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- John E. Layden III (BSEE ’63)

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### About our Contributing Writers:

- Sally Bond is a freelance writer based in West Lafayette, Indiana.  
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- Kathy Mayer, a resident of Lafayette, has been self-employed as a full-time writer since 1987.  
- Emil Venizis is a science writer at the Purdue University News Service.

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**ECE Calendar for 2003-04**

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**Purdue-Silicon Valley Events:**

March 8: Bipartite Match  
April 24: Technology Breakfast  
October 3: Special Event  
November 20: Alumni Happy Hour  
April 22: Wavelinks Conference  
May 17: MSEE Atrium  
November 20: Wavelinks Conference

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**Additional ECE off-campus events are being planned for 2004 and will be announced soon.**

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**Technical Exchange Breakfast**

- Purdue University School of Electrical and Computer Engineering  
- Permission. Appropriate credit would be appreciated.
Kudos for ECE

ECE faculty and staff members receive honors, awards, and distinctions for their achievements.

George Adams and Mike Melloch were selected as Outstanding Instructors for 2002 by the National Technological University. They are both past recipients of this award.

Edward Delp and Peter Doerschuk were elected Fellows of the American Institute for Medical and Biological Engineering. They were inducted in official ceremonies in Washington, DC on February 21, 2003.


The Engineering Projects in Community Service (EPICS) program, founded by Leah Jamieson and Edward J. Coyle and co-directed by Jamieson and Bill Oakes, received the Governor's Award for Outstanding Volunteerism in the educational institutions category. The program was honored in January 2003 during a Statehouse ceremony to recognize the importance of volunteers in Indiana communities. In the EPICS program, teams of undergraduates earn academic credit for multiyear, multidisciplinary projects that solve engineering- and technology-based problems for community service and educational organizations. The EPICS team, including Pam Brown, Leah Jamieson, Ed Coyle (all of ECE) and Bill Oakes, were also honored at the Engineering Faculty Recognition Banquet. They were the awardees in the "team" category.

Vladimir M. Shalaev was elected a Fellow of the Optical Society of America and a Fellow of the American Physical Society. He was also cited in the January 2003 issue of Popular Science for his work on nano antennae.

Vladimir M. Shalaev, Victor Podolskiy, a post doctoral fellow at Princeton University, and Andrey Sarychev, a senior research scientist at Purdue, had their research featured in a front-page article in EE Times. In the paper they suggested novel optical materials that should have unique properties. The article is available at http://www.eetimes.com/story/OEG20020827S0019.

Michael Zoltowski was the recipient of a 2002 Technical Achievement Award from the IEEE Signal Processing Society. The award was presented at the 2003 International Conference on Acoustics, Speech, and Signal Processing (ICASSP) April 6–10, 2003 in Hong Kong. The Technical Achievement Award "honors a person who, over a period of years, has made outstanding technical contributions to the theory and/or practice in technical areas within the scope of the Society, as demonstrated by publications, patents, or recognized impact on the field."

Venkataramanan Balakrishnan, Mark Bell, and Rudolf Eigenmann were promoted to professor.

Robert Givan, Cheng Kok Koh, and Hong Tan were promoted to associate professor.

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Leah Jamieson Named Indiana’s Best Professor

by Grant Flora

On accolades, accomplishments, and admiration alone, Purdue professor Leah H. Jamieson has had an epic career—particularly for her work bringing engineering expertise from the classroom into the community. Now, Jamieson, the Ransburg Professor of Electrical and Computer Engineering, has been named the 2002 Indiana Professor of the Year.

The award was announced in November 2002 by the Carnegie Foundation and the Council for Advancement and Support of Education, which administers the program.

“This is very exciting,” says Jamieson, who is no stranger to professional recognition. “It is a wonderful award, but it’s a little embarrassing. There are so many people involved in making it possible. I wish I could share it with all of them.”

Jamieson was selected from among 15 nominees from 11 schools in Indiana. She is the seventh Purdue professor since 1987 to earn this award for, as the criteria stipulate, “extraordinary dedication to undergraduate teaching, as well as commitment to students and innovative teaching methods.”

“Leah embodies everything that Purdue could ever want or expect from its faculty members,” says Purdue Provost Sally Frost Mason. “She is a world-class researcher, a respected and award-winning teacher, and her work with Engineering Projects in Community Service (EPICS) denotes a profound commitment to engagement. I can think of no one here who ties all three parts of our mission—discovery, learning, engagement—together as well as Professor Jamieson.”

For her part, Jamieson credits the success of the EPICS program and, in her words, its potential for “explosive campus and national growth” for her nomination and winning the award.

Edward J. Coyle, also an ECE professor, co-founded EPICS in ECE in 1995. “EPICS offers Purdue something other universities don’t generally have—an outreach capability that can share the exciting discoveries of a research university with the greater community.”

Students and colleagues were eager to praise Jamieson on receiving her award—and for her skills in teaching and leadership by example.

Keri Lynn Kokalis, now a quality engineer for the Ross Products Division of Abbott Laboratories in Abbott Park, Ill., studied under Jamieson in her senior year during the 1999-2000 school year.

“During that year I was an EPICS team leader for the Wabash Center-Greenbush Industries project, a community-service organization that employs people with various types of disabilities,” she says. “Not until I graduated with a degree in bioengineering and joined the ranks of engineers in the industry did I fully realize the tremendous impact Professor Jamieson has made on us as engineers and as people.

“By creating EPICS, she has given students not only the opportunity to learn the technical aspects of engineering but also how to effectively work in diverse groups and to experience the joy and pride of contributing to the community. She has reached students in a more profound way by giving us the opportunity to discover a new way to look at and to engineer the world.”

Jamieson received her bachelor’s degree in mathematics from the Massachusetts Institute of Technology and her master’s and doctoral degrees from Princeton University. In 1990, she joined the faculty at Purdue.

Jamieson’s research interests include speech analysis and recognition; the design and analysis of parallel processing algorithms; and the application of parallel processing to the areas of digital speech, image, and signal processing. She is the author of more than 160 journal and conference papers in these areas and co-edited two books in her areas of research.
Researchers from seven universities and the National Science Foundation have formed a new network for Computational Nanotechnology based at Purdue. Mark Lundstrom, Seifert Distinguished Professor of Electrical and Computer Engineering, is director of the new center.

The collaboration, funded with a $10.5 million, five-year grant from the NSF, will develop and use simulations to design materials and tiny devices for a wide range of applications, including a new generation of powerful, yet compact, computers. Purdue researchers will work with researchers at the University of Illinois, the University of Florida, Morgan State University, Northwestern University, Stanford University, and the University of Texas at El Paso.

A major focus of the center is to assemble diverse teams of researchers to create computer simulations that show the entire workings of a design—from its tiniest, nearly atomic-scale building blocks, to its largest components, which are visible to the naked eye, says Mihail Roco, coordinator of the National Nanotechnology Initiative and NSF’s senior advisor for nanotechnology.

“We envision a national center of excellence where academic and industry nanotechnologists will share the most advanced simulation tools for understanding and designing novel materials, catalysts, electronics, pharmaceuticals, and many other things that would not have been otherwise possible,” Roco says.

Simulations that combine all the parts of a design will be key to using nanotechnology for creating future computers, diagnostic devices for medicine, sensors for homeland security, and environmental monitoring and other potential applications. Researchers in the center also will work with scientists and engineers in the NASA Institute for Nanoelectronics and Computing, one of NASA’s seven University Research, Engineering, and Technology Institutes (URETI).

Researchers from seven universities and the National Science Foundation attended a banquet in early 2003 to celebrate the creation of the new Network for Computational Nanotechnology based at Purdue. The collaboration, funded with a $10.5 million, five-year grant from the NSF, will develop and use simulations to design materials and tiny devices for a wide range of applications, including a new generation of powerful, compact computers. Some of the participants are shown here.

“Problems in nanotechnology transcend length-scales, time-scales and academic disciplines,” Lundstrom says. “Our challenge is to bring together experts in well-developed disciplines to address science in the gaps between disciplines, and to focus teams on the most challenging problems in nanotechnology.”

The center will dovetail with Purdue’s URETI, where a group of six universities will work to develop high-performance technologies for space missions. “We have a real opportunity to connect theory and experiment in a way that has not been done before,” Data says. “Many of the problems being addressed by theory and computation are the same problems being addressed experimentally at the NASA institute, and the two fit together very nicely.”

The new multidisciplinary NSF center will include about 20 faculty members from the seven universities, teaming up computer scientists with engineers and researchers in various fields. The computer scientists will develop simulations that are specifically tailored for certain research.

“The research will support the nation’s nanotechnology initiative by linking experimentalists and computational experts,” Roco says. Traditionally, scientists and engineers have not worked side-by-side in the same labs with computer scientists skilled in creating simulations. “It’s a challenge because you have to link together experts in very different disciplines to solve one problem,” Lundstrom says. “Having one center that is largely experimental and another center that is all computational, we think we have a real opportunity to couple these different researchers in a way that’s usually difficult to do.”
Nanotech Center (continued)

The computational center will be an integral part of NSF's infrastructure for nanotechnology research and will be used by scientists and engineers around the country. The center's work will fall within three research themes: nanoelectronics, nanoelectro-mechanics, and combining artificial nanostructures with biological ones.

"In nanoelectronics, the center will explore new technologies that can step in when the microelectronics industry, which has fueled the information revolution for nearly 50 years, reaches its limits," says James Hutchby, head of Nanomaterials and Integration Sciences at the Semiconductor Research Corp., a consortium of several semiconductor manufacturing companies.

Kaif Hess, the Swamland Professor at the University of Illinois, says researchers want to exploit the nanostructures produced by nature to realize new kinds of “nano-bio-electronics systems.” So-called ion channels in living cells are natural nanosystems with an amazing ability to regulate the flow of certain molecules in and out of a cell, he says.

"Understanding how ion channels operate may help us to construct artificial nanoscale channels with new properties," Hess says. "If we can learn how to engineer at the nanoscale from nature, the opportunities are staggering." For example, it might be possible to design ion switches for new types of low-power circuits. Such circuits would help engineers design and build computers that consume a fraction of the power needed for conventional electronics.

"Such circuits would help engineers design and build computers that consume a fraction of the power needed for conventional electronics. Such an innovation, in turn, would enable researchers to cram more and more devices on a computer chip and to design super-computer, powerful computers. "Detailed simulations of natural and artificial ion channels could help us to control and improve ion-channel activity in the human body ranging from regulating heart beat to fighting cancer cells," Hess says. An important part of the NSF center's mission will be to create an infrastructure that supports the national nanotechnology effort, says Ahmed Samouh, Samuel Cowen Professor of Computer Science and director of Purdue's Computing Research Institute. A system pioneered at Purdue will enable scientists and engineers in different geographical regions to remotely use specialized software needed for nanotechnology research. The system will be an outgrowth of a prototype called the nanofab computer grid that already delivers advanced nanotechnology simulation services worldwide to users from high school students to professional scientists.

"Now the nanofab is running out of a corner of my lab, but it will be expanded into something much bigger," Lindstrom says. "That means people will be able to use a Web browser to run the software that is developed through this center."

Using a browser to access software from the nanofab spurs research because scientists in remote locations no longer have to install the complex programs on their own computers. Instead, the researchers can quickly run programs housed on a server at Purdue Information Technology at Purdue, or HIP, in charge of the online service that will eventually make the specialized software available to the research community.

"Our role is to take this technology developed on the research side, make it available for researchers, and provide support for users, who will be able to call a help desk or some similar service," says James Boman, Purdue's vice president for information technology. "We will actually deliver high-level, nanotechnology simulation services to scientists, educators, and students worldwide." Basicallly, it's an information source, but it's also a tool. Think of it as a scientific portal. In the future, computing software won't reside on your personal computer, but on a networked grid of resources."

When users run a simulator, the system will locate the needed hardware and software resources on a worldwide grid, perform the simulation, and provide results to the user.

"The center's grid-based computing services will provide the largest operating testbed for what many believe will be the competing paradigm of the future," says Jose Fortes, the Bell South Eminent Scholar and director of the Advanced Computing and Information Sciences Laboratory at the University of Florida. Fortes leads a team at the University of Florida that is developing a second-generation grid-computing platform for the center.

"A real challenge in nanotechnology right now is to begin the hard work of turning the exciting advances of nanoscience into new technologies. Doing so will require us to connect the physicists and chemists who work on small devices to the engineers who will begin designing systems with, perhaps, trillions of nanocomponents."

Creating multidisciplinary teams will be critical to furthering work in nanotechnology. "There will be some real synergies here," says Meyyappan, director of NSF's Nanotechnology Research Center.

Indiana's Best (continued from page 5)

The Council for Advancement and Support of Education (CASE) established the Presidents of the Year program in 1981 and works in cooperation with the Carnegie Foundation and various higher education associations in its administration. CASE assembled two preliminary panels of judges to select finalists. The Carnegie Foundation then convened the third and final panel, which selected the four national winners and state winners. This year there are winners in 46 states including the District of Columbia, Guam, Puerto Rico, and the Virgin Islands.

The Carnegie Foundation for the Advancement of Teaching was founded in 1905 by Andrew Carnegie, "to do all things necessary to encourage, uphold and dignify the profession of teaching." It is the only advanced study center for teachers in the world and the third oldest foundation in the nation.

The Council for Advancement and Support of Education is the largest international association of educational institutions, with more than 3,000 colleges, universities, and independent elementary and secondary schools in 49 countries, including the United States, Canada, Mexico, and the United Kingdom. Representing these institutions are more than 38,000 professionals in the disciplines of alumni relations, communications, and fund raising.

The Purdue University School of Electrical & Computer Engineering
In a time before DVDs, VCRs, and even TVs themselves, a passionately curious, determined, and unassuming researcher working in the basement of Purdue’s Electrical Engineering Building advanced the development of television on several fronts. And those impressive discoveries in the 1920s and 1930s were just the beginning of inventions by Roscoe George, who chatted up at least 35 patents during his nearly 30 years on campus.

So vast were his contributions, his 1980 Modern Pioneer Award from the National Manufacturers’ Association could be said to underline his ultimate achievements. These include a hot cathode oscillograph for studying high-frequency electrical phenomena, a signal transmitter for landing aircraft, an aircraft engine ignition noise suppression system, and a technique for transmitting electrical energy by microwave, among others.

He also fueled a love for learning and research in the students he worked with, assuring that his contributions would continue to evolve.

Born to engineering
The story begins with a Madison County, Indiana, farm boy who was more interested in machinery than crops. “The motors and equipment on the farm just fascinated him, so his father made a workshop for him so he could do some tinkering around,” the professor’s daughter, Eleanor Holt, says. “He also did silver-plating to make money for college.”

Armed with his earnings, George boarded the interurban railroad for West Lafayette and Purdue in 1915, leaving campus only for World War I service in the U.S. Army Mounted Engineers and to marry his childhood sweetheart, Rosa Smith.

George’s work in the television arena continued until World War II, when defense research took precedence.

Quiet, hard working
While his work was mammoth, George himself was shyly built and quiet. His daughter guesses he was about 5’5” tall. “I could see the top of his bald head, and I’m 5’8’,” says Robert Burnett (BSEE ’40, MSEE ’47, PhD EE ’59), who was on campus with George for 10 years and worked under him for five.

“His research often consumed him,” says his daughter. “In a nice way, he was a workaholic,” Burnett says of the man he called Professor George. “He was always there, always available with an encouraging word, and he had wonderful ideas about how to get around problems. He’d found his niche in life, and he really never gave up. He kept pursuing a problem until he got it solved.”

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“Once I saw him take his coat off when he was working in the lab. Just once I saw him take his coat off and roll up his sleeves,” Burnett recalls. “He was pretty quiet. If I asked him a direct question, he would answer, but he wouldn’t continue. He was an unassuming, very mild mannered, brilliant inventor.”

And he took his work seriously. “I didn’t see him running around the halls or chatting at the water fountain,” Burnett says. “And he wasn’t a joker.”

“He could be funny. He always read the funny papers to me. But he was a pretty serious man.”

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Early work with television
In 1929, his work caught the attention of the Grigsby-Grunow Radio Co., which funded research for creation of an all-electronic television system. George and colleague Howard Heim set to work using the cathode ray tube instead of the method then used—a two-foot spinning disc that had to revolve at high speed to be effective.

First, they added a second, vertical sweep circuit to George’s original oscillograph to permit display of the television image. L.A. Goldin reports in A Century of Progress: The History of Electrical Engineering at Purdue (1888-1988). Then they built cathode ray tubes in chemistry flasks to create electronic viewing screens for their television system.

In 1930, George and his team took the next step, securing a broadcast license for Station WPGG and building a 78-foot antenna tower near Ross Ade Stadium. On December 31, 1931, they transmitted their first broadcast. Regular movie broadcasts began in March 1932, at 7:30 p.m. every Tuesday and Thursday. Transmissions were silent, with occasional voice announcements.

To confirm transmission, George built a portable receiver and then drove around the area, tuning in. He heard from others who picked up the programs, too—one note even came from Maine.

In 1939, RCA stepped in with more funding, allowing George to bring in research fellows, one of whom was Richard Webb.

“They were our pal, our general guide,” Webb says of George. “He always let us work that part of the project we particularly liked.” But when it came to engraving the panels on the machines they built, Roscoe handled that task alone. “He loved to work the lathe and milling machines,” Webb recalls. “He wouldn’t let anybody else use the engraving machine.”

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Roscoe George, a relentless experimenter and a very talented inventor. And his drive was built-in, all natural.

Sometimes his pursuits found him working when others weren’t. One weekend George was alone in an ice chamber, working on his precipitation static project, when he fell off a ladder and hit his head. “He could have been severely hurt,” Webb says.

“Later years, people referred to him as a hardware man,” his daughter recalls. “If something had to be made, he did it. He not only had the knowledge to do things, he had the skill, too.”

“He was a builder. That would be a word used to describe him,” says James R. Eaton Jr., a visiting ECE professor at Purdue whose father was a colleague and friend of George’s.

A registered professional engineer, George was cited as an American Man of Science in 1961. His publications included articles in research, scholarly, and professional journals, as well as Purdue University Engineering Experiment Station bulletins.

“He was always willing to share his knowledge,” Eaton says. “And he always built on his earlier work and previous knowledge.”

That’s reflected in his research, where a connecting thread can be seen in his work with electrical discharges, static electricity, powerful microwave radio beams, and other areas.

Preferred lab over classroom

Most of his career, George was able to avoid teaching, a task he’d rather have skipped. He taught electronics, electric and magnetic fields, and the UHF/microwave laboratory.

“He didn’t think he would be a good teacher,” Holt says. “He’d had poor teachers in his day, and he didn’t want to be a poor teacher.”

“He would rather have been inventing, building, and testing,” Eaton says.

George retired from Purdue in 1965 at age 69, spending much of his time at a Michigan summer home before his death in 1975.

Roscoe the Researcher

At least 35 patents bear the Roscoe George name, for inventions such as the cathode ray tube and oscillograph, television system, vacuum seal, automatic volume control for television receivers, infrared image viewer, static eliminator for aircraft, and signal receiver circuit.

He’s credited with:

• Converting the cathode ray oscillograph for television image reception
• Creating the blacker-than-black method for synchronizing television transmission and reception
• Building a television station
• Converting microwave energy from solar power collecting satellites.

Meticulous Record Keeper in Lab, Garden

If the hallmark of a researcher is record keeping, Roscoe George earns top billing. Work or hobby, he kept detailed records.

Take his summer home and garden. He designed and built the home himself, on Michigan’s Bear Lake, where his neighbors were four other Purdue faculty and their families.

“He built that house as meticulously as he did machines,” says James R. Eaton Jr., whose father was also on the Purdue EE faculty and whose family summered next door to George.

George also built a garden, keeping equally precise records on its construction—15-foot fences topped by chicken wire to keep deer and sparrows out—and its strawberry and blueberry yield.

“De recorded water, temperature, and the number of quarts he picked.” Eaton says. “And those berries were something to behold.”

Roscoe George continued

was a relentless experimenter and a very talented inventor. And his drive was built-in, all natural.

Sometimes his pursuits found him working when others weren’t. One weekend George was alone in an ice chamber, working on his precipitation static project, when he fell off a ladder and hit his head. “He could have been severely hurt,” Webb says.

“Later years, people referred to him as a hardware man,” his daughter recalls. “If something had to be made, he did it. He not only had the knowledge to do things, he had the skill, too.”

“He was a builder. That would be a word used to describe him,” says James R. Eaton Jr., a visiting ECE professor at Purdue whose father was a colleague and friend of George’s.

A registered professional engineer, George was cited as an American Man of Science in 1961. His publications included articles in research, scholarly, and professional journals, as well as Purdue University Engineering Experiment Station bulletins.

“He was always willing to share his knowledge,” Eaton says. “And he always built on his earlier work and previous knowledge.”

That’s reflected in his research, where a connecting thread can be seen in his work with electrical discharges, static electricity, powerful microwave radio beams, and other areas.

Preferred lab over classroom

Most of his career, George was able to avoid teaching, a task he’d rather have skipped. He taught electronics, electric and magnetic fields, and the UHF/microwave laboratory.

“He didn’t think he would be a good teacher,” Holt says. “He’d had poor teachers in his day, and he didn’t want to be a poor teacher.”

“He would rather have been inventing, building, and testing,” Eaton says.

George retired from Purdue in 1965 at age 69, spending much of his time at a Michigan summer home before his death in 1975.
Making Wireless Connections

by Sally Bond

Strains of “O Holy Night” astonished ship crews all over the Atlantic Ocean on Christmas Eve of 1906. They heard Reginald Fessenden conducting the world’s first broadcast by radio. While a professor of electrical engineering at Purdue University, Fessenden began experiments that made him a leader in the race for wireless communication.

Professor Catherine Rosenberg (seated with laptop) is surrounded by her team of students researching wireless solutions. The team developed a unique remote printing application for use on the Purdue Air Link (PAL). It was a “fantastic opportunity,” says Rosenberg, “for students to work with engineers. Our undergraduates started with a new idea, created a concept, designed the solution, and then helped deploy it.”

Connecting with ITaP for remote printing

Imagine sitting in the Purdue Memorial Union putting the finishing touches on a Matlab linear circuit analysis. You need a paper copy before class starts, but your printer is across campus. ECE Professor Catherine Rosenberg and her team of students had similar dilemmas in mind while fashioning a unique remote printing application for use on the Purdue Air Link (PAL).

The platform-independent printing solution takes advantage of the intelligence of PAL’s wireless network without requiring special software on the laptop or PDA. The web-based service determines location, and therefore the nearest printer, by finding the access point in use. Rather than downloading a driver for a particular printer, the web service will print on the user’s behalf.

Information Technology at Purdue (ITaP) has nearly finished installing PAL, the campus-wide wireless network allowing portable devices to access a computer network without a physical connection. “One unique aspect of ITaP,” says Jim Bottum, vice president for information technology, “is that we partner with researchers like Professor Rosenberg to make the infrastructure available for research, testing, and evaluation of new potential services and products.”

“With ITaP’s strong laboratory, our students were able to design a perfectly platform-independent, network-oriented service,” says Rosenberg. “It requires a great deal of coordination between ITaP and the research team, but it’s a fantastic opportunity for students to work with engineers. Our undergraduates started with a new idea, created a concept, designed the solution, and then helped deploy it.”

“Usually we do a prototype in our labs and stop there,” agrees team member Jacky Lee, who was inspired to pursue his PhD in electrical and computer engineering through the wireless research project. “But we were able to go one step further to transfer the concept and help deploy it on the wireless network.”

Assistant Professor Bill Chappell conducts research on sensors for the ECE Center for Wireless Systems and Applications (CWSA). Chappell works on wireless antennas and filters for high-frequency sensors and receivers.

A World without Wire: The Center for Wireless Systems and Applications

Professor Rosenberg will be increasingly concerned with coordinating efforts to deploy wireless solutions as she directs the new Center for Wireless Systems and Applications (CWSA). “Some of the objectives of the Center at Purdue are to provide people an opportunity to talk to each other, to know what others are doing, and to attract leadership for new research ventures,” says Rosenberg.

CWSA brings together 85 professors from 11 departments across the Purdue campus for the interdisciplinary work necessary, for example, in complex areas such as sensors.

It was the sudden and puzzling loss of data from spacecraft sensors that gave mission engineers the first hint that something was terribly wrong with the space shuttle Columbia. Temperature and wind

continued on next page

The race continues today under mounting demands for better and better wireless functionality. Professors in Purdue’s School of Electrical and Computer Engineering continue the leadership tradition with comprehensive approaches to wireless technology that connect resources, ideas, and expertise.
resistance messages from sensors continued to confirm the worst.

The range of application for sensors is wide. They are important for monitoring movement and chemical levels. They may check for earthquakes or monitor solidity of buildings or ice formation on bridges.

"While at ECE we are not the creators of the application, we are very much the system designers. We create the small devices, make them communicable, develop a system of a large number of sensors, extract the information, and process it quickly. The interdisciplinary work required is what we call 'cross-layering,'" says Rosenberg.

The sensor network can be thought of organizationally in layers. In a physical layer, Professor Rashid Bashir and other researchers create biosensors. In the communication layer, researchers such as professors Bill Chapell, Saeed Mohammadi, Mike Zolowski, and Dean Linda Pauls work with smart antennas that adapt to random characteristics in a harsh environment. Professors Edward Coyle, Cheng-Kok Koh, Rast Manzimid, Ness Shirrof, and Rosenberg coordinate the devices in the networking and system layer.

Cross-layer research is necessary for making sensor systems very cheap and efficient. "We have a lot expertise in this area and are excited to see the Center play a very strong role in making sensor research a big success for Purdue," says Rosenberg.

Low Power for High Performance

The Center for Wireless Systems and Applications will create and energize a community of interest in numerous research areas, including low-power energy design with Kaushik Roy, professor of electrical and computer engineering.

"Energy consumption is becoming very important as each generation of technology continues to scale devices for better performance. But scaling, more functionality, and more transistors come with a price of exponential increases in leakage current. Power dissipation is now a real bottleneck," reports Roy.

Roy teams with ECE assistant professors T. Vijaykumar and Cheng-Kok Koh and 23 Ph.D. students to focus on power management techniques at every level of design—from devices and circuits to architecture. With Professor Mark Lundstrom, Roy is also working on new non-silicon devices such as carbon nanotube transistors for future technology applications.

"Part and parcel of low-power domain in wireless communication systems," says Roy, "is the digital signal processing research for low-power VLSI signal processing." Roy's low-complexity algorithms can reduce power and thereby save battery life in wireless applications. "We've started on this aspect more recently," says Roy, "but we're getting results that fit very well with the objective of the wireless center."

Connecting across Indiana

"A center within the Center" is a useful way to describe the loose affiliation between the new Indiana Center for Wireless Communications and Networking (ICWCN) and the larger CWSA.

Supported by the state's recently revived Indiana 21st Century Fund, the ICWCN is a substantial project connecting eight faculty members from lead institution Purdue University with three Notre Dame professors and four Indiana companies. Indiana 21st Century Funds intent is to foster economic growth and high tech jobs in the state.

"Our goal is to do research and apply it in products through our industrial partners," says Associate Professor Jim Krogmeier, who, with Professor Saul Gelfand, led the proposal to fund ICWCN. "We want to bring tangible benefits to Indiana."

Research in ICWCN is organized into three categories: Coding and Modulation, led by Notre Dame and drawing on work by Krogmeier and Gelfand; develops techniques for encoding information into signals that are transmitted wirelessly over a channel; ECE professors Mark Red, Mike Zolowski, and Gelfand pursue research in adaptive signal processing and channel modeling that can include receiver design, equalizers, smart antenna processing, and space-time coding.

A third research area targeted by ECE professors Ed Delp, Ness Shirrof, and Rosenberg looks at wireless networking and security issues. Professor Darcy Bullock from the School of Civil Engineering connects with the group to add an intelligent transportation element through imbedded signal processing research.

"We'll target our center more toward wireless local area networking, sensor networking, and specialized types of short-range communication used in transportation," reports Krogmeier. "These are the areas where we view Indiana having a business advantage."

The business advantage is represented by associations with Delphi Drivco in Kokomo, ITT Industries in Fort Wayne, and Thompson Consumer Electronics and Safety Technologies, both of Indianapolis. Research applications could extend functionality in vehicle to roadside communication and perhaps also involve road condition monitoring.

ICWCN will be working, for example, with the small company Safety Technologies to build prototypes of safety warning systems to better monitor train crossings and fast moving emergency vehicles. The wireless research would involve transmitters on emergency responders or trains and devices in cars that receive signals and function as a second warning system beyond the audible siren.

"We are all about companies leveraging university research and development. Purdue is serious about communications and networking research, and the state of Indiana is serious about investing in our success," says Krogmeier. "We are in the beginning stages of operation, but we believe we will see the fruit of this collaboration in the form of deliverable research applications to Indiana companies."
With all eyes on the prize of preeminence, The Campaign for Purdue is afoot! For ECE, a vital element in attaining world leadership will be faculty—the 70 on campus today and the 30 who will be recruited over the next five years. To support this ECE faculty enhancement, the campaign will dedicate $14 million to recruiting, startup packages, and nine new endowed professorships.

“I want to see Purdue regarded as best in class, well-respected as an engineering school, and highly valued by prospective students,” says Michael J. Birck (BSEE ’80, HDR ’90). “That won’t happen unless faculty members are highly regarded and highly motivated.”

Endowed professorships, which provide direct and discretionary support, speak volumes in recruiting and retaining such faculty, he believes. That prompted Birck and his wife Katherine to lend two in ECE “Endowed professorships are perhaps the best way to attract the brightest teaching/research candidates to a university,” Birck says. “Candidates given endowed positions know that the resources to support their work are already in place, and to be offered such a position is a clear sign that the institution really wants them. The same is true for someone already on the faculty. It is a clear indication that the school highly values the individual and seeks a long-term affiliation.”

“We want the best minds in the world to be here at Purdue,” says Mark J.T. Smith, ECE head. “Some of them already are, and endowed professorships will help us keep them. The rest we’ll recruit, and that’s where startup funding and more endowed professorships will give us the competitive edge.”

Supporting the Best Minds in the World

Of the $14 million in faculty allocations, half a million will support startup packages and the balance will support endowed professorships. More than $5 million and four professorships have already been funded in the first year of the five-year campaign.

“When you endow a professorship, it’s the most permanent, long-lasting impact you can make on the university,” Smith says. “Endowed professorships last much longer than buildings. And funding a professorship is perhaps the best way to attract the brightest teaching/research candidates to a university.” Birck says, “Candidates given endowed positions know that the resources to support their work are already in place.”

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Endowed Professorships Awarded to ECE Faculty

Jan P. Allebach has been named the Michael J. and Katherine R. Birck Professor of Electrical and Computer Engineering. His research focuses on printing and displaying images, color measurement, scanning and sampling of multidimensional signals, and synthesis of digital diffractive elements. For the past ten years, Allebach has led a major research program at Purdue that is sponsored by Hewlett-Packard Co. The results of his work can be found in many imaging products that are sold in the marketplace.

Allebach says it’s rewarding to work closely with industry sponsors. “We’re all working hand in hand with students, and it’s exciting to see our ideas in products,” he says. “Go into any computer store, and you will see Purdue technology.”

Allebach has been a visiting faculty member at IBM Watson Research Center in Yorktown Heights, New York; Sandia National Labs in Livermore, California; and Hewlett-Packard Labs in Palo Alto, California. He has consulted extensively for industry and government laboratories. From 1972 to 1975 Allebach was a National Science Foundation Graduate Fellow. He is also a Fellow of the IEEE for his contributions to digital signal processing. Allebach received his Ph.D. in electrical engineering from the University of Illinois in 1975.

Michael and Katherine Birck have endowed two Michael J. and Katherine R. Birck Professorships in ECE. “Endowed professorships are perhaps the best way to attract the brightest teaching/research candidates to a university,” says Michael J. Birck (BSEE ’60, HDR ’95). “Candidates given endowed positions know that the resources to support their work are already in place, and to be offered such a position is a clear sign that the institution really wants them.”
Edward J. Delp has been named the Silicon Valley Professor of Electrical and Computer Engineering, a chaired professorship created by the Silicon Valley Alumni Association. Delp is also a professor of biomedical engineering at Purdue. Delp's research interests include image and video compression, multimedia security, medical imaging, multimedia systems, communications, and information theory. Various companies and government agencies consult Delp on topics such as image processing, robot vision, pattern recognition, and secure communications.

“We’re working in the area of multimedia security, with water marking and data hiding, and we have one of the best groups in the world,” Delp says. “We want to secure images transmitted over the Internet, and we also want to be able to detect data hiding—secret messages in audio, visual, and digital images.” Delp is also currently working on problems related to breast imaging. “We want to be able to flag mammograms that are suspicious,” he says, “so that a physician can detect cancer more readily.”

Delp has published more than 250 papers. He has chaired numerous committees and conferences and in 2003 will be the program co-chair for the IEEE International Conference on Image Processing in Barcelona, Spain. In 2000 he was selected a distinguished lecturer of the IEEE Signal Processing Society. He is a Fellow of the IEEE and the Society for Imaging Science and Technology. Delp is also the past associate editor of the IEEE Transactions on Pattern Analysis and Machine Intelligence (1991-93), the Journal of Electronic Imaging (1994-2000), and the IEEE Transactions on Image Processing (1996-98). He was co-editor of the book Digital Cardiac Imaging and a member of the editorial board of the International Journal of Cardio Imaging (1984-91).

Delp has received the Honeywell Award and D.D. Ewing Award, both for excellence in teaching, and the Raymond C. Bowman Award for fostering education in imaging science, a Fulbright Fellowship, and a Nokia Fellowship.

Before coming to Purdue in 1984, Delp spent four years at the University of Michigan, Ann Arbor. Delp received his BS (cum laude) and MS from the University of Cincinnati in 1973 and 1975, respectively, and his PhD from Purdue in 1979. In May 2002, Delp was named the Scifres Family Distinguished Professor of Computer Engineering. Weiner’s research focuses on ultrafast optical signal processing and high-speed optical communications. He is especially well known for pioneering the field of femtosecond pulse shaping, which enables a generation of nearly arbitrary ultrashort optical waveforms according to user specification. He

studies the use of light pulses that are shorter in duration than one-trillionth of a second for optical communications. “With a focus on ultrashort-optics, we can create technology that will increase greater data rates for fiber optics,” he says.

The impact of Weiner's research extends worldwide and has influenced other fields—physics and physical chemists, for example, are using Weiner's technology to manipulate chemical reactions. Weiner holds five U.S. patents. He has published over 120 research articles and four book chapters. He has authored co-authored over 200 conference papers and presented over 80 invited seminars. He is served as chair of the 1999 Gordon Conference on Nonlinear Optics and Lasers. In 1998, at the Conference on Lasers and Electro-optics, Weiner shared the general co-chair role with Don Scifres, the donor responsible for the endowed chair. Weiner was awarded.

Weiner is a Fellow of the OSA and IEEE and a board of governors member and the secretary treasurer for the IEEE Lasers and Electro-optics Society. He is past associate editor for the IEEE Journal of

Quantum Electronics, IEEE Photonics Technology Letters, and Optics Letters. His career awards include the 1997 International Commission on Optics Prize, the 1999 IEEE LEOS William Sturman Scientific Achievement Award, the 2000 Alexander von Humboldt Foundation Research Award for Senior U.S. Scientists, and the 1960 Adolph Lomb Medal of the Optical Society of America for pioneering contributions to the field of optics made before the age of 35.

Weiner studied at the Massachusetts Institute of Technology, where he received his BS, MS and PhD in 1979, 1981, and 1988, respectively. In 1994, Weiner joined Bellcore, where he conducted research on ultrashort optics. In 1999, he became manager of the Ultrashort Optics and Optical Signal Processing Research District. From 1999 to 2000, Weiner was a visiting professor at the Max Born Institute for Nonlinear Optics and Short Pulse Spectroscopy in Berlin, Germany.

Weiner assumed his current position at Purdue in 1992 and in 1996 began serving as director of graduate admissions for ECE. Weiner has two children ages eight and four, of whom he is extremely proud.
Two Alumni Gifts Help Create New ECE Professorships

Bob and Anne Burnett: A Vision for Faculty Preeminence

Two Purdue University alumni, with five degrees between them, have given $1 million toward establishing a named professorship in ECE. James R. “Bob” and Anne K. Burnett, of Rancho Palos Verdes, California, made their gift in response to President Martin C. Jischke’s call for $200 million to attract and retain the very best faculty as part of Purdue’s strategic plan in conjunction with the $3.1 billion Campaign for Purdue.

“Purdue has nothing in the long haul unless it is outstanding professors,” says Bob Burnett, a retired executive vice president of the space and defense sector of TRW, Inc., who also served as an associate professor at Purdue. “The key issue is: Do Purdue have the type of professors who can inspire students to learn, and who can do top-level research? The key is the outstanding faculty. Raising money for professorships helps in recruiting the brightest and the best.”

The couple’s latest gift goes toward an endowment fund that will provide for professorships helps in recruiting the brightest and the best. “Raising money for professorships helps in recruiting the brightest and the best,” Burnett says. “It’s particularly meaningful for the couple, personally and professionally. Burnett credits his Purdue education as the reason he is both able and willing to give back to the University. “I have outstanding memories of the electrical engineering faculty. They were excellent teachers and there was excellent research being done,” he says.

As a Purdue faculty member Burnett headed research in servomechanisms, digital computers, and network theory. He earned his professional reputation as the systems engineer and technical director of the Minuteman Intercontinental Ballistic Missile System (ICBM). Burnett takes pride in the Minuteman program, which he says was delivered on time, was still operational, and was a key part of winning the Cold War.

“Based on my Purdue education, I was able to do quite well professionally. I am able to give back, and I want to. My Purdue education was the key to my professional career.”

Ironically, Burnett’s decision to leave the University made the couple’s gift possible.

“When I was at Purdue as an associate professor, I decided to leave because I could become part of the Minuteman Ballistic Missile Program in industry,” he says. “That decision proved good for the Burnett, the country, and the University.”

In 1996, Burnett left Purdue and joined the Guided Missile Research Division of the Raytheon-AlliedSignal Corporation (which subsequently became TRW, Inc.), as manager of the Computers and Controls Department. In 1997, he became technical director of TRW’s electronics/wholesale/distribution and was responsible for the system engineering of the guidance and control systems for the ICBM Minuteman weapons systems. In the early 1960s, he was named Minuteman program director. In 1989, Burnett became vice president of TRW and served as vice president and general manager of the Defense Systems Group. He was later promoted to executive vice president and deputy general of the Space and Defense sector of TRW. Burnett retired from TRW in 1991, but he has continued to serve on various government committees and corporate boards. He has served as a member of the selection board for the National Science Foundation and as a consultant to Argonne National Laboratory operated by the University of Chicago for the United States Department of Energy. He is currently a consultant for Lawrence Livermore National Laboratory.

Burnett is a member of the Institute of Electrical and Electronics Engineers and a Fellow of the American Institute of Aeronautics and Astronautics. He was elected to the National Academy of Engineering in 1990 and an honorary doctorate in engineering in 1997. He was also elected to the prestigious National Academy of Engineering in 2003. Burnett is a member of the Institute of Electrical and Electronics Engineers and a Fellow of the American Institute of Aeronautics and Astronautics. He was elected to the National Academy of Engineering in 1990 and an honorary doctorate in engineering in 1997. He was also elected to the prestigious National Academy of Engineering in 2003.

Tom and Wendy Engibous: A Leadership Strategy for Wireless

Tom Engibous, CEO and successful strategy behind Texas Instruments Inc., received his master’s degree in electrical and computer engineering in 1976 from Purdue University. He said goodbye to officemate Ed Delp, now a full professor in ECE, and headed to Dallas, home of Texas Instruments, to begin what is now approaching a three-decade career.

Engibous started in TI as an integrated circuit design engineer and rose through the semiconductor ranks with such distinction that Purdue awarded him a Distinguished Engineering Alumni award in 1980 and an honorary doctorate in engineering in 1997. He was also elected to the prestigious National Academy of Engineering in 2003.

After becoming CEO and president in 1986, Engibous engineered a timely strategy focusing on digital signal processors (DSP). He sent TI to the top of the global market with the most advanced DSPs.

With his proven experience and expertise, Engibous has been a valuable member of the School of Engineering’s Visiting Committee for many years. He also co-chairs ECE’s campaign steering committee. Now ECE is also grateful to Engibous for providing a recent and timely endowed professorship for research and education in wireless communication.

“The history of the growth of electronics,” says Engibous, “is really defined by new areas and levels of functionality that, when supplied to the consumer, open up new growth areas. The invention of the analog modem created a huge home and notebook computer business reaching hundreds of billions of dollars.”

With the slow down in growth in the electronics world, Engibous points beyond the lagging economy. “The reality is that companies have not produced any brand new functionality for consumers and businesses in the last few years. How much smaller do you really want a cell phone to be?” asks Engibous. “The electronics industry is in a full right now in terms of providing the enabling new functionality to drive growth.”

Engibous sees change coming and warns Purdue ECE positioned as a major contributor. “Change is going to be driven by two things,” produces Engibous. “We’ll have new levels of functionality with the advent of the mobile internet and also with more prevalent broadband communication data rates to and through the home.”

“A professorship specifically to support ECE’s commitment to lead in wireless communication is important,” says Engibous. “The bottom line, I believe, is that the best opportunities in electronics and semiconductors are in the area of wireless communications.”

Published by Grant Flora

Florence, Alabama

Jen Engibous and his wife, Wendy, recently provided an endowed professorship for research and education in wireless communication. “A professorship specifically to support ECE’s commitment to lead in wireless communication is important,” says Engibous. “The bottom line, I believe, is that the best opportunities in electronics and semiconductors are in the area of wireless communications.”

Bob and Anne Burnett have given $1 million toward establishing an endowed professorship in ECE. Bob Burnett says that the key is the outstanding faculty who will now continue to lead research and inspire students to learn.

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Venturing into Entrepreneurship

by Sally Bond

“We are here to educate and do excellent engineering and science, of course,” says Rashid Bashir, associate professor in ECE and holder of 23 patents. “But at the end of the day, it’s extremely important that our research also produce ideas, patents, and intellectual property that can be commercialized by entrepreneurs and benefit society.”

Entrepreneurship—the start of new companies—probably brings to mind the likes of Bill Gates rather than Queen Isabella, the venture capitalist behind Christopher Columbus. “But entrepreneurship is as old as human history and the capitalist economies,” says Arnold Cooper, Purdue’s Louis A. Weil Jr. Professor of Management. “What is relatively new is entrepreneurship as a highly visible activity for the public.”

Entrepreneurship, and its close companion venture capitalism, have been highly visible activities for ECE alumni nationwide. New Purdue University itself is the scene of dramatic new initiatives to bring Boilermaker technology to the marketplace. As the ECE community ventures into technology commercialization, entrepreneur alumni provide valuable insights into the requirements for launching community ventures into technology commercialization, entrepreneur and founder of the venture capital firm Foundation Capital Bill Elmore (BSEE ’75, MSEE ’80), “is a collection of great brains and great technology” that will change the rules. Waves can also come from a shift in social-behavioral trends such as the popularity of digital cameras.

Timing Can Be Everything

“A start-up needs a great idea and the right people, but it must also anticipate market trends and demands. Market waves might be driven by technological shifts from technical innovations, like the personal computer, or by regulatory changes, such as the Telecommunications Act, that rewrite the rules. Waves can also come from shifts in social-behavioral trends such as the popularity of digital cameras.”

# Purdue Engineering Education and Entrepreneurship

“Universities know that starting companies is part of the process of disseminating their research results to the world,” explains Binder. “In some extent, the results of university research get out into the world unless someone does start a company.”

From Campus to Company

“It’s not unusual for half of the companies invested in by a venture capital firm to come from academia. What is required,” says entrepreneur and founder of the venture capital firm Foundation Capital Bill Elmore (BSEE ’75, MSEE ’80), “is a collection of great brains and great technology, which is an engineering university like Purdue has. But you also need a university environment supportive of engineering research that is both long-term and shorter-term production oriented. I ask, is the technology really ready to become a company? Can the company get enough of the inventor’s ‘brain power’ to build the company around? Can an appropriate licensing agreement be worked out with the university?”

Elmore, who recently funded Purdue’s Advanced Wireless Concepts Validation Laboratory in the Birck Nanotechnology Center, has seen firsthand the success of Purdue engineering research and education in the Silicon Valley. “Many Silicon Valley companies are starting up or becoming venture capitalists. My own Purdue experience has been crucial as a venture capitalist to assess whether entrepreneurs have something real or not.”

Campus paths to entrepreneurship vary greatly, but one scenario could look like this: A professor files a disclosure with the university, meets up with a technology business person, finds venture investors, and does an early valuation of the idea. Seed money allows partial or complete commercialization of the technology. If/when customers can be found, it might be time to set up a company and hire experienced management to run it with the inventor.

continued on next page
Entrepreneurship continued

Entrepreneurship must be an interdisciplinary effort. “From an entrepreneurial standpoint, engineering professors make a key part of the team,” says Boyle, “but they are rarely enough. You also need business people. Quite frankly, money is often lost on start-ups with cool technology but with some fundamental business flaw.”

Teaching Interdisciplinary Partnership

When ECE student Himanshu Lal and his team of friends watched “The Matrix,” they got more than an evening of Hollywood entertainment. They copied a name for their new computer device—Zion. When Lal entered the campus-wide Burton Morgan Entrepreneurial Competition, he received more than the $3,000 prize—he took away an education on the teamwork required to start companies.

Lal arrived on the Purdue campus two years ago as a freshman, heard about the entrepreneurial competition, and signed up to make Zion a reality. He engineered Zion to solve the web transaction barrier a reality. He engineered Zion to solve the web transaction barrier, “The Burton Morgan was a wonderful experience. Our whole team matured into a professional unit under the guidance of Dr. Subhrada Mehra, Director of KRAMENT School Entrepreneurship Initiative,” says Lal. With help from competition prize money and venture money from Silicon Valley, Zion hits the market in a matter of months.

Following networking with Purdue MBA students for business and marketing expertise, Zion entered the 2002 Burton Morgan Entrepreneurship Competition and came in fifth place out of 54 business plans and second for undergraduate entries.

“The Burton Morgan was a wonderful experience. Our whole team matured into a professional unit under the guidance of Dr. Shalendra Mehra, Director of KRAMENT School Entrepreneurship Initiative,” says Lal. “With help from competition prize money and venture money from Silicon Valley, Zion hits the market in a matter of months.”

Lal’s experience is the type of interdisciplinary entrepreneurial education ECE would like to offer students. “Certainly one of the main goals of entrepreneur activity at Discovery Park is educational,” says Binder. “Certainly one of the main goals of entrepreneur activity at Discovery Park is educational,” says Binder. “To some extent, the results of university research won’t get out into the world unless someone does start a company.”

New Policies Prove Fruitful

According to the Office of Technology Commercialization (OTC) at Purdue Research Foundation, Purdue produced only one or two start-ups per year until the past two years when there were at least ten start-ups each year. This upturn is the fruit of friendlier licensing policies and more entrepreneurial infrastructure. OTC is the access point for all parties interested in licensing Purdue technology. After a Purdue professor files a disclosure through OTC to license the technology, one-third of royalty proceeds go to the inventor’s department, one-third go to the inventor, and one-third is added to the Trask Pre-Seed Venture Fund for Purdue to invest in its own research. Purdue Research Park, OTC also works on that all-important step of linking start-up companies with interested venture capitalists. Venture capitalists such as Gordon Binder (BSEE ’77) look at university company for technologies that are ripe for the marketplace. “Entrepreneurs know that starting companies is part of the process of disseminating their research results to the world,” says Binder. “In some extent, the results of university research won’t get out into the world unless someone does start a company.”

Connecting with Venture Capital

“Quite often,” says Binder, “a professor’s initial idea will get what is called ‘friends and family’ as early investors. Then when they make a little progress they get venture capital.” Venture capital can come from a variety of sources, but always begins with forming a relationship.

After building his own software company, Technology Development Corporation, Frank Greene (BSEE ’82) left to found New Vista Capital. As a privately owned Small Business Investment Company (SBIC) in partnership with the federal government, New Vista targets socially or economically disadvantaged entrepreneurs.

“Because we are in Silicon Valley with so many other venture capital firms, you might ask, why do you need to start one more?” says Greene. “My best answer is that there are whole communities of people, especially women or minorities in general, who often do not have access to some of the more traditional venture capital firms. This is still a very relationship-oriented business.”

“You need an introduction and a not a mass mailing,” agrees Boyle. “Each day I receive two to four business plans and most of them are unlooked. Even if nobody on the team knows a venture capitalist, you must be creative enough to find a way to get a personal introduction and leverage it.

“Then show me a compelling business plan. Is there something really exciting? Is this someone who is likely to be really successful, or technology that is very proprietary, or a market that is taking off? I need to get excited about it because I’m betting not just my money but also my time.”

Twice as Much Success

Purdue Vs. Peer Institutions

The number of start-up companies formed in 2003 based on university-licensed technologies is shown in the chart at right. Five companies were started the previous year at Purdue.

The increasingly entrepreneurial-friendly environment at Purdue shows in statistics from the Office of Technology Commercialization (OTC). In 2003, OTC saw a doubling of the number of patent filings, a doubling in the number of start-up companies, and a doubling in the income derived from licensed technologies as compared to the year 2000.

In addition to organizing monthly forums and newsletters on entrepreneurship issues and working closely with research incubator facilities in the Purdue Research Park, OTC also works on that all-important step of linking start-up companies with interested venture capitalists.

The Purdue University School of Electrical & Computer Engineering

University of Michigan University of Illinois Penn State University of Wisconsin Cornell University Georgia Tech Purdue University

Number of Start-Up Companies
Entrepreneurship  continued

It’s not all win-win.

In this entire process,” says Bashir, “we need to think of making it a win-win-win situation—a win for Purdue, a win for faculty, and a win for the investors. The changing culture at Purdue points to a recognition that starting companies requires a partnership of common interest rather than a conflict of interest.”

Although the University is not a commercial lab, ECE is interested in moving technology with broad commercial appeal into society. More high-tech companies coming from the campus means more job opportunities available for spouses of Purdue faculty and staff. Graduates will have more job opportunities in the area, and students will have more internship and co-op opportunities. Faculty interested in entrepreneurship can stay in the area. The community becomes more economically diverse. With great brains and technology, easier licensing policies, and a thriving network of supportive alumni, Purdue and ECE can economically diverse.

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An EPIC Time for Entrepreneurs

Purdue University’s innovative Engineering Projects in Community Service (EPICS) program is nationally recognized for its teams of undergraduate students that partner with local community service agencies to identify and solve engineering-based problems in the community. Already overwhelmingly successful, EPICS is adding a new dimension of partnership: the EPICS Entrepreneurship Initiative.

Launched in 2001, the new initiative formalizes a partnership with the Krannert School of Management through Discovery Park’s Burton Morgan Center for Entrepreneurship. Under the $600,000, three-year provision, students explore entrepreneurship through workshops and with MBA students in the Innovation Realization Laboratory to gauge the commercial potential of EPICS products. Many EPICS MBA teams prepare business plans and design commercial grade prototypes for the Burton Morgan Entrepreneurship Competition. Historically, EPICS projects finish well in the competition: an automated locker opening device for disabled students placed first in 1997 and the ‘Hold Your Head High’ training device for children with cerebral palsy placed fourth in 1999.

‘What is required,” says Bill Elmore (BSEE ’75, MSEE ’76), entrepreneur and founder of Foundation Capital, “is a collection of great brains and great technology, which an engineering university like Purdue has.”

“In this entire process,” says Bashir, “we need to think of making it a win-win-win situation—a win for Purdue, a win for faculty, and a win for the investors. The changing culture at Purdue points to a recognition that starting companies requires a partnership of common interest rather than a conflict of interest.”

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NESEPs Reunite at Homecoming 2002

Homecoming 2002 brought together a hearty group of Navy Enlisted Scientific Education Program (NESEP) alumni, wives, widows, and friends to catch up, reminisce about the good old days, and remember those no longer with us. Through the NESEP program, initiated in 1958, a select group of U.S. Navy enlisted personnel attended Purdue as part of their training to become highly-skilled technical officers.

Approximately 500 students graduated from Purdue through the program, and the participants formed lasting bonds that survived a lifetime.

“There was so much that we had in common, to much that set us apart, for the full four years we attended Purdue, that when we graduated, we knew each other very, very well and could attribute much of our diploma to the help and encouragement of this family of sailors and marines,” says Paul Brodeur (BSEE 1967, MSEE 1968). “Our reunions are family reunions, and Purdue’s ECE is our family’s hometown.”

A bronze plaque hangs in EE and commemorates NESEP participants. The plaque reads: “In honor and memory of the men of the NESEP program. This plaque is dedicated to the men of the Navy that served their country, and following their service, led U.S. industry to the forefront in the fields of electronics and computing.”

Several NESEP alumni are working to establish a scholarship for Purdue ECE students to memorialize all NESEP participants. “NESEP at Purdue is now history,” says Brodeur. “A piece of history that will be forgotten and lost if a concerted effort is not made to keep it alive. I believe most NESEP sailors and marines are extremely proud of their time at Purdue and extremely thankful for the risk that Purdue and the Navy were willing to take in accepting them into a college program. In many, many cases, those were not small risks.”

The NESEP alumni are hoping to meet at three-year intervals in the future. The next planned reunion is during homecoming 2005. For more information about NESEP, check out the Web site at www.nesep.com.

James C. Anderson

With over two decades in venture capital, Jim Anderson (BSEE & MSEE ’72) has watched, coached, and participated in the nurturing of hundreds of early-stage companies, helping develop them into industry leaders. He is the founder of Legacy Venture, Foundation Capital, and Merrill, Packard, Anderson, and Eyre.

In a scenario where the arts and engineering come together, Anderson says of his motivation to attend Purdue, “Marching in a high school band behind the Purdue band at the Rose Bowl is what got my interest rolling for attending Purdue. When I learned that you could play in the Purdue band as well as learn from one of the leading engineering schools in the nation, I was hooked!”

Anderson recalls, “Fred Mowle was one of the most influential professorial contacts I made at Purdue when he pushed me into engineering schools in the nation. I was hooked!”

Anderson began his career as a microprocessor designer and quickly moved into venture capital. As managing partner of Foundation Capital, Anderson helped develop high-end microprocessors. His influence continues through his role as chairman of the National Venture Capital Association and the National Venture Capital Association Foundation, a nonprofit organization that awards scholarships and supports educational programs for venture capital professionals.

Anderson says that technology is key to the continued growth of the United States. “The role of venture capital is to provide the capital necessary for companies to grow.”
in my career as I moved from engineering to management, to the venture capital arena as it was growing itself on the West Coast.” At the peak of his venture career, Anderson was shaken by a medical crisis that put him in touch with the realization that there was more to life than his success as a venture capitalist. “As a result, I spend most of my time and energies with my newest creation, Legacy Venture, a new venture vehicle designed to encourage high-impact philanthropy through a unique venture investment structure and style combined with collaboration and entrepreneurship. Early activities have largely focused on bonding participants with medical research, schools, and the environment.” As Legacy Venture’s founder and idea generator, Anderson has focused on getting the power of Silicon Valley reenacted on the philanthropic arena. He has often stated that, “The skill set for philanthropy and venture capital are very synergistic with the simple addition of some care, refined listening, and a realization that philanthropic problems are often much more difficult than those in the venture arena.”

As a past president and director of the Western Association for Venture Captains, as well as a director of the National Venture Capital Association, Anderson has seen the venture industry in Silicon Valley evolve from an early stage activity to a sophisticated wide-ranging generator, Anderson has focused on getting the power of Silicon Valley more to life than his success as a venture capitalist. “As a result, I spend more to life than my wife even before our marriage.”

Looking back on his time at the Purdue campus, Anderson says, “Following areas of passion has served me well throughout life, and the experience at Purdue with the people, the school, and the Midwest environment has had lifelong implications. Perhaps the most important element of the ‘educational experience’ was out of the classroom, in simply bonding with people across a range of backgrounds, where learning the elements of thoughtful cardor and team building was more important than any one class or technical educational experience.”

Barry Epstein

Barry Epstein (BSEE ’89, MSIE ’93) is the founder and president of Technology 21, Inc. and the retired founder and CEO of Current Technology, Inc. In 1973, Epstein founded Current Technology, Inc. in a space smaller than a garage. “Picture a small cloister with a water heater on the left, a pull-down attic staircase overhead, a workbench on the right, and space in the middle for a chair,” recalls Epstein of the cramped space where he developed and constructed the first Power Siftor®. The company soon expanded 800 percent to a modest shed, affectionately known as the “Penthouse.” Financed entirely from medical research, Epstein lists three standouts: Power Siftor® on the right, and space in the middle for a chair,” recalls Epstein of the cramped space where he developed and constructed the first Power Siftor®. The company soon expanded 800 percent to a modest shed, affectionately known as the “Penthouse.” Financed entirely from the medical crisis that put him in touch with the realization that there was more to life than his success as a venture capitalist. “As a result, I spend most of my time and energies with my newest creation, Legacy Venture, a new venture vehicle designed to encourage high-impact philanthropy through a unique venture investment structure and style combined with collaboration and entrepreneurship. Early activities have largely focused on bonding participants with medical research, schools, and the environment.” As Legacy Venture’s founder and idea generator, Anderson has focused on getting the power of Silicon Valley reenacted on the philanthropic arena. He has often stated that, “The skill set for philanthropy and venture capital are very synergistic with the simple addition of some care, refined listening, and a realization that philanthropic problems are often much more difficult than those in the venture arena.”

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His latest venture is Technology 21, Inc., a company he founded in 1994 that offers consulting and patent development of computer, power, and communication applications. “Engineers are blessed with the opportunity to contribute to society and pursue a variety of career paths,” says Epstein. With this conviction, he has combined a lifelong enthusiasm for engineering with a dedication to community service. “Both my wife and I have enjoyed being a part of and going back to the community,” Epstein says. He is most fond of a community service program he developed at Current Technology, Inc. Employees were encouraged to volunteer at non-profit agencies at the company’s expense. One employee teamed with a young woman suffering from severe cerebral palsy; their relationship continued for many years.

Epstein was a member of Sigma Alpha Mu fraternity while on campus and appreciates the opportunities that arose from friendships that formed as a result of that association. He stays involved with the fraternity by serving as a trustee for the Sigma Alpha Mu Foundation and by funding an annual scholarship that gives preference to SAM engineering students at Purdue. Epstein and his wife, Paddy, enjoyed beginning their married life at Purdue during his last semester of graduate school. They are involved in many of the same community organizations, and both have served as president of Temple Shalom. They have two married sons, Robert, whose wife is Susan, and Bradley, whose wife is Brooke, and six grandchildren. Visiting with their family is an activity they enjoy very much.

Epstein credits former professors and his Purdue education with motivating him to set as his professional sights high. “I led forever indebted to former professors George Cooper and John Hancock, who have also received this award, not only for what they taught, but also for the outstanding examples they set for all of us,” says Epstein. “The Purdue engineering education continues to benefit me in ways I would have never imagined. The benefits of being taught how to think, identify problems, and solve problems extend far beyond the engineering lab into virtually every aspect of life.”

Charles ‘Jack’ V. Jakowatz, Jr.

The first day Charles ‘Jack’ Jakowatz, Jr. (BSEE ’72, MSIE ’73, PhD ’76) arrived on the Purdue campus, a faculty member told him, “When you graduate from this institution four years down the road, you’re going to have a big permanent ‘block P’ stamped on your forehead—because wherever you go across this country or elsewhere in the world, when you tell people that you are a Purdue University graduate, they will instantly both respect you and expect much of you.”

Jakowatz joined Sandia National Laboratories in Albuquerque, New Mexico, in 1976 shortly after receiving his PhD from Purdue. Today he is manager of the Radar Signal Processing Research Group, a 12-person research and development team. His current personal research interests are in the areas of analytical and applied signal processing for SAR and SONAR, including phase error correction and interferometry.

Looking back over his engineering career, Jakowatz says, “I can identify four guiding principles that helped me gain whatever measure of success I have achieved. They are: 1) Spend most of your time trying to ask good questions. Even though good answers are necessary, all important truths are eventually framed in questions. Besides, it’s fun to
be the person asking the hard questions. 2) Say hungry—every day try to think about something you haven’t contemplated before, or think of an old idea in a new way, or debate one of your thoughts with somebody new. When you’re no longer hungry for truth, you’re pretty much done.

3) When you think that you can’t win at something, remember that hard effort can almost always overcome a lack of natural ability. Gifts are good, but hard work is better. 4) Have a thoughtful position on a few really critical issues. That’s a lot better than half-baked opinions on everything.

His passion for education led him to serve as adjunct professor in the College of Engineering at the University of New Mexico at Albuquerque from 1978 to 1985. In 1994, he founded and became managing partner of SAR Education Associates, a small company dedicated to teaching modern imaging radar technology via short courses.

Jakowatz is widely recognized for his many achievements in signal processing. In 1990, he was a joint winner of the R&D 100 Award for the invention of a radar processing methodology known as Phase Gradient Autofocus. He is the author of Gradient Autofocus. His work was cited for its advance the use of synthetic aperture radar. His research and teaching contributions include a wide range of subjects in signal processing, imaging, ultrasound, sensor array processing, and wireless communications. “As a mentor, I am, of course, indebted to the contributions of my former students and am proud of their professional accomplishments in academia and industry.”

Kaveh was elected to the status of Fellow of IEEE for his work in the area of diffraction tomography, a technique he and colleague Rolf Mueller developed for ultrasonic imaging of soft tissue. He was awarded the 2000 Society Award by the IEEE Signal Processing Society for work in the area of statistical array processing.

Kaveh and his wife Carol, a 1969 Purdue graduate with a BA in business administration, have career aspirations of their own, people who want to succeed. Her answer is, “In my mind, my success has very little to do with where I work or what I do. Kaveh is commonly asked is how being a woman has impacted her ability to succeed. Her answer is, “In my mind, my success has very little to do with where I work or what I do. Kaveh’s research and teaching contributions include a wide range of subjects in signal processing, imaging, ultrasound, sensor array processing, and wireless communications. “As a mentor, I am, of course, indebted to the contributions of my former students and am proud of their professional accomplishments in academia and industry.”

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Kaveh and his wife Carol, a 1969 Purdue graduate with a BA in French Language, have two children. Their daughter, Ana, is a biologist and program supervisor of the Human Body Gallery at the Science Museum of Minnesota. Their son, Dari, will be a freshman this year at the University of Minnesota. When recalling his Purdue experience, Kaveh says, “The genius of American higher education has been its welcoming attitude and the opportunities it has provided to students and scholars from around the world. Science and engineering have been particular beneficiaries of such an intellectually stimulating yet, and industry has thrived from the resulting creative and entrepreneurial diversity. This global meeting of minds is worth celebrating and supporting.”

Catherine E. Kozik

“As a senior executive, many people ask me if I still use my engineering degree,” says Catherine Kozik (IEEE ‘82), chief information officer and senior vice president of Tellabs Global Information Systems. “Was it ‘worth it’ to put in all of that hard work in college? My answer is, ‘Absolutely!’ I practice engineering every day—solving complex multidisciplinary problems is a cross of any position in industry today. The education that I received at Purdue taught me how to find the right resources and the right tools to solve problems in most effective and efficient manner.”

Kozik is responsible for strategically managing the information technology that serves Tellabs’ business operations in more than 80 countries; for the development and support of the company’s global business applications, including the SAP R/3 software; as well as worldwide support of Tellabs’ voice and video services. WANG, WANA, desktop PC, and UNIX systems.

She has learned that a Purdue engineering degree is a ticket to instant credibility wherever you go in the world. “A Purdue engineering degree says that you have the capacity to learn and respond to difficult challenges. It says that you have the hope to make the right decision (after all, you chose Purdue, right?).” It says that you come from a long line of successful people, and that you have been treated by the best. It also says that you have what it takes to be successful in business—you know how to work as a part of a team, you know how to manage deadlines, and you know how to prioritize (let’s see—no party or study?).”

Kozik, the first person to be named CIO with Tellabs, is a passionate supporter of women in the engineering profession. She frequently speaks to organizations such as the Society of Women Engineers and Chicago Women in Technology. One of the questions she is commonly asked is how being a woman has impacted her ability to succeed. Her answer is, “In my mind, my success has very little to do with being a woman, and everything to do with being a human being. You have to remember that no matter how far you move up in the organization, it’s people who get the job done, people who have families, who have career aspirations of their own, people who want
A. Stephen Morse

Morse is widely recognized in his field and is the recipient of numerous awards, including Best Technical Paper for a paper presented at the 1970 Joint Automatic Control Conference with W. M. Wonham, a 1992 Purdue postdoctoral fellow. The paper, entitled “Decoupling and Pole Assignment in Linear Multivariable Systems: A Geometric Approach,” was recently cited by the IEEE Control Systems Society as one of the 25 most influential papers published in the field of automatic control in the twentieth century. He is also the 1999 recipient of the IEEE Technical Field Award for Control Systems, an award that is the most prestigious form of recognition one can receive worldwide for research contributions to the field of automatic control, and he was among 74 new members elected to the National Academy of Engineering Research Center (ERC) with mechanical engineers, industrial engineers, and electrical engineers. This gave him the opportunity to integrate the many different engineering studies into integrated technology. “Although the fields are from very different backgrounds, the possibility of uniting and finding the various areas into something that is possible was a remarkable experience,” Morse says of the project. “To have had the opportunity to apply our theoretical knowledge and apply it to a real-life industry practice was a learning experience I will not forget.”

“Automatic control has been called both the ubiquitous technology and the invisible technology,” Morse says. “It is needed to keep a huge number of things running smoothly, but only when its failure does its job do people become aware of its existence. Automatic control also regularly wins the U.L.T. (least understood technology) award. Ask any control research what his parents think he does for a living. Ask any control faculty member what his dean thinks he does for a living. Ask any control researcher what his parents think he does for a living.”

Hyodae Park

Park returned to Korea and continued to do research development and sales management at Samsung Corporation where he was head of the Computer-Aided Engineering (CAE) Center. In 1993, he moved to Samsung SDS as head of the Research and Development Department. Upon leaving Samsung, he founded and established 5-Net Systems in 1999, a soft solution network and customized service company which has grown to be the second largest network integration company in Korea.

“The role of the engineer is much greater than we realize in setting the standards of the IT industry and the business world in general. Thus, in their early education, engineers should focus on communication and management skills.”

“With a strong basic foundation, building and growing the company will be a challenge I look forward to achieving.”

Reflecting on the importance of educational experience, Dr. Park says, “In depth, academic studies are important. However, communication skills and understanding of related technology are more important for success in the business world. Acquiring and developing ‘fusion technology’ in the business area that you are in is critical in the progress and expansion of your career path. Incorporate others’ experiences as well as your own knowledge base to create a synergy effect. It is important to continuously invest and upgrade your individual growth by building up your people-related communication and management skills.”

“Boilermaker Pride has always been very strong with me,” Park says. “I believe the role of the engineer is much greater than we realize in setting the standards of the IT industry and the business world in general. Thus, in their early education, engineers should focus on communication and management skills.”

Hyodae Park (PhD ’96) received his BS degree from Seoul National University in 1979, before coming to the United States. During his doctoral studies at Purdue, he was placed in a joint project in the Engineering Research Center (ERC) with mechanical engineers, industrial engineers, and electrical engineers. This gave him the opportunity to integrate the many different engineering studies into integrated technology. Although the fields are from very different backgrounds, the possibility of uniting and finding the various areas into something that is possible was a remarkable experience,” Morse says of the project. “To have had the opportunity to apply our theoretical knowledge and apply it to a real-life industry practice was a learning experience I will not forget. Especially with the guidance of D. R. Mitchell (who always had a smile), the learning experience at Purdue was enjoyable and irreplaceable.”

Park and his wife, Insook Hur, have two children, a son, Christopher, who will begin his bachelors year at Westminster College in Missouri this August; and a daughter, Elizabeth, in ninth grade. “Boilermaker Pride has always been very strong with me,” Park says. “It is evident by his participation as the current president of the Purdue Electrical Engineering Korean Association, which has over 50 members, and his advisory position in the Purdue Korean Student Association, which has over 400 members.”
1949
William Reynolds Harper (BSEE '49), although retired, is owner/consultant of WEH Associates and is very active. In addition to traveling extensively to work on various patents and papers for design, development, and marketing, he is executive director for Litton Industries and serves the intelligence community in designing equipment and developing special applications. His consulting activities include Collins Radio Company (Rockwell International), United Aircraft (Industries), S-Systems, Incorporated (Raytheon), AVION Corporation, and J.E. Group Corporation, among others.

1952
Robert C. Tucker (BSEE '52) retired and living in San Diego, California, had left hip replacement surgery.

1953
Eugene Sonney (BSEE '53) is an application engineer for calco Industrial Electronics in Mankato, Michigan.

1962
Robert A. Song (BSEE '62) is ‘effectively’ retired. He works part-time as a specialist on computer system interfaces. At 70+, he still quite working if it stops being fun.

1963
Max Kobleng (BSEE '63) lives in San Jose, Costa Rica.

1966
Donald A. James (BSEE '66), retired, has 13 U.S. patents in the Seagate Technology Hall of Fame, and lives in Oklahoma City, Oklahoma.

1969
Ronald E. McDougall (BSEE '69) is a bouncy retiree and lives in Stamford, Connecticut.

1971
J. Harold Grossman (BSEE '71) is an electrical engineering consultant performing network security, state machine programming, and systems design for water/wastewater plants. He resides in Orlando, Florida.

1977
Ronald T. Taylor (BSEE '77, MSEE '74) is president of Rangers Consulting and chief designer at Bifrost Technical Solutions in Grapevine, Texas.

1980
Randall J. Higg (BSEE '80) is staff engineer of IC design for Tall Timbers Logic in Evansville, Indiana.

1987
Dr. Small lives in Henderson, Nevada. Ronald L. Taylor (BSEE '73, MSE '74) is president and chief designer at Bilbost Technical Solutions in Grapevine, Texas.

1988
Fred Stephan (BSEE '88) is president and CEO of GE Lighting Systems in Henderson, North Carolina.

1990
Charles J. Alajajian (BSEE '90) is Visiting Associate Professor of Electrical and Computer Engineering at West Virginia University Institute of Technology.

1994
Jack W. Reisinger (BSEE '94) is retired and lives in Bloomington, Illinois.

1996
Bill Ballard (BSEE '96), retired, is a member of the Board of Directors. He works for Boeing Aircraft, who worked for 20 years on a B-B-1 Bomber Program. He resides in Los Angeles, California.

1999
Kurt Eisbrenner (BSEE '99) is an electrical engineer in the software development division of NAPA.

2000
Ramiro A. Ramirez (BSEE '72, MSEE '79) works for the U.S. Army Reconnaissance Office in Chautilly, Virginia.

2003
Larry F. Cracraft (BSEE '64, MSEE '75) lived in Seattle, Washington, with his wife Margaret.
Alumni Tell It Like It Is in EE 400 Senior Seminar

Each semester alumni from all over the country and from a variety of companies and industries speak to students in EE 400 Senior Seminar about technical and non-technical opportunities the graduating electrical and computer engineer may encounter.

For students, it’s an opportunity to hear pearls of wisdom delivered from the front lines of the working world.

For alumni, many of whom took the same course, it’s a golden opportunity to come full circle; to return to campus, stand on the other side of the desk, and tell it like it is—from their point of view.

“Purdue EE 400 seminar is a great environment for graduating electrical engineers to get exposure to broad industry experiences,” says Jim Bender (BSEE ’76). “The speakers are well-qualified and well prepared to inform our students about technical and non-technical opportunities the graduating electrical and computer engineer may encounter.”

In March 2003, Jim Bender (BSEE ’76, MSEE ’77) spoke to the EE 400 Senior Seminar on ethics in engineering. Bender, business services manager for the DLPtm Products Business Unit at Texas Instruments, made the course ten years ago and has become a favorite EE 400 presenter.

ECE wishes to thank the 2002–2003 EE 400 Senior Seminar presenters. Many of the speakers were Purdue alumni, including:

- Tom Arnie (BSEE ’80, MSEE ’83)
- Jim Bender (BSEE ’76, MSEE ’77) Texas Instruments
- Scott Bartlett (BCSE ’91) Bank One
- Greg Cox (BCSE ’93, MSEE ’91) Motorola
- Frank Crone (BCSE ’82) New Vista Capital
- Ron Hess (BSEE ’63) Consultant
- Don Hubbel (BSEE ’65) Barnes & Thornburg
- Rob Kishenofsky (BSD) Enterasys Networks
- Cathie Kozik (BSEE ’82) Tellabs
- Rick Kosdrosky (BS Interdisciplinary Engineering ’76) Lockheed Martin
- Tony Andric (BSCEE ’88) AMD
- Amy Noah, Manager of Corporate Relations, at (765) 496-3338 or arnoah@purdue.edu.
2002–2003 Fellowship, Scholarship, & Award Winners

STUDENTS

Departmental Merit-Based Scholarship Recipients

3M Scholarship: Raymond Baxter
Karl H. Bollenback Memorial Scholarship: Matthew Makowski
BP Amoco Scholarship: Evan Brownlow, Brian Hicks
Caterpillar Scholarship: Hengin Cho, Quinn Kirch, Timothy Norwood, Brandon Rigg, Gregory Springer
CISCO Scholarship: Aaron Ault, Tracy Wells
Class of 2002 Scholarship: Taran Shahani
Convergys Scholarship: Michael Doney, Louisa Salem
Dorothy Diggin’s & Albert Wiggins Scholarship: Jason Meldena
Prof. El-Abiad Scholarship: Raymond Baxter, Jason Kading, Chet Hao Lin, Michael Newman, Edward Susanto
Fessenhen-Trott Scholarship: Christopher Cox, Sean Duff, Mark Harris, Dimitris Karabinis, Brian McCammon, Chris Rodgers, Blake Stroser, Jennifer Tutt
George Hollister Scholarship: Scott Brock, Michael Burton
Charles & Anna Holder Scholarship: Landa Huffman, Peter Raymond, Matt Willey, Douglas Young
International Foundation for Telemetering: Peter Richmond, Matt Willsey, Douglas Young
Landis Huffman, John Byerly, Raid Habayeb,

Other Scholarships and Awards

Ela Kappa Nu Outstanding Sophomore Award: Jacob Schröder
Ela Kappa Nu Outstanding Junior Award: Chad Lau
NSF/CGE Scholarship: Raymond Baxter, Hengin Cho, James Fubs, Sjd Raghunathan
Purdue Student Engineering Foundation
Outstanding Senior Award: Adam Solomon
Purdue Student Engineering Foundation
Outstanding Graduate Student Award: Elita Suryak

Fellowship Recipients

Andrews and Birch Fellowships: Shihan Xiao, Kirk Meran, Ethan Schuchman, Qiaoting Xiao
Andrews and Mary I. Williams Fellowship: Troy Johnson
GAANN Fellowship: Jason McInney, Arthur Mills, Cory Prust, Kirk, Jason Riley, Petra Robinson, Aaron Walker, Jessica Young, John Andrews, Samantha Banker
GE-Faculty for the Future (GFF) and Mary I. Williams Fellowships: Ingrid Lin

GEM and Boeing-McDonnell Douglas Fellowships: Courtney Amos, Shuddick Bessen, Brandon Cassimere, Brant Cassimere, Mercedes Lorenzo
GEM and RCA-Zworykin Fellowships: Tracy Brown, Patrick Carpenter, Chanson Jones, Paul Kirby, Carol Smith, Tommy Wlker
IEET Fellowship: James Cafe, Benjamin Loop, Brian McInnery
Intel Masters Fellowship: Ameer Schlosser
Intel PhD Fellowship: Sang-Min Park, Anil Arjand, Mark Batark, Prachi Dung, John Fischer, Ruzheh Jazayeri, Yan-Chung Lee, Pablo Navarrete Michelini, Haadi Wani, Ansond Jyer, Jatip Raychowdhury, Kevin Robbins, Iber Saygin, John Young, Sayred Saluddin
NSF Fellowship: Brandon Blondi, Parul Kapoor
NSF/GIF Fellowship: Ruck Kennelly, Greg Freul
Purdue and Mary I. Williams Fellowships: Alberto Vega, Ross and Mary I. Williams Fellowships: Luke Ince, Zhilang Jiang, Syunnaga Koswara, Hong Li, Wan Luang, Anthony Martone, Adelighe Adebiyinka, Najaun Ben, Mutah Sentel Special Initiatives and Birch Fellowships: Juan Pernierra
SRC Fellowship: Cassandra Crotty Neau
SRC Fellowship: Nakam Sirisantana
Whitaker Fellowship: John Brandon Laffin

For the same year, 42 graduate students received fellowships, including new awards and renewals, for a total amount of approximately $1,381,000. In addition, 120 teaching assistantships and 190 research assistantships were awarded. ECE enrolled a total of 496 graduate students as of the fall 2001 semester. Some graduate students received multiple awards.

ECE Student Support
工业联盟项目——连接工业界和ECE

过去二十年，ECE工业联盟项目（ECEIAP）已成为ECE校园活动与外界的桥梁。随着项目的不断增长，该项目为ECE学院的学生、教师和员工提供了有意义的和相互受益的合作伙伴关系。ECEIAP项目最近被重新构想，以提供给企业更多的参与选择。在新体系下，项目结构化地分为三个会员级别：银级执行会员、金级执行会员和铂金级执行会员。

ECEIAP项目的另一半年度会费用于管理项目、主办奖学金颁奖晚宴、支持企业的招聘需求以及支持学院的年度活动。

除了增加公司的校园能见度，成员还参与奖学金颁奖晚宴、举办企业论坛和信息会议，并与ECE学院的教师和员工建立长期的合作伙伴关系。成员公司有优先权向ECE学生演讲（参见相关文章在第43页），获得使用ECE学院的显示柜的使用权，并在ECE出版物和EE实验室中获得认可。

另一个好处是增加了招聘帮助。成员在ECE学生实习、兼职和全职招聘活动中获得帮助。通过持续的年度支持，公司开始建立一条人才管道。为了更多地了解工业联盟项目的信息，可以联系Amy Noah，公司关系经理，电话（765）494-3538或arnoah@purdue.edu。

ECE感谢2002-2003年度工业联盟项目成员：
- Advanced Micro Devices
- BAE SYSTEMS
- Cisco
- Hewlett-Packard
- Kimberly-Clark Corporation
- Lockheed Martin
- Lucent Technologies
- Motorola, Inc.
- Raytheon
- Tektronix
- Texas Instruments
- TyCom Laboratories
GAAN Fellowship Recognizes McKinney as Future Educator
by Lillie Fisher

Jason McKinney, the recipient of a Graduate Assistantship in Areas of National Need (GAANN) Fellowship, believes that a research university, quality teaching should be given as much importance as quality research. McKinney says, “I see the role of teaching as too valuable to give students the knowledge base necessary to be a technically competent engineer and also to communicate to them that engineering is a fascinating and enjoyable field.” The GAANN program, funded by the U.S. Department of Education, International Education and Graduate Programs Service, provides graduate fellowships to students with excellent academic records, who demonstrate financial need, and plan to pursue the highest degree available in their course of study. ECE selects the recipient and provides a teaching experience in an undergraduate program. The grant covers tuition, fees, stipends, travel, and research expenditures.

“I am honored to have received this fellowship in recognition of my teaching skills and potential as a future educator. Teaching experience gained through the GAANN program has allowed me to develop these skills further and has been invaluable to me in working toward becoming an effective educator,” McKinney says. His research is in the area of ultrahigh optics and arbitrary electromagnetic waveform generation, with applications to optical and radio-frequency communication. As a research assistant, he is conducting experiments in optical pulse shaping and arbitrary waveform generation. His teaching interests are Basic and ElectroFiber optics, Ultrafast optics, Electromagnetics, and Solid State Devices.

McKinney, who was also inducted into the Teaching Academy in the fall of 2001 says, “Academically, in addition to my research, one of the best experiences I've had was teaching a section of our undergraduate electromagnetics course with my friend, and fellow GAANN recipient, Art Mills. I think this experience ranks among the most enjoyable and beneficial I've had here at Purdue.” Because of his outstanding teaching ability McKinney has received previous awards, including the Purdue Graduate Student Award for outstanding teaching in 1999–2000 and the Eiren H. and Vashiti L. Magson Award for outstanding work as a graduate teaching assistant in the 1998–1999, 1999–2000, and 2000–2001 academic years. As for future plans, McKinney says, “Ideally, after spending several years in a non-academic research position, I intend to return to academia as a faculty member, predominantly as an engineer and educator. I hope to contribute a great deal through my own research work and through the education of others.” Considering non-academic experiences at Purdue, he lists meeting his fiancée, Amanda, and playing in a band for several years among the best of all experiences.

Duff and Harris Win Prestigious Fessenden-Trott Scholarship
by Lillie Fisher

Sean Duff and Mark Harris are two of the most recent recipients of the Fessenden-Trott Scholarship, the most outstanding of the ECE scholarships awarded at Purdue. The scholarship is a four-year award of $6,750 per year, which covers tuition and fees. Each year there are two new recipients plus six renewals of the upperclassmen. The scholarship is funded by the Fessenden Trust and named for Professor Reginald Aubrey Fessenden and his wife, the late Helen May (Trott) Fessenden. Fessenden, the first professor of electrical engineering at Purdue, conducted experiments in 1892-1893 that led directly to wireless transmission of the human voice and music. Both Duff and Harris say the Fessenden-Trott Scholarship made it possible for them to attend Purdue.

Duff, who was a member of the President’s Leadership Class as a freshman, is on the Dean’s List and has received semester honors and has served as a Peer Mentor for Engineering 104 and president of the Gamma Alpha Chapter of Phi Sigma Pi National Honor Fraternity. He also received the A. F. Welch Memorial Award. Duff, a junior from Middletown, Ohio, counts as his highest honor being selected as the chair of the Student Orientation Committee, the student group that helps coordinate all orientation programs at Purdue; the Boiler Gold Rush being the largest event. He hopes to attend graduate school; in addition, he and his brother have a dream of someday owning a microbrewery. He says of the Fessenden-Trott Scholarship, “It means a lot to me, I have been able to concentrate more on my education than my bank account. I am very grateful for this assistance.”

Harris, a senior in ECE, from Tomball, Texas, says, “The Fessenden-Trott Scholarship is what helped me make my final decision to attend Purdue.” Harris, who has assisted in lab work for IN Dix and has assisted the hardware design team at Compag, hopes to work on emerging and developing technologies. As a graduating senior, he is pursuing job opportunities with the government and with companies that work primarily with the government and the military. He says, “These jobs could allow me to work on projects that may benefit our nation’s security and defense.”

Harris, who also received the Gillies Morell Memorial Scholarship, has been on the Dean’s List and has received semester honors, and is a member of Triangle Fraternity, where he has served on the Board of Directors for two terms. He is also active in Eta Kappa Nu (ECE/Comp. Honorary), Golden Key International Honor Society, Purdue Society of Professional Engineers, and the Purdue Motorcycle Alliance. He’s also a huge football fan and has had season tickets all four years at Purdue. He hopes in the future to pursue an MBA and a master’s degree in engineering.

Criteria for the Fessenden-Trott Scholarship are strong academic record and promise, potential leadership qualities, noteworthy participation in extra-curricular activities, good moral character, and a financial need.
Wells Recipient of Three Scholarships

by Lillie Fisher

People often do a double take when they first hear that Tracy Wells’s hometown is Truth or Consequences, New Mexico. “Needless to say, it’s been an interesting topic of conversation on a lot of occasions,” she says.

The truth is that Wells, an undergraduate in computer engineering, is the recipient of three scholarships, the McDonnell-Douglas-Boeing Scholarship, an A.F. Welch Memorial Award, and, most recently, the Cacao Scholarship. Wells, whose major area of interest is VLSI circuit and logic design, has been on the Dean’s list and received Semester Honors each semester. Wells is also a Robert C. Byrd Scholar, a member of Eta Kappa Nu, and the Society of Women Engineers, and she participates in the M & M Mentor program for women in engineering.

A former co-op student with IBM, Wells graduated in May 2003 and plans to attend graduate school. “I think the most important experience I’ve had while at Purdue was being in the co-op program. I did five co-op terms with IBM in Austin Texas and Burlington Vermont and had a blast. I would recommend it to anyone who has the opportunity,” says Wells.

While with IBM, Wells co-authored a publication in the Journal of Solid State Circuits, helped break the world record for low voltage and low power performance in subthreshold logic, and helped patent low voltage low power circuitry for subthreshold logic.

“My supervisor had developed a circuit in which you could change the subthreshold voltages of the n and p wells, which were tied together. In this way, the voltage thresholds of the first could be altered, thereby allowing them to switch at a lower voltage,” she explains. “I was working with a ring oscillator that contained this kind of circuitry, and my task was to make it oscillate at as low a voltage as possible. The standing record was 100 mV, which had been obtained by my supervisor earlier in the year. I was able to sustain oscillations at about 64 mV, which was a very low-power circuit also, and would be used for things that do not need a lot of speed, but want to conserve power.”

Wells says the scholarship program has been extremely important to her during her years at Purdue. “I never realized how giving some people can be. Finances have been pretty tight for me, especially with out-of-state tuition, so the scholarships that I have received have been an amazing help.” Looking to the future, Wells says that if she’s given the opportunity, she hopes to contribute to scholarship funds in order to help other students obtain the education that they desire.

Fellowships Help Adewunmi Achieve Dream

by Lillie Fisher

“When choosing Purdue was the biggest decision I’ve had to make to date and I have no regrets,” says Adewunmi “Gbile” Adewunmi, recipient of both the Ross Fellowship and the Mary J. Williams Fellowship. Adewunmi family, originally from Nigeria, moved to Michigan so the children could get a better education. “I wanted to be an electrical engineer for a long while and wanted a school that was affordable and in the top ten. Purdue was the best.”

The fellowships Adewunmi received have been critical to his being able to attend college. “I am very grateful to those who provide those scholarships. I had to take out loans to supplement my scholarships as an undergrad, but it would have been too costly to do so for my graduate degree. These fellowships have made it possible for me to be in the position to help make other people’s dreams come true.”

As an undergraduate, Adewunmi served as chair of the ECE Senior Class Pledge Program Committee. That committee raised the most pledges of any school on campus during the Senior Face Off, Senior Pledge Program, amassing a pledge rate of 36 percent from the ECE senior class, compared to the overall university’s 11.4 percent. Of the experience, Adewunmi says, “The class of 2002 pledge program was a great opportunity for my class to give back to the school. It’s one of the things I am most proud of achieving here at Purdue. With the money raised, we were able to provide a scholarship for a student this school year. It was a lot of fun talking to my fellow students about this, and it made me think seriously about why every one should give back.”

The Mary J. Williams Fellowship is supported by an endowment established in 1981 by Mary J. Williams in memory of her parents, Grover M. Williams, BSEE 1908, and Grace M. Williams. The Ross Fellowship is a University fellowship administered by the graduate school.
ECE alumnus Victor H. Green (BSEE 49, MSEE 53) established the Victor H. and Helen T. Green ECE Scholarship for undergraduates in ECE. The $25,000 endowment will help support future students while honoring and memorializing his wife, Helen.

“Purdue is an outstanding school,” says Green. “As far as I’m concerned, my education at Purdue is what gave me the basis for everything I did in my life.”

Green worked in the aerospace industry in the areas of design, development, management, and new business development. He was an active member of the aerospace organization known as the National Security Industrial Association and served on some of its committees. He retired in 1986 after 37 years at the Hughes Aircraft Company. “I taught out with nothing,” Green says. He funded the bulk of his college education by working his way through school. The scholarship he received while pursuing his undergraduate studies was a little help. “I certainly hope that what he received while pursuing his undergraduate studies was a little help.

Green was a full time instructor on the EE staff while pursuing his MSE. He was also in the U.S. Army Reserve, and the pursuit of his MSE was interrupted when he was called up during the Korean War. Green experienced firsthand the sacrifices associated with military duty, for both the individual serving and for family members. “That’s why he hopes that qualified students who are children of gamers with active military service or Peace Corp experience apply for this scholarship.”

“He gave something up,” Green says of those who served. “It was a long time ago, but this is something to give back.”

The Greens have four children, eight grandchildren, and four great grandchildren.

Frank Greene ECE Scholarship

Frank S. Greene, Jr. (MSEE 62) has made a gift of $50,000 to endow the Frank Greene ECE Scholarship for undergraduates. The scholarship gives preference to minority and female students who qualify through the ECE Merit-Based Scholarship Program.

“I like what President Jischke is doing as far as trying to increase the amount of diversity within the student population,” says Greene. “I wanted to encourage that to continue.”

Greene entered college in 1936, just after the landmark Brown v. Board of Education ruling required desegregation of schools across America. After the ruling, Greene was not only able to obtain his undergraduate degree at a formerly segregated private school, Washington University, but he received a half-tuition scholarship. By the time he came to Purdue to pursue his MSE, he was a U.S. Air Force officer and had a full-tuition scholarship.

The financial assistance he received both at the undergraduate and graduate levels was a “tremendous help.” On the Air Force scholarship, tuition was paid and Greene received a housing allowance and monthly stipend. “I was relatively rich back in those days in comparison to other graduate students,” Green says.

The scholarship Greene endowed for ECE students is his way of giving back. “My general attitude is kind of like the golden rule: the more you give the more you get. I’ve gotten a lot in my life. I’ve had tremendous help from people. I would encourage people to think about that. Sometimes they’ll figure that they can’t give this much for one reason or another. My experience has been that literally the more I give the more I get.”

In the course of his life, Greene has taught electrical and computer science, served as assistant chairman of the Electrical Engineering Department at Stanford, completed a four-year tour in the U.S. Air Force, and founded three successful businesses. Currently he is founder and general partner at New Vista Capital. In 2002, Purdue awarded Greene the Distinguished Engineering Alumni Award and in 1999 the Outstanding Electrical Engineer Award. Greene received the Distinguished Engineering Alumni Award from Santa Clara University (PhD ’70) in 1965 and the Black Alumni Achievement Award from Washington University (BS 65) in 1991.

Michael and Sharen Schoendorf endowed a $20,000 scholarship for ECE students. “Each generation has an obligation to support the next one,” says Michael Schoendorf. “It’s vital that they do it.”

The ECE alumnus received a scholarship that covered most of his expenses after his first semester at Purdue and says that this is how he was able to increase such that you could recognize the value that the education had for you and where you are with it versus where you’d be without it.”

Schoendorf says that without the support of others, we as individuals and as a society would be far worse off. “If it weren’t for the work of others, I never would have gotten here,” he says. “Each generation has an obligation to support the next one. It’s vital that they do it.”

Schoendorf is retired after a productive 30-year career at Hewlett Packard. He says he was able to use the skills that he learned at Purdue to retire early and do what he wanted. These days he is very active in travel, sales, and home-remodeling.

ECE alumna Victor Green and his wife, Helen, at their home in Anaheim, California, in 1956. Green established a $25,000 endowed scholarship to help future ECE students while honoring and memorializing his wife, who passed away in 2002. Scholarship makes it easier for someone to get through who might not have otherwise.”

Green was a full time instructor on the EE staff while pursuing his MSE. He was also in the U.S. Army Reserve, and the pursuit of his MSE was interrupted when he was called up during the Korean War. Green experienced firsthand the sacrifices associated with military duty, for both the individual serving and for family members. “Thats why he hopes that qualified students who are children of gamers with active military service or Peace Corp experience apply for this scholarship.

“They gave something up,” Green says of those who served. “It was a long time ago, but this is something to give back.”

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The ECE alumnus received a scholarship that covered most of his expenses after his first semester at Purdue and says that this is his way of giving back. “Purdue basically put me through,” he says. “So, why shouldn’t I put somebody else through? “When you get out of school, you have an obligation not just to the university that educated you, but to society as a whole to pay back part of the education that wasn’t covered by the cost that you actually paid. Whether you give $5 a month or $10 a month, it should be something, and it should be a lifetime of giving. However small it is, it should be able to increase such that you could recognize the value that the education had for you and where you are with it versus where you’d be without it.”

Schoendorf says that without the support of others, we as individuals and as a society would be far worse off. “If it weren’t for the work of others, I never would have gotten here,” he says. “Each generation has an obligation to support the next one. It’s vital that they do it.”

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ECE alumna Victor Green and his wife, Helen, at their home in Anaheim, California, in 1956. Green established a $25,000 endowed scholarship to help future ECE students while honoring and memorializing his wife, who passed away in 2002.
Donald E. Knebel Scholarship

Donald E. Knebel (BSEE ’69), a longtime supporter of the School of Electrical and Computer Engineering, has made a gift of $150,000 to endow a merit-based scholarship for ECE students. A partner in Barnes & Thornburg, resident in the Indianapolis office, and a talented intellectual property litigator, Knebel has compelling reasons for endowing a scholarship.

“First of all, what I’m doing now is dependent upon having gone to Purdue and gotten a degree in electrical engineering,” he says. “My ability to attend Purdue was made possible by a scholarship from Lockheed Aircraft Corporation. I was growing up in the era of Sputnik when the country was challenging its students to go off and become engineers. I had an aptitude for mathematics and was encouraged to become an engineer. My parents could not really afford to send me to college.” The scholarship covered tuition, room and board, and provided him with a summer internship. “I’m not sure otherwise what I would have done, probably burned over the money or gotten some kind of grant, but the scholarship allowed me to go to Purdue. So I see the importance of scholarships to what I’ve done, and I know that scholarships are important to others’ opportunities,” he says.

Knebel’s scholarship is intended primarily for electrical engineers who intend to pursue a career in law. A path endorsed by Knebel, who graduated from Harvard Law School in 1974 and became a partner litigator. “There are great opportunities for engineers of any kind, in particular electrical engineers, in the legal profession,” he says.

“I want to encourage electrical engineers to at least consider those opportunities. Many legal problems require some understanding of the technology that is now pervasive in our society, they involve computer engineering technology and computer technology. Lawyers trained in computers and electrical engineering are better able to understand those problems.”

A native of Star City, Indiana, Knebel says he hopes the scholarship supports his home state. “I grew up in a small town in Indiana and went to Purdue. My parents still live there. That is to some extent why it’s so important to me to help improve the economy of the state. It’s important to me that qualified people continue to stay in Indiana and help maintain Indiana’s economy and take it to the next level, especially as it relates to an increase in technology within the state.”

The interest in boosting Indiana’s economy extends to the firm, as well. Barnes & Thornburg is very supportive of improving the technology climate of the state. The firm sponsors two seminars that are broadcast throughout Indiana each month, one supports life sciences, one supports broader technology. The firm also has been a founding sponsor of TechPoint, an organization that provides technology advocacy, economic development, and business services to Indiana’s technology-based firms and the companies that serve them. Knebel received a BSEE with highest distinction from Purdue in 1969 and worked from 1969 to 1971 as an electronics design engineer for Lockheed Aircraft Corporation. He received his J.D. magna cum laude from Harvard Law School in 1974, joined Barnes & Thornburg the same year, and became a partner in 1980. He is the litigation administrator of the firm’s Intellectual Property Department and co-chair of Tech, the firm’s Business and Technology Group. He has been listed in The Best Lawyers in America since the first edition in 1983.

A recent survey by Bloomberg, an English company, identified him as one of the most recommended lawyers in the world in the field of patent law. Barnes & Thornburg is the largest law firm in Indiana and one of the largest in the Midwest. More than 350 attorneys provide legal services to more than 11,000 international, national, regional, and local clients. A recent survey concluded that the firm was second in the United States in the number of patent cases filed on behalf of plaintiffs for the 2002–2003 academic year to Loulwa Salem and Michael Dorsey. Salem, a junior from Spring, Texas, is majoring in computer engineering. Dorsey, also a computer engineering major, is a sophomore from Madison, Indiana.

“Receiving the Convergys Scholarship was a big self-esteem and confidence booster,” says Dorsey. “It made me realize that hard work really does pay off. Now that I have this scholarship to back me up, I really do believe that I can accomplish all that is ahead of me.”

Salem concurs with her classmate, adding, “This scholarship played an important role in my academic choices. It confirmed my interests in my field of study. It also pushed me to work harder. I’m determined to end up with the best possible grades and experiences by the end of my college journey.”

Rebecca Face, director of college relations at Convergys, says the company believes it has a civic responsibility to help students prepare for their careers. “We want to give a jump-start to those students who are going the extra mile,” she says. “The students of today are the leaders of tomorrow. Those leaders of tomorrow are looking for us to reach out to them and help them make their way into the work force.”

There’s also an internal motivation to help those students excel Convergys, like all companies, have specific hiring objectives. Supporting students today helps ensure that tomorrow’s pool of new recruits is top-notch.

The company hopes to offer internships to scholarship recipients that would ultimately position a candidate to accept a potential offer of full-time employment upon graduation. That would bode well for the company, says Face. Employees tend to remember the support they received while in college. “Corporations rely on their employees,” she says. “We’re hoping that everything comes full circle at some point.”

Convergys is the global leader in integrated billing, employee care, and customer care services provided through outsourcing or licensing. Convergys serves top companies in telecommunications, Internet, cable and broadband services, technology, financial services, and other industries in more than 40 countries. It also provides integrated, outsourced, human resource services to leading companies across a broad range of industries.

Convergys employs more than 40,000 people at 60 customer contact centers and in data centers and other offices in the United States, Canada, Latin America, Europe, the Middle East, and Asia. Convergys is on the net at www.convergys.com and its world headquarters in Cincinnati.

Students a Jump-Start
Guest Editorial
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NASA Astronaut

Editor’s note: On February 1, 2003, the Space Shuttle Columbia and its crew of seven astronauts were lost in the Texas sky. As a country we were stunned, we mourned, and we waited as volunteers combed the countryside in search of clues that might tell us what went wrong. Inevitably, the tragedy brought to focus questions about the value of space flight, the risk to life, and the enormous cost. In our guest editorial, David Wolf, NASA astronaut and ECE alumnus, shares his vision of a future that is far better for the risks we take today.

Our vision is to make Earth a better place. It is the purpose of Purdue University. It is the purpose of NASA. Our crusade faces obstacles and risks, but the vision drives us to pursue a better world. The path forward may not be obvious or clear. There is no precise map into this brilliant future, and we choose our direction forward with limited resources. Judgment and experience are our friends. Our great universities and institutions (Purdue and NASA) serve to prepare and enable individuals to operate as teams calculated to achieve our vision. These are the behaviors that distinguish humans.

Let’s look ahead just one human lifetime, 100 years, and try to get a glimpse of this future vision:

- Cancer is prevented by advancements in molecular biology that correct the misbehaving cells before any damage is done. It was initially eradicated by precision-guided pharmaceuticals that recognize and destroy tumors while leaving healthy tissue fully intact.
- Replacement organs are “engineered” from a person’s own cells, so that rejection is not an issue.
- Mental remains sharp well through the expected 150 year lifespan.
- Purdue’s programs in nanotechnology, bio-engineering, and computing have merged into the neuro-engineering department. A graduate degree is available in tissue engineering. Aerospace engineering has undergraduate courses in regenerative life support systems used in most of the existing laboratories and manufacturing facilities.

Reflections continued

- Purdue developed the new propulsion systems and thermal insulating materials that made space travel safe and practical and helped humans reach Mars.
- Business models developed at Krannert incorporate most humans on Earth and allow a level of productivity that commits poverty to a memory.
- Humans control the weather and the climate. NASA global data have long ago resolved questions as to global warming and fostered development of the field of global climatic engineering.
- People will have dreams of a better future and still debate on the right way to get there. They look back compassionately on the early days of space travel when the methods were not clear. Tragedies and failures will occur as our quest continues to push the limits. Young people are still taught that it is the way we move forward from failure that is our measure of greatness.

There were 70 experiments conducted aboard Columbia, including an experiment on living samples of a prostate cancer, which appeared to have made a significant step forward. Humans will have the fortitude to go back and finish this and the other experiments conducted on this research mission. It will still be dangerous, but, because we are humans, it is not a choice after all. It is our nature to explore our way into the future and to make a better world.
“Buildings alone will not establish preeminence, but to remain at the forefront of invention and discovery, researchers must have the facilities that can house their laboratories and students and accommodate the changing requirements of a dynamic field.”

—Robert Pierret, ECE professor and assistant head for facilities, planning, and staff

The Campaign for Purdue–ECE officially began in July 2000 and will last until June 2007. ECE’s overall campaign goal is $128.4 million, $80.7 million of which has been earmarked for facilities: the new Nanotechnology Center, a new learning and discovery facility, EE and MSEE Building renovations, and equipment. The improved ECE infrastructure will accommodate pioneering technologies and research initiatives, an evolving curriculum that emphasizes team-learning, and growth in student enrollments and faculty size. Watch for an update on The Campaign for Purdue–ECE facilities goals in our next issue of Wavelinks.