabry was a bit apprehensive when she arrived on campus to study electrical engineering. A

transfer student from Kansas City Junior College, she applied to Illinois based on the recommendations of some of her classmates and instructors. She attended Illinois because it was the only school that accepted her.

"They wrote me a nice note saying they couldn't accept a girl in their engineering school, Mabry said about the other university she had applied to. "I was so naïve I threw it [the letter] away and was embarrassed."

It was September 1946 when Kimble stepped off the Illinois Central train in Champaign with her mother. She and her mother went to see Fred Turner, campus dean of students, who found her a place to live at the Medea House, a large three-story stone house on west Green Street.

"I didn't know a soul," she said. "When my mother left, I felt completely alone. It was very scary."

Her loneliness didn't last too long. She soon met George Mabry (BSEE '47)—he sat next to her in an electronics class. The two of them

hit it off and began dating. Outside of class, they cheered on the Illini basketball team at Huff Hall, went to dances, and met friends at the new Illini Union.

During her senior year, she opted to specialize in illumination under the direction of Professor John Kraehenbuehl. She graduated in the spring of 1948—the first member of her family to graduate from college—and married George Mabry that fall in Kansas City. She was the second woman to graduate from the Department of Electrical Engineering.

She applied for work with Kansas City Power & Light but was politely told that the company didn't need her. "In those days...it was hard for a woman to do anything like that," Mabry said. "Most of those boys in the illumination option probably went to General Electric, and they had to go back East. Of course, I didn't want to do that at that time."

The Mabrys moved to Southern California in 1952, where George went to work in the aerospace industry.

Although she never practiced engineering, she used the problem-solving skills she learned in engineering at home raising her three children and as a volunteer in her church and at the children's schools.

In the 1970s, she indulged her hobby for dolls by designing and making a series of cloth dolls. She designed the wardrobes, too, creating many patterns based on 19th century fashions. She started T.E.M. of California to market and sell her dolls and patterns. She named the patterns after her mother Nettie, who taught her to sew when she was a girl.

She advertised in McCalls and other

magazines and she displayed her products at doll shows up and down the West Coast. The business thrived until the early 1990s when she and George moved to the high desert city of Hesperia to continue to enjoy their retirement. She said she occasionally still receives letters from people asking if T.E.M. is still in business.

According to Mabry, the T.E.M. mail-order business was very fulfilling because it enabled her to exercise her design skills. Perhaps more importantly, though, were the therapeutic benefits her customers enjoyed from making the dolls and their clothing. "I received so many letters from ladies who had been depressed, in the hospital, or whatever, saying how much these helped them recover. It was a thing for them to do and they just really enjoyed it."

Mabry has fond memories of her two years at Illinois, where she was the only woman in her class, and by her own recollection one of only two women in the college.

"All the fellows were very nice to me," she said about her student days in electrical engineering. "I remember the first class I went to was with Professor Fett, who was a character. He said, 'Now class, we're going to have to change our little jokes with Miss Kimble in here.'"

She added: "My two years at the Uni-



### New Illinois Institute, continued from page 1

Overbye are affiliated with ITI.)

ITI has already turned a lot of heads in its short life. Last December, the institute sponsored a workshop on dependability and security that brought industry and academic experts from around the world to Urbana. Earlier in the fall, Illinois signed a deal with Boeing that will bring millions in research dollars to the university, with Sanders and ITI heading up work on airport security, logistics, and other applications of “trusted” software. That deal put U of I in the media limelight of Chicago, home to the Boeing headquarters. And locally, Sanders has been interviewed by radio station WILL in Urbana.

What distinguishes ITI from other security-focused research centers is its holistic approach to solving problems. “The key is to look at the entire network—the computer system as a whole,” said Sanders on WILL. “Even if the pieces fail, how do you design a system to operate in spite of those things? So firewalls, intrusion detection systems, monitoring software—all these are key elements. But we focus on the whole.”

Nicol’s research involves modeling computer networks with an eye toward improving the firewalls within them. “When a network is complicated, you have what’s called ‘defense in depth’—the firewall becomes a system, gets very complicated, and is easy to misconfigure,” said Nicol. He cited a recent study showing that almost all such systems are misconfigured. “What that means is, the people who define the security policy are not seeing it implemented by the system. There’s a mismatch between the policy and the execution because the system is so complex, people give it the wrong instructions.” By modeling a network, Nicol can identify such mismatches and evaluate the network’s firewall.

ITI’s mission also includes an educational component. The Institute offers short courses on cyber trust and cyber security, as well as ITI-approved certificate programs that draw on existing U of I course offerings in several departments. The ITI web site is at [www.iti.uiuc.edu](http://www.iti.uiuc.edu).

### Alumni Association Board president’s message



I am honored to have been selected president of your ECE Alumni Board. The board has committed itself to working with the ECE department to help achieve its goal of being the best in its class of Electrical and Computer Engineering departments. At our fall meeting the board focused on three areas of near-term endeavor and established task forces to address the issues. First and foremost, we want to look at ways to improve

the competitiveness of the Illinois ECE department. Our graduate and undergraduate programs are consistently rated in the top 5 among U.S. universities and we want to look at ways to improve on that outstanding performance.

Second, we are looking at concepts for better preparing our engineers to face the realities of a global economy. Finally, we have revised the Alumni Association by-laws to assure that we are structured to provide value to the ECE department and its leadership. We evaluated the task forces’ progress at our spring meeting in March, and generated further actions to pursue prior to our fall meeting in September. If any of our readers have ideas and inputs on the above topics, please send them to me at [sherel.horsley@verizon.net](mailto:sherel.horsley@verizon.net).

Finally, congratulations to ECE senior Jack Ingram and his Fighting Illini teammates for giving us an awesome basketball season.

### Know an exceptional fellow alum? Nominate him or her for an ECE award

The ECE Distinguished Alumni Award honors graduates who have made professional and technical contributions that bring distinction to the department and the university. This award is presented each year to four or five exceptional alumni at the fall banquet on campus. There are more than 19,000 ECE alumni worldwide.

The ECE Young Alumni Achievement Award recognizes alumni younger than 40 years old who have made outstanding professional contributions to their field. This award is also presented at the annual fall banquet on campus.

See [www.ece.uiuc.edu/alumni/index.html](http://www.ece.uiuc.edu/alumni/index.html) for more information on the nomination process and the awards.

## Featured alumni careers

### Sterling credits ECE faculty for shaping her career

By Erin Luke-

Jennifer Sterling (BSEE '89, MSEE '90) credits where she is today to the excellent advising she received as an ECE student. When she initially expressed an interest in power engineering, her advisor encouraged her to meet with Professor Peter Sauer. Sauer became Sterling's second undergraduate advisor, and Professor Emeritus Mangalore Pai advised her as a graduate student.

"Both of them really shaped my career," says Sterling, now director of transmission planning for Exelon energy delivery. "They were very enthusiastic about the subject matter, very knowledgeable, and very down to earth."

Sterling's academic interest in power engineering was cultivated at a summer job with her hometown's utility company—Cincinnati Gas and Electric. The hands-on experience also helped to shape her career arc. "I really specialized in power engineering," said Sterling, "so then it made sense that I started with Commonwealth Edison right out of school."

Sterling has remained with Commonwealth



Jennifer Sterling Edison, and its parent company Exelon, ever since. Her first position at Commonwealth Edison was in system planning. "I did a little bit of analysis work," she recalls, "and then the analysis work lead to a similar position at our operations center."

While working at the operations center, Sterling had the opportunity to become involved with the power company's efforts in opening up to third party access. Sterling also spent a little over four years in the regulatory side, administering the company's open access transmission tariff as well as being responsible for the analysis required to support transmission rates. Then in December 2003 she returned to the planning side as the director.

"We analyze the system

for future years to define what transmission enhancements need to be made to ensure the reliability of the system," Sterling explains. "Basically, we're analyzing the load growth and the system changes to make sure our system is able to handle and serve our customers reliably."

Sterling says her ECE education has proved invaluable throughout her career. "Right out of school, especially when I was heavily into analysis, the principles of power engineering that I learned in school were really important," she recalls.

Even the basic problem-solving skills she learned in ECE have remained important to her work, adds Sterling. "To approach problems from a logical point of view and work through them, those are skills I think stay with you and serve you no matter what you're doing."

Sterling remains connected to the department as an active member of the Alumni Association Board. She is currently serving as treasurer and also coordinates the annual freshman calling program, which

takes place each summer before the fall semester. Sterling and her volunteers call newly enrolled ECE students to welcome them into the department and to address their questions.

"We want to make sure they know there's alumni trying to reach out to them and trying to make them feel welcome to the university," she explains. Recalling her initial feelings of apprehension about attending a large university, Sterling said she hopes to ease the new students' fears and to show how the department is a supportive community.

"I had such a positive experience at the U of I and I really wanted to stay connected to the department and lend my skills into helping the current students in

## Distinguished alumni honored at banquet

By Janet Krenn

"I know I've said other evenings are special evenings, and if I say it again, I'm afraid you'll start to doubt my word. But this really is the most special of the special evenings," joked ECE Department Head Richard Blahut to the guests at the 2004 Distinguished Alumni Awards banquet September 24 at the Grainger Library. The ECE department paid tribute at the banquet to seven alumni who have made significant technical contributions to their field.

A. Michael Andrews II, Gary S. Brown, John P. Hayes, and Carl C.T. Wang received Distinguished Alumni Awards—the highest honor the department bestows on its graduates. Thomas M. Conte and Bradford Gliner received Young Alumni Achievement Awards, presented to alumni less than 40 years old.

Andrews (PhD '71), chief technology officer for L-3 Communications in Arlington, VA, was recognized for his pioneering advances in military infrared imaging systems, and for his leadership in directing the R&D efforts of the U.S. Army. While at Rockwell he helped develop a focal-plane IR imaging technique, which was used in the precursor to the

Javelin missile system. As chief scientist for the Army, Andrews was in charge of that service's entire research and technology programs at 21 laboratories and centers with 9,000 engineers and scientists, and a \$2 billion budget.

Brown (BSEE '63, MSEE '64, PhD '67), the Bradley Distinguished Professor of Electromagnetics at Virginia Polytechnic Institute and State University, was recognized for his contributions to the basic theory of the scattering of electromagnetic waves from random media and rough surfaces. His theory has helped the Navy and Air Force understand the interaction of radar signals with the ocean surface. His work on the back-scattered power of downward-pointing radar has been used to estimate wind velocity that causes roughness over an ocean surface. Consequently, remotely sensed data from satellites can be used to estimate wind velocity close to the earth's surface.

Hayes (MSEE '67, PhD '70), the Claude Shannon Professor of Engineering Science at the University of Michigan, is recognized for his pioneering contributions to the designing and testing of logic circuits and



ECE Distinguished Alumni recipients (left to right) John Hayes, Carl C.T. Wang, Gary Brown, and A. Michael Andrews II were honored September 24, 2004, on campus.

for impacting engineering education worldwide through his textbooks. Hayes conducts research in the general area of computer science and engineering, with specific interests in computer hardware design, quantum computing, computer-aided design, testing, and verification of digital systems, VLSI design, and fault-tolerant and embedded computer systems. Hayes has written several textbooks including, "Computer Architecture and Organization," "Layout Minimization for CMOS Cells," and "Introduction to Digital Logic Design."

Wang (BSEE '58, MSEE '59, PhD '64), president of Medical Instruments Development Laboratory in San Leandro, CA, was recog-

nized for his contributions to vitreoretinal surgery in the United States and China and for his teaching and humanitarian efforts. Wang has developed microsurgical instrumentation for ophthalmic surgery. His contributions to eye surgery are seminal, with his innovations forming the basic platform for vitreous surgery; modifications of his designs are used worldwide for treating retinal detachment, trauma, and eye infections. Each year Wang travels to China with physicians to teach vitreoretinal surgery.

Conte (MSEE '88, PhD '92), professor of electrical and computer engineering at North Carolina State University, was honored for his technical and leadership



## Alumni class notes



ECE Young Alumni Achievement Award winners Thomas Conte (left) and Bradford Gliner received their awards at the September 24, 2004, banquet.

contributions to the field of computer microarchitecture. A leading expert in very long instruction word (VLIW) microarchitectures, Conte is director of the Center for Embedded Systems Research at NCSU. His contributions to microprocessor design include a highly regarded solution to the problem of VLIW code compatibility, seminal work on instruction fetch mechanisms, and industry-influencing work on hardware performance counter design. His work has been adopted by Intel, TI, and IBM.

Gliner (BSEE '87), director of research and program manager at Northstar Neuroscience Inc. in Seattle, WA, was honored for contributions to the development of the world's first portable

automatic external defibrillator (AED). In 1992, Gliner co-founded Heartstream Inc., where he led the seminal work to develop the low-energy biphasic waveform that was critical to the portable AED. In 1999, Gliner joined Northstar Neuroscience, a medical device company developing innovative medical technologies that restore function and quality of life for people suffering from neurological diseases and disorders. Gliner is leading the R&D team developing cortical stimulation technologies for stroke recovery and other neurological applications.

Also at the banquet, the department presented the Marcia Peterman Award to Larry F. Altenbaumer (BSEE '70) for dedicated service to

### 1954

Edward Johanson (BSEE) and Porter Womeldorff (BSEE) attended the College of Engineering's banquet on campus October 29, 2004, where they received their 50th anniversary diplomas.

### 1955

Joseph Killpatrick (BSEE), retired chief scientist with Honeywell, presented an ECE graduate seminar October 20, 2004, at Everitt Lab. Killpatrick pioneered major developments in the ring laser gyroscope, an inertial navigation device that helps guide, steer, and stabilize airplanes.

### 1963

Mayer Sasson (BSEE '61, MSEE) became a Life Fellow of the IEEE in January 2004—one of only 1,779 people elevated to this distinguished status. In June, he was among 10 prominent Colombians to receive the Colombian Abroad Excellence Award at a banquet in Miami, FL. Sasson is a senior project manager in the Energy Markets Policy Group at Consolidated Edison of New York.

### 1964

J.K. Aggarwal (MSEE '61, PhD '64) received the 2004 biennial King-Sun Fu Prize at the International Conference on Pattern Recognition in Cambridge, UK. He was recognized for pioneering contributions toward establishing the fundamentals of structure and motion from image sequences and their applications to robot vision and human motion. Aggarwal is the Cullen Professor of ECE and director of the Computer and Vision Research Center at the University of Texas at Austin.

Carl Wang (BSEE '58, MSEE '59,

PhD), president of Medical Instruments Development Laboratory in San Leandro, CA, presented an ECE seminar on artificial vision in Everitt Laboratory on September 23, 2004. His talk introduced a number of vision prosthesis programs aimed at helping the visually impaired.

### 1969

Samuel Green (MSEE '66, PhD) was selected as a Boeing Technical Fellow in 2004.

### 1971

Dennis Parker (BSEE) retired in February 2003 from professional flying after 32 years as a pilot first with the United States Air Force, and more recently, as a pilot with American Airlines. While in the Air Force, he flew F-4 jets. As a commercial pilot, he flew 727, DC-10, and 777 aircraft.

### 1972

Archie Clemins (BSEE '66, MSEE), owner and president of Caribou Technologies, will receive an honorary doctorate from the University of Illinois at the May 2005 commencement. A retired four-star admiral and former commander of the Pacific Fleet, Clemins brought U.S. Naval operations into the electronic age.

### 1975

Kim Boyer (MSEE '75) and Connie Vernon Granston were married March 20, 2004, in Seattle. The Boyers reside in Kirkland, WA. Alum Courtney



Krehbiel (BSEE '73, MSEE '94) was among the guests.

## 1977

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

## 1978

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

## 1981

Tim Chou (MSEE '78, PhD), president of Oracle On Demand, helped initiate an information technology event in Chicago that gave the university and business community an opportunity to listen to Larry Ellison, chief executive officer of Oracle Corporation, discuss the security and privacy challenges in IT, overseas outsourcing, how universities can cooperate with business to advance technology, and more.

## 1984

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

## 1985

Prith Banerjee (MSEE '83, PhD)

'85) became dean of engineering at the University of Illinois Chicago campus in August 2004. He had been chairman of the ECE department at Northwestern University.

## 1986

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

## 1987

Steven Castillo (MSEE '84, PhD) was appointed dean of the College of Engineering at New Mexico State University, where he has served as a faculty member since 1987. Since 1999, Castillo had been head of NMSU's Klipsch School of Electrical & Computer Engineering.

David Lindner (BSEE) joined the law firm of Brinks Hofer Gilson & Lione, an intellectual property firm in Chicago, as an associate in October 2004. Lindner had been a senior systems engineer at Motorola. He earned his law degree from DePaul University.

Sanjay Srivastava (MSEE), president, CEO, and cofounder of Denali Software in Palo Alto, CA, was named to the nine-member Electronic Design Automation Consortium Board of Directors in November 2004. This consortium represents more than 100 companies in the multi-billion dollar EDA industry.

Thomas Ting (BSEE '82, MSEE '84, PhD) has been working for General Motors in R&D Planning for the last 10 years. His work has focused on developing on-board engine

diagnostic algorithms for automobiles. He received GM's Boss Kettering Award in 2004, the company's top technical honor. He lives in Troy, MI, with his wife and two daughters.

## 1988

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

## 1989

Krista Schwartz (BSCE) practices intellectual property law with Jones Day in Chicago.

## 1990

Upamanyu Madhow (MSEE '87, PhD), a faculty member at the University of California, Santa Barbara, was elected an IEEE Fellow in January 2005 for contributions to adaptive multiuser detection for wireless communications theory.

Jo Major (BSEE '85, MSEE '86, PhD) became president and CEO of Avanex Corp. in August 2004. The Fremont, CA, company is a global provider of Intelligent Photonic Solutions™, meeting the needs of fiber-optic communications networks. Previously, Major had been senior vice president and general manager of the Components Business Group at JDS Uniphase.

## 1991

Rob Palandech (BSEE '89, MSEE) works for Anadigics, where he develops new products—900 MHz, 2 and 6 GHz wireless transmitter blocks. The company is located in the Atlanta area.

## 1992

Tom Conte (MSEE '88, PhD) was elected an IEEE Fellow for contributions to computer architecture, compiler code generation and performance evaluation.

Ioannis Kanellakopoulos (MSEE '89, PhD), of Iperasys Inc. in Cupertino, CA, was elected an IEEE Fellow in January 2005 for contributions to the theory and practice of adaptive non-linear control.

Joy Laskar (MSEE '89, PhD), a faculty member at the Georgia Institute of Technology, was elected an IEEE Fellow in January 2005 for contributions to the modeling and development of high-frequency communication modules.

## 1993

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

## 1994

Derek Taubert (BSEE), a software engineer with Cisco Systems in San Jose, CA, was awarded a patent in April 2004. Taubert developed a method for improving network compatibility.

## 1997

Mark Laufenberg (BSEE '92, MSEE '93, PhD), president of PowerWorld Corp. in Champlain, received the 2004 IEEE Power Engineering Society's Walter Fee Outstanding Young Engineer Award. This award is presented each year to engineers who are 35 years

or younger for outstanding contributions in the leadership of technical society activities.

## 2000

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

## 2001

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

## 2002

Mike Kramer (BSEE '92, MSEE '95, PhD) presented an ECE undergraduate seminar on digital signal processing for binaural hearing aid applications at Everitt Lab in October 2004. Kramer works for Phonak, a hearing aid manufacturer.

## 2003

Stephen Chu (MSEE '99, PhD) appeared in the Scientific American Frontiers program "Cars that Think," which aired on PBS stations January 26, 2005. A researcher at IBM's Industry Solutions Lab in Hawthorn, NY, spoke about audio-visual speech recognition.

Daniel Roth (BSEE) married Christina Strong April 17, 2004. He is an electrical engineer with Schweitzer Engineering Labs.

## Obituary

Richard Bernstein (MSEE '66) died in December 2004.

Flyod M. Cassidy (BSEE '48), 80, died May 7, 2004. He worked for Honeywell for 40 years before retiring. He also served in the Army during World War II.

Kenneth A. Dippel (BSEE '48), 77, died July 1, 2004. He worked for Commonwealth Edison from 1949 to 1984. Mr. Dippel served in the US Navy.

Robert Feik (BSEE '41) died June 15, 2004. He was 85. A research scientist for the Air Force, he developed radar systems that are still in use today. Mr. Feik served in the Army during WWII and the Korean War.

Joseph Wei Fong (MSEE '57, PhD '62) died September 14, 2004. He was 79. He had a long career at MITRE in Bedford, MA, working in the Common User Communications Systems department. He also taught mathematics in the Ashland public schools.

William Kessler Sr. (MSEE '54) died April 5, 2004, at the age of 77. Before retiring in 1993, he worked for Sangamon Electric Company in Springfield; he transferred with the company to Sarasota, FL, in 1978. He was a Navy veteran, serving in the Pacific during World War II.

Edward D. Loukota (BSEE '68) died in September 2004. He was 59.

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

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

James Snell (BSEE '68) died July

31, 2004. He worked for Harris Government Systems, which became Intersil, in Florida. He held 13 patents.

Arthur T. Tiedemann (BSEE '46, MSEE '51) died October 24, 2004. He was 78. A member of the Navy's V-12 program as an undergraduate student, he served on a mine-sweeper off the California coast during World War II. He earned his PhD in electrical engineering from the University of Wisconsin in 1958 and became a professor that same year, retiring in 1989. He was known for teaching the 7:45 a.m. introductory courses.

Joseph Ye (MSEE '57, PhD '62) died September 14, 2004.

## Semiconwest conference



Left to right: Richard Williams (BSEE '80), president and CEO/CTO of Advanced Analogic Technologies Inc., ECE Professor Ilesanmi Adesida, and ECE Head Richard Blahut were among those attending an ECE reception at the Semiconwest conference in San Francisco on July 13, 2004. Williams hosted the alumni event. Blahut, Adesida and ECE Professor Jim Coleman presented talks at the reception. If you want to host an ECE alumni event, contact Emma Marshall at 217-333-5817.

## Proud alumnus shared good fortune with new generation

By Erin Luke-



When he passed away in May 2002, Burton J. "Jim" Wilson (BSEE '43, MSEE '47) left behind a lasting legacy for his beloved alma mater. Wilson was not only a proud alumnus, but also had been an instructor in EE from 1946 to 1952, and he hoped to aid future students in their own endeavors by establishing a scholarship fund.

In the fall of 2001, Wilson and his wife Betty drove from their home in Maryland to Champaign-Urbana, enjoying brilliant fall foliage along the trek. "I'll never forget the trip," said Betty. "During my 28 years in California, I had not enjoyed changing seasons so it was particularly enjoyable to me." She recalls how proud her husband was to show her the campus and the engineering facilities.

During that trip, Wilson met with a number of ECE faculty members as well as officers from the U of I Foundation to talk about setting up a scholarship fund. The fund was to be used for either an ECE or Physics student who demonstrated an interest in studying electrical energy/power production, conversion, utilization or conservation.

Upon their return to Maryland, Wilson and his wife met with attorneys and tackled the required paperwork. Unfortunately, Wilson fell ill in early 2002 and passed away in May. Betty knew that the scholarship fund had been extremely important to her husband, and proceeded to sign the documents on his behalf to make sure his wishes were met.

The scholarship had been important to him, she said, because he felt indebted to the school for the great experiences he'd had, and looked back fondly on his years at Illinois. "When you go to a school, you have certain strong feelings about that school. What you got out of it you want so much for someone else to experience, too," she said.

After his six years of teaching in ECE, Wilson went on to a distinguished 30-year career at the Naval Research Laboratory. From 1952 to 1982 he served as a research electrical engineer, a branch head, and a consultant. More recently, from 1982 to 1997 Wilson was a lecturer in electrical engineering at the University of Maryland, College Park, teach-

## ECE alumni to lead two National Academies

The Council of the National Academy of Sciences announced in December 2004 that Ralph Cicerone (MSEE '67, PhD '70), chancellor of the University of California, Irvine campus, will become president of the National Academy of Sciences July 1, 2005. Together, the NAS, National Academy of Engineering, Institute of Medicine, and National Research Council constitute the National Academies, which bring together experts to address critical national issues and give advice to the federal government and the public.

An atmospheric chemist, Cicerone has conducted research on the plasma physics of Earth's ionosphere, the chemistry of the ozone layer, radiative forcing of climate change, and sources of atmospheric methane and of methyl halide gases. He was elected a member of the NAS in 1990.

ECE alumnus William Wulf (MSEE '63) has served as president of the National Academy of Engineering since 1997, marking one of the few times in Academy history when both NAS and NAE presidents are alumni of the same university—let alone the same department. Wulf and Cicerone are recipients of the ECE Distinguished Alumni Award.

ing courses in power machinery and power electronics.

Betty was excited to have received a touching thank-you letter from the scholarship's first recipient, physics student Benjamin Sibley. "He must be an exceptional young man," she said.

Although they had been friends for several decades, Betty and Burton Wilson did not marry until later in life. When he passed away, they had been married only three years. "I am absolutely thrilled to have been in his life and able to carry out his wishes."

## ECE donors' generosity helps department maintain its excellence

ECE extends its appreciation to those graduates and friends who have generously supported the department in the last year through gifts and donations. This list is sorted by the graduation dates within each gift level—the date of the first degree appears for alumni with more than one degree. Contributions were made between January 1, 2004, and December 31, 2004. If we have inadvertently omitted your name, please notify Emma Marshall at (217) 333-5817 or [marshall@ece.uiuc.edu](mailto:marshall@ece.uiuc.edu).

### GIFTS OF \$500 OR MORE

Bob and Jan Ackmann  
 Lowell E. Ackmann  
 J. K. 'Jake' and Shanti Aggarwal  
 John J. Allemong  
 Larry F. Altenbaumer  
 C. P. Bates  
 Charles W. Beall  
 Gale and Todd Beanblossom  
 Edward F. Bell  
 Richard W. Benfer  
 Frank A. Bernatowicz  
 Morley M. and Kay Blouke  
 Mark T. Bohr  
 David Edward and Mary McCarthy Borth  
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 Gary S. Brown  
 John H. Bruning  
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 Robert J. and Rosalie J. Camillone  
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 Ta-Chung Chang  
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 Raymond Chin  
 April Chou  
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 Melvin D. and Anne Louise Hassebrock  
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 Richard S. Hill  
 Neil S. and Beth C. Hirshman  
 Se June Hong  
 William R. Hunter  
 John W. Isberner  
 Robert M. Janowiak  
 Carl J. and Margot A. Johnson  
 Robert E. Jordan  
 David H. Julifs and Roxann M. Marumoto  
 Robert Jung and Lisa Chan  
 Lee Olaniyi Kareem  
 Robert G. and Cynthia M. Kennedy  
 Kyekyoon Kim  
 Martin Korn  
 An-Yu Kuo  
 Soon-Bog Kwon  
 Richard W. and Susan Landon  
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 Robert P. Wiegand  
 Jan L. Yang  
 Richard F. H. and Jean Yang  
 Nicholas and Rosemary Yaru

### GIFTS OF \$100-\$499

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 Joseph H. Alwan  
 Arne D. Anderson  
 Arthur L. Anderson  
 Robert B. Arbetman  
 Mahmud and Joyce E. Assar  
 Kwang-Hyun Baek  
 Dennis L. Balzarini  
 Bruce T. Bauman  
 Robert W. Beck  
 William S. and Cheryl S. Bennett  
 John S. Benway and Beverley N. Great  
 Leland Berkwits  
 David G. and Zoe A. Berry  
 Judy Bitman  
 Donald L. and Maryann D. Bitzer  
 Thomas S. Blazeck  
 William A. Bridge  
 Barry D. Briggs  
 Richard L. Brown  
 Newton A. Campbell  
 Jerome T. and Ellen Cheng Chen  
 Wai-Kai and Shirley S. Chen  
 Jerome J. Chesnul  
 Vivekanand Chickermane  
 Janice Chiu-Kikta  
 James C. Chow  
 Michael J. Chu  
 George M. Cleveland  
 Daniel P. Connors  
 David H. Cowling  
 Paul R. Davis  
 Gary M. and Judy Daymon  
 Gary L. DeGregorio  
 William F. Denny  
 Charles A. DeVries  
 W. Michael Diekman  
 Phillip H. Doppelt  
 Edward T. Doris  
 Peter E. Doris  
 James W. Duncan  
 Floyd and Elsa Dunn  
 Wendell R. Dunning  
 Austin A. R. Dyson  
 Emad S. Ebbini  
 Bradley D. Eisenmann  
 Win H. Emert  
 Edith R. Emery  
 Barbara A. Ernst  
 Walton L. Fehr  
 Pete Fenoglio  
 Jeffrey F. Ferrara  
 Larry A. Finch  
 Jose R. Flores  
 Thomas P. Fontana  
 Michael L. Freie  
 John M. Friedrichsmeyer  
 Stephen H. Frishauf  
 Dennis E. Fuoss  
 Oscar L. Gaddy  
 Amy M. Galbraith  
 Dwight J. Garrison  
 August J. Gartner  
 Ruth B. George  
 Sorab K. and Cecilia B. Ghandhi  
 Brion C. Gilbert  
 Timothy E. Graff  
 Frank W. Grebner Jr.  
 Phillip B. Green  
 Samuel I. Green

Adam J. Gudat  
 Robert B. Hall  
 Kenneth B. Hallman  
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## ECE alumni elected to National Academy of



ECE alumni Mark T. Bohr (MSEE '78) and Per Kristian Enge (MSEE '79, PhD '83) were among the 74 new members elected to the National Academy of Engineering, one of the highest professional distinctions accorded an engineer. NAE announced the elections February 11, 2005.

Bohr, a senior fellow and director of Process Architecture and Integration in the Technology and Manufacturing Group at Intel Corp. in Hillsboro, OR, was elected for leadership in defining,

developing, and implementing a manufacturable CMO/BiCMOS technology for microprocessor and logic products. Bohr joined Intel in 1978 and has been involved in integrated circuit process development on a wide variety of technologies for dynamic random access memory (RAM), static RAM, and microprocessor products. He holds 21 patents in the area of integrated circuit processing.

Enge, a professor of aeronautics and astronautics and the Kleiner Perkins, Mayfield, Sequoia Capital Professor in the School of Engineering at Stanford University, was elected for leadership in the development of augmentations to marine and aviation global positioning systems that have become worldwide standards. At Stanford, he directs the GPS Research Laboratory, which develops satellite navigation

systems based on the global positioning system. He is a Fellow of the Institute of Navigation and the IEEE.

The NAE was established in 1964 under a charter from the National Academy of Sciences as a parallel organization of outstanding engineers. It is a private, independent, nonprofit institution that advises the federal government and conducts independent studies that investigate and provide a forum for some of the most important topics in engineering and technology.

This latest election brings the total U.S. membership in NAE to 2,195 and the number of foreign associates to 178.

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