BY TRUDY E. BELL

ALL THEM ELECTRONIC charts or electronic medical records: whatever the name, the days of patients' medical conditions and diagnoses being written illegibly on paper and stored in manila folders are numbered. Medical records, according to plans under way, are going electronic.

To help make that happen, the IEEE has joined forces with the American Medical Association and eight other major nonprofit medical and engineering societies to form an umbrella consortium, the Biotechnology Council. The council's primary goal is nothing less than standardizing everything from medical terminology to networking protocols so that medical records can be stored electronically and sent instantly anywhere in the world—with absolute privacy, security, and understandability.

In a few months, the first fruits of the Biotechnology Council's efforts—the council passed its first anniversary in November—will ripen. Its first technical conference, the Distributed Diagnosis and Home Health Care Conference on remote-monitoring technologies and policies, is scheduled for 3 and 4 April in Washington, D.C. The council also plans to hold a workshop on what it terms Bio-
The NEW IEEE Credit Card for U.S. Members

Choose the card that’s best for you:

With the exclusive IEEE Visa® Signature card, you’ll enjoy:
- No annual fee
- Low introductory rate on purchases and balance transfers for six months*
- No balance transfer fees for six months*
- No preset spending limit
- One point for every dollar spent. Redeem points for merchandise, gift certificates or unrestricted travel on any airline
- Concierge service, dining privileges and other Signature benefits

IEEE Visa® Platinum cardmembers receive:
- No annual fee
- Low introductory rate on purchases and balance transfers for six months*
- No balance transfer fees for six months*

The IEEE Travel Rewards Visa® Platinum card also gives you one point per dollar spent, redeemable for travel, merchandise or gift certificates.

Or choose the IEEE Cash Rewards Visa® Platinum card for up to 1% cash back on net purchases!

Students: Apply for the IEEE College Rewards Visa® card and earn 1 point for every purchase dollar, good for CDs, media rentals, movie tickets, electronics, restaurant certificates, and more.

U.S. Bank National Association N.A. is creditor and issuer of the IEEE Visa card.
* Certain conditions and exclusions may apply. Details will be provided when you become a cardmember. Introductory rate does not apply to cash advances.

Apply today at
www.ieee.org/fap
or call +1 800 853 5576 ext 8621
Medical Records: From Clipboard To Point-and-Click

BY TRUDY E. BELL

The IEEE has joined forces with nine medical and engineering societies to develop a standard system for storing patients' medical records electronically.

Adding Ethics To Engineering Education

BY WILLIE D. JONES

A touch of ethical principles is being added to engineering curricula, with the IEEE also helping to make students aware of their professional responsibilities as engineers.

A Year for Optimism

BY CLEON ANDERSON

Global prosperity through technological innovation shows that IEEE members have reasons to be optimistic about the future.
**NEW PRESIDENT-ELECT**

**LEAH JAMIESON**

LEAH H. JAMIESON has been selected the 2006 IEEE president-elect by members of the IEEE. She will begin serving as IEEE president on 1 January 2007 (pending acceptance of the Teller’s Committee election tally report by the IEEE Board of Directors, which was to take place in mid-November). Jamieson is the second woman to be elected president of the IEEE; Martha Sloan held the office in 1993.

Jamieson, an IEEE Fellow, is the Ransburg Professor of Electrical and Computer Engineering, and associate dean of engineering for undergraduate education at Purdue University, in West Lafayette, Ind., where she has been a faculty member since 1976. She is the vice president this year of IEEE Publication Services and Products and was chair of the IEEE Technical Activities Board Periodicals Committee, as well as vice president of Technical Activities in 2003.

At Purdue, Jamieson co-founded and is a director of the Engineering Projects in Community Service (EPICS) undergraduate engineering design program, which was initiated at Purdue and adopted by 17 universities. EPICS matches teams of engineering students with local community-service programs to define, design, build, test, and support projects that improve the community. One example is Purdue’s partnership with the Wabash Center Children’s Clinic, in Lafayette, which works with the physically disabled. Purdue students helped deliver custom playgroup software, including interactive programs to teach the sign-language alphabet. For her work with EPICS, she was the co-recipient of the 2005 Bernard M. Gordon Prize given by the U.S. National Academy of Engineering to recognize innovation in engineering technology education.

Jamieson received a bachelor’s degree in mathematics from the Massachusetts Institute of Technology, in Cambridge, and master’s and doctoral degrees in electrical engineering and computer science from Princeton University, in New Jersey.

Of the IEEE members who voted in the election, 15,965 selected Jamieson, and 10,723 chose Gerald H. Peterson. James M. Tien received 9,901 votes.

---

**IEEE Xplore Adds New Features**

SEARCHING FOR AN IEEE book? Want to buy a standard? You can now do such things through IEEE Xplore, thanks to features added in the digital library’s latest upgrade. IEEE Xplore contains more than 1.2 million documents from IEEE journals, magazines, transactions, conference proceedings, and standards, as well as journals and conference proceedings from the Institution of Electrical Engineers in the United Kingdom.


IEEE standards can be purchased through IEEE Xplore, or you can buy the standard through the IEEE online store, ShopIEEE.

To try these new features, visit http://www.ieeeexplore.ieee.org/Xplore.

---

**Herz Award to Honor Outstanding IEEE Employee**

DO YOU WORK WITH an IEEE staff member who continually demonstrates leadership and makes outstanding contributions to the IEEE’s success? Then consider nominating that person for the newly established Eric Herz Outstanding Staff Member Award, named for the former IEEE general manager and executive director who also is a longtime institute volunteer.

The first award will be presented next year. The deadline for submitting nominations is 31 January 2006.

The prize includes a US $5000 honorarium, a certificate, and reimbursement for the cost of travel to the award ceremony, which is scheduled for the final Board of Directors meeting of the year, in November.

Only full-time staff members of the IEEE with at least 10 years of service are eligible for the award, which is to be given every two years. The nominators and supporters must be IEEE volunteers. Members of the IEEE Board of Directors, the Awards Board, and the selection committee may not submit nominations. For nominating forms, visit the IEEE Awards Web site at http://www.ieee.org/awards or send a message to awards@ieee.org.

---

**Journals to be Digitized Dating Back to Volume 1, Number 1**

THE IEEE IS IN THE PROCESS of digitizing the articles of all its journals, each dating back to its very first issue, so that researchers will have easier access to the historic, scholarly content.

The IEEE Electron Devices Society (EDS) is the latest society to put its archived journals online. The society recently uploaded more than 15,000 articles from its most influential publications: IEEE Transactions on Electron Devices (from 1954 to 1987), IEEE Electron Device Letters (1980 to 1987), and the IEEE International Electron Devices Meeting Conference Proceedings (1955 to 1987). Those articles, now part of the IEEE/IEEE Electronic Library (IEL), make up about half of the society’s collection. The other half, from 1988 to the present, is already available online.

The first phase of the two-year project began in June, and since then more than 12,000 papers and articles published in the Proceedings of the IEEE from 1963 to 1987 were uploaded as well (See “Digitizing Technology’s History,” p. 39). The older issues are being added to an IEEE digital collection of 1.2 million documents that have appeared in 120 journals, 900 active standards, and the proceedings of 400 annual conferences. Articles can now be searched electronically for phrases and keywords—which is characteristic of the IEL.

---

**IEEE Potential**

MEMBERS CAN NOW ACCESS the online version of IEEE Potential, the peer-reviewed bimonthly magazine aimed at innovators and young professionals. The magazine, which had been available only to student members, presents general-interest articles that trace the latest in research and innovation. It also covers new developments in a wide range of engineering and technical topics, and it tackles workplace issues such as how to deal with a difficult boss.

There’s no charge to members who access the online edition from IEEE Xplore, the digital library. Students in the United States and Canada will continue to receive print copies of IEEE Potential, which is included with each membership. Students from other countries pay US $5 for a print subscription.
Members Weigh In on IEEE Code of Ethics Revision

REACTING TO FEEDBACK from IEEE members and volunteers, the IEEE Ethics and Member Conduct Committee has modified its proposed revision of the first declaration of the IEEE Code of Ethics. The committee previously sought to replace the word “engineering” with “technological” in the code’s first article, as reported in “Revision Proposed to IEEE Code of Ethics” (September 2005, p. 4), to recognize that IEEE members who are not engineers are also governed by the IEEE Code of Ethics.

The EMCC now proposes to remove any reference to “engineering” or “technological” in the code’s first article. The declaration would state that IEEE members agree “to accept responsibility in making decisions consistent with the safety, health, and welfare of the public, and to disclose promptly factors that might endanger the public or the environment.” Originally, the code said that IEEE members agree “to accept responsibility in making engineering decisions” and so on.

The IEEE Board of Directors will consider the proposed revision at its February meeting. Two-thirds of the board must vote in favor of the change for it to pass.

Send any comments about the proposed revision to ethics@ieee.org. You can read the IEEE Code of Ethics at http://www.ieee.org/about/whatis/code.html.

Corrections

In “Dues Up Slightly” [September], the 2006 affiliation fee for society affiliate membership was incorrect. Affiliates—individuals who belong to one or more IEEE societies but are not IEEE members—pay an affiliation fee of US $60. The fee, which is set at half the basic IEEE member dues (currently $119), is, in practice, rounded up to the nearest dollar. Note, too, that society affiliates pay the $60 affiliation fee for each IEEE society they join, as well as the member dues charged by that society.

In “In Memoriam” [September], the locations of Jack St. Clair Kilby’s universities were misstated. He earned a bachelor’s degree from the University of Illinois at Urbana-Champaign and a master’s degree from the University of Wisconsin, in Madison, both in electrical engineering.

Lights, Camera, Engineering Breakthroughs

MORE STORIES about IEEE-related technologies are making their way into short TV news programs produced by the American Institute of Physics. To this end, IEEE-USA started collaborating with AIP in November 2004.

Each month AIP’s Discoveries and Breakthroughs Inside Science news service delivers a dozen 90-second spots to 108 subscribing stations. The spots aim to provide a realistic image of how professionals in engineering, math, science, and technology contribute to a better quality of life. They are meant to run during local news programs and can theoretically reach more than 80 million U.S. households.

IEEE-USA is working with AIP to add segments that focus on engineering. IEEE Technical Activities, Corporate Communications, and IEEE Spectrum are providing story ideas and technical experts.

The broadcasts focus on practical innovations. Since the collaboration began, the news service has included stories about such items as a mechanical arm for stroke victims, a remote-controlled robot that can be sent into dangerous rescue sites, and mesh wireless networks, which ease overloaded communications networks.

To view sample video spots or find a TV station near you that airs them, visit http://www.ivanhoe.com/science. A limited number of DVDs with sample segments are available for U.S. IEEE volunteers to incorporate in presentations to middle schools and high schools. To order a DVD, contact Pender McCarter, IEEE-USA, at p.mccarter@ieee.org.

E-newsletter Zeros In on Standards

FOR THOSE WHO want to know the latest on IEEE standards, there’s now a free monthly newsletter that can bring the news to you and your computer. The Standards Bearer Online, which focused mainly on the actions of the IEEE Standards Board and not on what was going on with the standards themselves. StandardsWire provides readers a description of the standards that are being released and related products, as well as an explanation of how the standards and products will benefit industry.


—Compiled by Shazia Memon
Get Involved
Robert Gluck’s article (“Steering Students Toward Science and Engineering,” September, p. 1) emphasizes engineering as it exists today. People in developing countries are “steering students towards engineering and science,” while in the West we see a collapse of manufacturing and a lack of demand for Western engineers and scientists because of cheaper sources elsewhere.

The failure to adopt a national industrial policy in the United States will inevitably result in the country’s deindustrialization and adversely impact the national standard of living. The IEEE should be neutral on such issues as steering students toward engineering and science, because such policies in low-income countries—while in the national interest of those countries—are not in the national interest of the United States and the countries of Western Europe.

Given the transnational character of the IEEE and the conflicting interests of globalization, the IEEE should remain strictly a technical society without advocating or encouraging anything that may affect the employment of its members.

STEVE AMES
Los Osos, Calif.

I felt very optimistic after reading Robert Gluck’s article. I always felt that the IEEE needed to extend its efforts deeper into our educational system. The institute appears to have a good handle on college students and programs but seems to fall short with younger students.

A few years ago I became involved in a program at a local high school called For Inspiration and Recognition of Science and Technology (FIRST), which sponsors an annual international robotics contest for high school students and a Lego robotics contest for junior high students. FIRST is a multinational, nonprofit organization that aspires to transform culture by making science, math, engineering, and technology as cool to kids as sports. Our team, as well as others around the world, has been instrumental in steering students toward earning science and engineering degrees. When I became involved in the project, I knew that it would be something that the IEEE could help promote and even benefit from. Our team made a presentation to my local IEEE chapter in the program but was unable to spark any interest from the chapter’s members.

After four years with this program, I am even more convinced that a relationship must develop between the IEEE and FIRST. As I read about the programs in this article, I hope to read about additional ones such as FIRST.

MATT FARMER
Paola, Kan.

Editor’s note: The IEEE supports FIRST by encouraging its members to mentor students and help them build their robots. The Institute has helped publicize FIRST by publishing articles about the contest in its June 2004 and July 2005 issues.

Not-So-Great Expectations
From “Investing in Tomorrow’s Engineers” [June, p. 4], we learned that the IEEE Board of Directors has approved US $98 000 to fund the Center for Pre-university Engineering Education. If one looks at the statistics (pick a source, any source), it is clear that the IEEE’s emphasis needs to be in grades four through eight, where children are most vulnerable to becoming lost to math and science.

The main problem is that preuniversity administrations and teachers in general have weak academic expectations of students, and these expectations reach an ultimate low by grades four through eight. I have children entering grades six, seven, and nine, and I have seen this with my own eyes.

MICHAEL YOUNG
Edmond, Okla.

Undermining Engineering
I object to replacing the word “engineering” with the word “technological” in the IEEE Code of Ethics so that one of its declarations reads that IEEE members agree to “accept responsibility in making technological decisions consistent with the safety, health, and welfare of the public.” I had read, “making engineering decisions…” [“Revision Proposed to IEEE Code of Ethics,” September, p. 4].

I recognize that many engineering decisions are made by nonengineers, but I find this to be all the more reason to keep the word “engineering.” I have been an engineer for 31 years, and I still remember my struggle as an engineer at Cairo University to get the needed UNESCO coupons (hard currency was not available to many Egyptians) in 1973 to join the IEEE as a student member. This proposed change puts the IEEE stamp of approval on the practice of engineering by nonengineers, and then we wonder about the poor U.S. job market for engineers.

RAMEZ GERGES
Goleta, Calif.

TELL US WHAT YOU THINK

We welcome letters from readers expressing opinions on matters of interest to IEEE members and to the technical community at large. Along with your name, please include your city and state, or province and country.

MAIL: The Institute
IEEE Operations Center
445 Hoes Lane
Piscataway, NJ 08855-1331 USA
FAX: +1 732 235 1626
E-MAIL: institute@ieee.org

“The institute appears to have a good handle on college students and programs but SEEMS TO FALL SHORT WITH YOUNGER STUDENTS.”

—MATT FARMER
**MARKETPLACE OF IDEAS**

**RESPONSES TO SEPTEMBER’S QUESTION**

**What do you think of this decision?**

The U.S. Supreme Court unanimously ruled that companies offering Internet file-sharing software may be sued for copyright infringement if they have encouraged their users to illegally download songs, movies, or television programs, even if the software has other, legal uses.

**Certain Limits**

I support the court ruling. Internet agencies that encourage illegal actions such as copyright violation should be held liable.

However, I am against restraining Internet usage by limiting the development of peer-to-peer software. I don’t approve of firmware that prevents CD or DVD copying, even though without it there is a possibility of software, video, and audio piracy. If I buy a DVD, I should be able to copy it onto a hard disk or cut out portions of it and use them for academic or other purposes. In other words, I do not want to see enforcement methods that prohibit the fair use right to copy any kind of copyrightable material.

GEORGE GERRITY
Harden, Australia

**Outrageous**

This decision is ridiculous. While we’re at it, let’s allow auto manufacturers and car dealers to be sued for vehicular homicide, gun manufacturers for armed robbery, boat manufacturers for (mail) piracy, and rap artists for any felony committed by people who listen to them.

ROBERT CLEMONS
Tokyo

**A Sound Judgment**

The decision is a good one. If you have a hardware store that sells large gripping pliers and one is used in a crime, it’s not your fault. However, if you set up a display showing how to use the gripping pliers for home burglary, you’re aiding and abetting. The court’s decision is much better than the alternative outlawing file-sharing software entirely—which would not be fair to the manufacturers of that software or to the people who use it in lawful ways.

PORTER TAYLOR
San Antonio

**Misplacing the Blame**

This ruling basically blames the tool and not the tool user for illegal activities, which is an unreasonable solution to copyright problems. Internet filesharing software can be used for illegal purposes, but it also has many benefits. It is an advance in technology.

This court decision will not stop piracy and other illegal activities. It will only hamper innovation.

Since these are matters of national concern, a conference should be held to decide the appropriate measures needed to deal with the problem. Participants should include users, as well as software originators, and everyone in between, including financial experts.

MIKE DIVINS
Easton, Md.

**Free Distribution**

In the United States, where it is legal to stockpile semiautomatic guns and ammunition, the idea that it is illegal to distribute software that could be used to steal copyrighted material is difficult to understand. I think that anyone that distributes copyrighted material knowingly (without the permission of the copyright owners) should be prosecuted, and companies that openly encourage such actions should be penalized.

However, software is a form of information, and it should be freely distributed. In Germany a similar situation arose with audiocassettes, most of which were used to record copyrighted material. The solution was to tax blank tapes and transfer the money to a copyright clearinghouse, which distributed it to the copyright owners. Perhaps the United States should adopt a similar method with file-sharing software companies.

I. GLASER
Virginia Beach, Va.

**A Reasonable Compromise**

For once, the court acknowledged the development of new technologies. The copyright holders wanted the court to ban all software-sharing systems from the Internet. But the court realized that discouraging creative development would be worse than the possibility of some infringement of publishers’ and artists’ rights.

To encourage continued development of Internet technologies, the court compromised and allowed file sharing in a responsible way. It was probably a good decision. After all, aren’t cooperation and compromise what the free market is all about?

ALMON CLEGG
Highland, Utah

**Kill the Copyright Laws**

The recent development of Internet filesharing has made it easy to copy information or music, instead of continuously updating copyright legislation, perhaps we should do away with the entire concept.

Recently, some artists have started selling their own material, completely avoiding record companies. Previously, an individual artist was at the mercy of the record companies to get his or her creation published. Before the Internet, publishing your own work was expensive and difficult. Now, however, it is a realistic and even preferable option.

It might be difficult for record companies to go out of business, but new inventions can bring about such an outcome. It is time to abandon the outdated copyright concept. This court ruling will soon enough be outdated as well.

WILBUR DEHART
Dexter, Mich.

**Innocent Until Proven Guilty**

Companies that encourage customers to use the downloading software in illegal ways should be punished if there is enough evidence to prove that they are involved. Manufacturing knives is not a crime, but encouraging someone to use them in a criminal manner can be. The person who uses the knife to commit a murder should be prosecuted, but the knife manufacturer should not be.

TARIK KHAN
Raleigh, N.C.

**What do you think?**

Since these are matters of national concern, a conference should be held to decide the appropriate measures needed to deal with the problem. Participants should include users, as well as software originators, and everyone in between, including financial experts.

**Man in Space**

NASA Administrator Michael Griffin, an IEEE member, told the editorial board of USA Today in September that the space shuttle and the International Space Station were mistakes. The two projects, he said, are too expensive in terms of astronaut lives and dollars and haven’t produced enough scientific knowledge.

What do you think?

RESPOND TO THIS QUESTION by e-mail or regular mail. Space may not permit publication of all responses, but we’ll try to draw a representative sample. Suggestions for questions are welcome. Responses will appear in the March issue of The Institute and are subject to editing for brevity.

MAIL: The Institute, IEEE Operations Center 445 Hoes Lane Piscataway, NJ 08855-1331 USA FAX: +1 732 235 1626 E-MAIL: institute@ieee.org
**PRESIDENT’S COLUMN  BY CLEON ANDERSON**

**2005: A Year for Optimism**

We began 2005 cleaning up after the Asian Tsunami and reached the end of the year cleaning up after hurricane damage on the U.S. Gulf coast and earthquake devastation in India and Pakistan—events of extraordinary human suffering that brought out all the nattering nabobs of negativism. But for my last column, I would rather focus on the positive, some of the year’s events that give us hope.

IEEE MEMBERS have reasons to be optimistic, even excited, about the future. Indeed, this year has given us good news that points toward global prosperity through technological innovation.

First, energy is abundant on the planet. In January, an interesting new book, The Bottomless Well: The Twilight of Fossil Fuels, the Virtue of Waste, and Why We Will Never Run Out of Energy (Basic Books, 2005), affirmed that “the price of oil remains high only because the cost of oil remains so low.” Co-authors Peter W. Huber and Mark P. Mills continued, “We remain dependent on oil from the [Middle East] not because the planet is running out of buried hydrocarbons but because extracting oil from the deserts of the Persian Gulf is so easy and cheap that it’s risky to invest capital to extract somewhat more stubborn oil from far larger deposits in Alberta, Canada.”

In April, Ali Al-Naimi, Saudi Arabia’s minister of petroleum and mineral resources, announced that Saudi oil reserves, thought to be 261 billion barrels, might be increased to more than 460 billion barrels. In addition, no one yet knows the size of the oil reserves in the Alaskan National Wildlife Refuge. They could be huge, too.

In June, U.S. President George W. Bush announced his intention to reinvestigate the nation’s use of nuclear power. To date, France has led the world in demonstrating the efficient and environmentally friendly nature of nuclear energy. For large-scale power generation, hydrogen and nuclear power are the only two sources of energy that don’t produce the greenhouse gases of fossil fuels. Indeed, this year even oil-rich Iran took notice and is working toward using nuclear energy instead of oil for electric power generation.

In 2005, a number of engineers were recognized for their contributions to society that went well beyond their laboratories. For example, as noted in the June issue of IEEE Spectrum, all nine members of China’s Politburo Standing Committee are engineers. India’s president, Abdul Kalam, is a renowned scientist with a background in engineering and satellite communications.

Further, Asia’s universities are graduating, at all levels, more than five times as many engineers as U.S. universities. We are rapidly approaching the point where an undergraduate degree in engineering—especially in electrical and computer engineering—is the best entrée for the most highly skilled and learned arts, including the political arts and sciences.

This year, I dedicated IBM’s RAMAC drive as an IEEE Milestone in Electrical and Computer Engineering. The milestone honors the first use of magnetic disk storage in a computer system. Developed in 1956 by IBM in San Jose, Calif., the Random Access Method of Accounting and Control drive was more than a meter high—a stack of fifty 24-inch disks with a capacity of 4.4 megabytes. Now, just 50 years later, the cost of magnetic disk storage has dropped to less than a dollar per gigabyte, and the space requirement is smaller by orders of magnitude. Flash memory promises even greater savings in size and cost as large-capacity virtual drives come about.

Huge amounts of memory—created to satisfy the needs of digital cameras and cellphones, and the insatiable need for digital imaging—have not only fueled today’s Information Age but also have been the catalyst for developing the search engines necessary for data mining, research, and predictive science.

An explosion of engineering skill and technical knowledge, coupled with an abundance of energy, mass storage, and techniques for manipulating information, gives everyone good reason to be optimistic about the future. Now we can store, search, and use the data produced by strategically placed sensors, as well as by radio-frequency ID tags, GPS, and DNA, to remove uncertainty and make our world a safer place for all its inhabitants. Opportunities have never been greater for technological innovation in nanotechnology, biomedical science, and information technology.

The challenge is to take the abundance of data and information and to use technology to control and manage our response to natural disasters, to preserve human life, and to control (or at least understand) the environment in which we live. That is how we, as IEEE members, can fulfill the IEEE’s Vision to advance global prosperity and promote community worldwide.

I thank the 2005 IEEE Board of Directors and all the other IEEE volunteers and staff for their important contributions to the institute. I am optimistic for the future. I know that in 2006 President Michael Lightner will continue to lead us with experience and skill toward the realization of the IEEE’s vision.
Piña Makes Chip Fabrication Affordable

By Jean Kumagai

This year marks the 25th anniversary of a groundbreaking program that has introduced tens of thousands of engineering students to the real world of integrated circuit design. The program, run by a not-for-profit organization called MOSIS (Metal Oxide Semiconductor Implementation Service), manufactures working prototypes of the students’ integrated circuit designs free of charge. Based at the University of Southern California’s Information Sciences Institute, in Marina Del Rey, MOSIS also gives businesses, universities, and government labs a means of inexpensively producing prototypes.

Many chip designers have few options for getting their devices built, explains MOSIS’s director, IEEE Member César Piña. Scheduling a run at a wafer fabrication plant would be prohibitively expensive for students, not to mention university and government researchers and startup companies. The smallest run possible is typically 12 wafers, which can cost more than US $50,000 after tallying up the cost of materials, photolithography, and fabrication, he says.

Piña has been involved with MOSIS from the start. From 1980 to 1987, while at the Jet Propulsion Laboratory (JPL), in Pasadena, Calif., Piña led a project funded by the U.S. Defense Advanced Research Projects Agency to develop CMOS test structures for determining how well a MOSIS wafer was moving through the fabrication process. In 1990, he became the director of MOSIS. “I originally thought I’d stay for three or four years,” Piña says, sitting in his seventh-floor corner office overlooking the harbor at Marina Del Rey. “That was, well, a lot of years ago.”

CONCEPT FOR PROTOTYPES The concept behind MOSIS was first put forward by Carver Mead and Lynn Conway. In their breakthrough text, Introduction to VLSI Systems, published in 1979, the two described how, with a simple set of design rules, any engineer could easily make a prototype of an IC. “All you need is access to a computer,” Piña says. “Then you’d send your design to a fabricator and get the thing made.” It was a revolutionary idea at the time, but as more chip designers realized the advantages, it took off.

When Piña was in sixth grade, his father got a job at the U.S. naval base at Guantanamo Bay, and Piña began attending school there, alongside the sons and daughters of U.S. military personnel. He learned English so well that at the age of 16, he enrolled in the University of Michigan, in Ann Arbor, graduating with a bachelor’s in aerospace engineering.

While in college, Piña met student Marilyn Wohl, and in 1958, they married and returned for a few months to his town. Piña remembers poring over the comics while sitting in the library. While reading to him, Marilyn showed Piña how to sound out letters and words. One day I asked Piña to read something for me, and he said, ‘Go ahead and read it yourself.’ To my amazement, I could.

When Piña was in sixth grade, his father got a job at the U.S. naval base at Guantanamo Bay, and Piña began attending school there, alongside the sons and daughters of U.S. military personnel. He learned English so well that at the age of 16, he enrolled in the University of Michigan, in Ann Arbor, graduating with a bachelor’s in aerospace engineering.

While in college, Piña met student Marilyn Wohl, and in 1958, they married and returned for a few months to his town. Piña remembers poring over the comics while sitting in the library. While reading to him, Marilyn showed Piña how to sound out letters and words. One day I asked Piña to read something for me, and he said, ‘Go ahead and read it yourself.’ To my amazement, I could.

In 1958 the couple left Cuba for the United States. With the Cold War in full swing, there was a huge demand for engineers—but not ones from Cuba. “The only industry that didn’t seem to care where I was from was semiconductors,” Piña recalls. His first job was with Raytheon’s semiconductor division, outside Boston. His education didn’t exactly equip him for a job in the chip industry, but then the field was very new, so the learning curve wasn’t too difficult. “I spent the first two weeks reading the June 1956 Proceedings of the IEEE—the special semiconductor issue—and [William B.] Shockley’s Electrons and Holes in Semiconductors.”

After he’d been at Raytheon a year, his wife persuaded him to relocate to the Midwest to be closer to her family. During the next two decades, his career mirrored the ups and downs of the chip industry; all of the chip companies he’d worked for either been sold or gone out of business. In Chicago, he worked for Hoffman Electronics, a small chip firm, for six years before taking a job with Continental Devices, a small semiconductor company near Los Angeles.

In 1971, Piña decided to branch out on his own, founding Regulus Semiconductor, which he named with great hope after a bright star in the constellation Leo. One of Regulus’s products was an electronic interlock that wouldn’t let a car start unless the driver’s seat belt was fastened. “Nobody liked that,” Piña recalls, and the idea died when Congress passed a law making such a device optional for U.S. cars. Four years later, with five small children at home, he was forced to sell the company and take a job with Micro Semiconductor, another small chip company in Los Angeles, where he worked for five years before joining JPL.

While at JPL, he earned a master’s degree in applied mathematics from Claremont University, in California, and he has continued a collaboration with the school of mathematical sciences there. One area he’s been exploring at MOSIS is the use of boundary layer methods and other mathematical techniques to understand semiconductor behavior. “For example, on a CMOS device you have one region where the current changes very rapidly with respect to the voltage and another region where the current changes very slowly,” Piña explains. The equations in each region can be solved separately and then “matched” or “blended” to obtain a single, continuous equation. The method is now being extended to include quantum effects, which have become significant as device dimensions decrease below 90 nanometers.

Though he never planned to stay so long, Piña has no desire to move on from MOSIS. “My wife always asks, ‘When are you going to retire?’ To be honest, I don’t know what else I’d do that would be as interesting.”

For More Information On MOSIS, visit http://www.mosis.org
IEEE Press Counts On New Strategic Plan

BY ERICA VONDERHEID

WITH EFFORTS to acquire books on more popular subjects and with more involvement by IEEE volunteers, a three-year strategic plan is under way in hopes of bringing new life to the IEEE Press. The plan calls for the Press to break even in 2008, after years of operating at a financial loss, and ends almost a year of uncertainty about its survival.

A STRONGER BASE IEEE Fellow Mohamed El-Hawary, Press editor in chief, is charged with the task of rallying volunteers, which he will do, he says, “by talking, talking, talking.”

The IEEE Press has long relied on getting ideas for its books, and getting authors, from the large pool of IEEE members who are deeply involved in the latest technologies. “I’m on a first-name basis with many leaders on the technical side,” says El-Hawary, who relies on these volunteers “to guide us on what books to publish.” By being in closer contact and talking with them more, El-Hawary hopes to get better ideas for books and more help in guiding and supporting the IEEE’s book-publishing business.

For example, the IEEE Press depends on volunteers to handle a number of tasks, based on their knowledge and connections. Book authors are, of course, a necessity. But the Press also needs volunteers who can serve as editors of the book series that the Press publishes. Series editors identify potential authors, review manuscripts, enlist other expert reviewers, and make suggestions for improvement.

Volunteers also serve as liaisons to an IEEE society or technical council, where they use their knowledge of technology to unearth ideas for new books and identify authors. The Press will seek to revitalize this important group of volunteers. One idea is that society or council liaisons will be appointed to serve for two years instead of one, as in the past. This should give them more time to get to know in depth what’s going on in the different technical areas they oversee. The liaison will also have the option for reappointment.

As for what it will publish, “we’re going to concentrate on professional books where we’ve shown strength, while cultivating new growth areas in emerging technologies,” says Ken Moore, director of IEEE Book and Information Services, the department that oversees the IEEE Press, in Piscataway, N.J. Accordingly, the Press will continue to publish books in its five most popular and commercially successful technical areas: power engineering, electromagnetics, wave theory, digital and mobile communications, microelectronics, and biomedical engineering. The Press is also nurturing book series in new and emerging fields such as computational intelligence, which deals with adaptive mechanisms that facilitate the intelligent behavior of machines.

For each of these topics, the IEEE Press is looking for practical tutorials for engineers already in a field, as well as technology primers for newcomers. It has been publishing 15 to 30 titles a year, including professional tutorials for working engineers, textbooks for graduate students, analytical books that provide the mathematical and theoretical foundations of electrical engineering, and “soft” books on career management. Starting in 2006, the Press will publish between 20 and 30 books a year, with half—10 to 15 titles—aimed at working engineers.

BACK TO LIFE The strategic plan has been in the making for more than a year. At one point, the Press almost met its end. At its June 2004 meeting, the IEEE Publication Services and Products Board (PSPB), which oversees the institute’s publishing activities, reviewed the status of the Press and did not like what it found. It determined that without significant changes, the Press would continue to operate at a loss, and the board voted to terminate the book-publishing program. But the IEEE Board of Directors was unwilling to give up the benefits of the program, and Arthur Winston, IEEE president at that time, asked PSPB to renew its efforts to save the program. PSPB established a committee made up of Press volunteers and others new to the program, such as former PSPB finance chair John Baillieu and 1999 IEEE President Kenneth Laker, to come up with a plan under which the Press could continue. Their work resulted in the present three-year plan to break even in 2008.

“Developing the strategic plan was a good exercise that showed the best of our volunteers’ skills,” Moore says. “The new volunteers brought fresh ideas and merged their thoughts with those from longtime IEEE Press board members.”

The IEEE leadership was receptive to the strategic plan the committee delivered to the June 2005 PSPB meeting, thanks in part to a new copublishing proposal from John Wiley & Sons, in Hoboken, N.J.

“Wiley saw the value of the partnership with the IEEE, and its proposal makes the relationship more financially viable for us,” Moore says. The new agreement will extend the relationship—which began in 2001—and the Wiley–IEEE Press imprint for another five years and increases royalties paid to the IEEE for each book sold. By approving the plan, adds Moore: “PSPB endorsed the IEEE Press, saying that it is a vital part of the IEEE community and that its mission will be supported.”

An important part of the Press’s title-acquisition strategy will be to leverage both the IEEE’s and Wiley’s global resources to cultivate Asia as a source of book authors, Moore says. “As a global organization, we seek authors throughout the world, but we see this opportunity with Wiley as a good time to capitalize on the growing number of authors in Asia,” Moore says. The agreement means that the Press will have more titles—and in turn more revenue—but will be able to concentrate its acquisition efforts on developing its current series.

The strategic plan also calls on the IEEE Press to explore new electronic products to accommodate readers’ changing needs. Currently, IEEE Press books are available electronically through Wiley’s Web site, at http://www.wiley.com. Customers can download either an entire book or one chapter at a time. Abstracts of Wiley–IEEE Press books are also posted on the IEEE Xplore digital library, allowing users to search for books and then click through to Wiley’s site to purchase them.

But what customers see are just static copies of the printed books, with none of the extra bells and whistles an electronic format could offer, such as links to supplemental Web-based information, multimedia, or simulation software. The intent is to evolve from simple PDF pages of the print edition to electronic products that take full advantage of the electronic medium and IEEE Xplore, according to the IEEE Press strategic plan.

However, theIEEE Press has no plans to abandon the printed page. “Books carrying the IEEE logo are a physical token of the IEEE’s mission to deliver all information our members need to do their jobs,” Moore says. “As a leading professional organization, we recognize that engineers’ research and work habits are changing, but when it comes time to select a study tool for a given topic, I think our engineers are always going to have books at the top of their list.”

FOR MORE on the IEEE Press or how to submit book proposals, visit http://www.ieee.org/press
Economics, in Washington, sometime in August. Other activities and publications are planned as well.

Perhaps the Biotechnology Council’s most important goal is “for patient medical records to be available 24/7—anywhere, anytime, anywhere in the world,” says the council’s chair, IEEE Senior Member Richard L. Doyle, former Division VI director. By focusing the expertise of some of the world’s top engineering and medical organizations, the Biotechnology Council hopes to influence the creation of universal standards for electronic medical records. Among other goals, the council hopes to work with the new Office of the National Coordinator for Health Information Technology, an office founded last year within the U.S. Department of Health and Human Services. The coordination office wants the U.S. medical community to migrate to e-medical records within the next decade.

**TOP CHALLENGES** Advanced medical technology for treating patients may be pioneering new approaches in the 21st century, but most patients’ records are still handled as they were in the 19th, handwritten on paper. They are then stored in file cabinets along with, say, X-rays on film and paper EKG printouts. According to a U.S. study earlier this year, fewer than a third of hospitals and well under a fifth of private-practice physicians use electronic medical records. True, most doctors and hospitals rely on computers to bill for services—but in many cases, that’s it.

The fact that most medical records are still on paper and film leads to many problems. For example, ambiguous terminology or hard-to-read handwriting can lead to errors in other physicians’ interpretation of the records or in the filling of prescriptions. Miscommunication has even led to surgery on the wrong body part or the wrong patient. What’s more, in an emergency it can be difficult, if not impossible, to transmit paper records electronically for interpretation by specialists. And backup copies of paper and film are seldom made.

“The notion and concept of e-medical records have existed since the 1960s. So why haven’t we had them before now?” asks Michael Rozen, IEEE senior member and the institute’s representative on the Biotechnology Council. The delay, says Rozen, is due to three factors: “standards, interoperability, and privacy.”

The absence of data-storage and networking standards for both medical equipment and administrative computers has led to a variety of challenges. For example, if a medical system is compatible with other systems, it is easier to share information. However, if a system is incompatible, it can be difficult to integrate with other systems.

The IEEE in the Biotechnology Council

In addition to the IEEE Standards Association and IEEE-USA, six IEEE societies and two councils are participating in the Biotechnology Council:

- Circuit and Systems Society
- Computational Intelligence Society (formerly the Neural Networks Society)
- Computer Society
- Engineering in Medicine and Biology Society
- Lasers and Electro-Optics Society
- Signal Processing Society
- Nanotechnology Council
- Sensors Council
MEDICAL RECORDS

Continued from page 11

been a major technology barrier. “In an integrated world, every medical machine should be able to communicate with other equipment, computers, and displays,” Rozen says. Of equal importance, each patient and physician must be uniquely identified across machines, so “we know that Mary Smith is the correct Mary Smith,” he continues. Thus, standards are needed to authenticate both the patient and the requesting entity to create an audit trail of those who have read or added to the file, and to maintain data integrity during transmission. Moreover, standards are needed for handling inputs from many devices used by physicians that were originally created for nonmedical uses, such as cellphones and PDAs.

INTEROPERABILITY The stumbling block the e-medical records community calls interoperability refers not so much to machines working together as to human beings understanding each other. “The medical language in each e-medical record must follow a structured terminology that has universal acceptance, so it can be unambiguously interpreted by any skilled personnel,” Doyle points out. The word “cold,” for example, can bring to mind a viral infection or someone with a temperature, “and there are 126 different ways of saying ‘high blood pressure,’” adds Rozen, who is also chair of the IEEE-USA Medical Technology Policy Committee (MTPC).

For e-medical records to be completely interoperable, however, ambiguity must be removed between medical and lay terms. “Individual medical practitioners and their patients must understand each other across all specialties, which requires consistent terminology,” Doyle says. And that is yet to be achieved.

Rozen’s third factor, privacy, including the security of patient records in an electronic environment, is only part of the way to a solution. In the last five years, the United States and other countries have developed enough stringent safeguards that most of the population would “probably go along” with having medical records stored and transmitted electronically, says Rozen. Still, important questions remain. For example, can records be made absolutely hack-proof? Is it possible, for example, to ensure absolute confidentiality of a patient’s psychiatric background, HIV status, genetic background, or similar sensitive information? Who should control access to the records?

THE IEEE’S ROLE The Biotechnology Council comprises 10 nonprofit organizations, including the American Institute of Chemical Engineers and the American Society of Mechanical Engineers, along with the IEEE and the American Medical Association. The IEEE’s participation actually consists of contributions from 10 IEEE entities, including IEEE-USA’s Medical Technology Policy Committee and the IEEE Standards Association (see sidebar, p. 11).

Given the IEEE’s long experience with networking and computer standards, Doyle observes, “we’re the 800-pound gorilla in the corner.” But to meet the needs of all manner of physicians, instrument and device companies, biotechnology organizations, hospitals, and insurance companies, to say nothing of patients, “the IEEE can’t go it alone,” he acknowledges. Hence, the Biotechnology Council has devoted its first year to setting up formal mechanisms for cooperation and funding among its members. The resulting consortium collectively represents more than a million physicians, engineers, and other professionals.

OPEN QUESTIONS Other knotty issues remain.php
How should the records be stored? “Should everything be in a central database, or could patients carry the records with them on an ID card, much like a driver’s license, that could be scanned at every doctor’s office?” asks Doyle. Who should administer the system, and how should records and users be identified and authenticated?

Then there is the gray area of just how much information should be consolidated. “If a patient has an artificial heart valve, should the record include the valve’s manufacturer and serial number?” asks Doyle. “Should the records include all the digital X-rays and MRI scans, as well as test results from all physicians? Should all records of medical insurance claims be included?”

In the United States, at least, an example of an e-medical records system already exists. “VA [Veterans Administration] hospitals already own a pretty good e-medical records–keeping model,” says Rozen. “VA patients have their medical records, blood tests, X-rays, and other imaging results stored electronically and accessible to any of the VA hospitals. The VA is now trying to bridge the gap between VA physicians and private physicians who are treating the same patient, by trying to provide them access to the VA record of the patient.”

NEXT STEPS At this stage, “it is premature to think about [the Biotechnology Council’s] drafting white papers representing the consensus of its 10 organizations, Doyle says. Nonetheless, the IEEE-USA MTPC was scheduled to release its own individual white paper before the year’s end on challenges of and recommendations for interoperability.

It is also too early to add non-U.S. organizations to the council, although “world standards ultimately will be part of our activities,” Doyle adds. “Some European nations are well advanced, and we can all benefit from their achievements. Moreover, Asia is among the fastest-developing regions in the world, and we need to share our knowledge with our officials.”

In the long term, the influence of the Biotechnology Council on national policy will lie in the fact that “its constituent members have no axe to grind politically and no software to sell,” Rozen points out. “This neutrality can provide legislators and regulators unbiased information to assist them in their deliberations.”

FOR MORE INFORMATION


Interoperability refers not so much to machines working together but HUMAN BEINGS UNDERSTANDING each other.
this year by the IEEE Ethics and Member Conduct Committee (EMCC).

**VARIED APPROACHES** Not all students welcome the opportunity to learn about ethics. “You get all sorts of reactions, [including] those who think ethics courses are not entirely appropriate to a technical degree. They’ll say, ‘I thought I was studying technology and not the people issues,’” says Kevin Bowyer, an IEEE Fellow who heads the department of computer science and engineering at the University of Notre Dame in Indiana. “But we try to show them that a lot of the things that go wrong in the workplace have people issues wrapped up in them.”

A requirement that engineering school graduates demonstrate “ethical awareness” was written, in 2000, into the criteria U.S. schools must meet to maintain their accreditation. Since then, the schools have tried different approaches to ethics instruction. A few have made ethics classes mandatory; at others, they are electives. Still others weave ethics discussions into standard engineering courses to achieve what they call ethics across the curriculum.

Texas A&M University, in College Station, and the University of Virginia, in Charlottesville, are among the handful of schools where instruction in engineering ethics is mandatory. First-year engineering students at the University of Virginia, for example, must take an introductory course in the engineering school’s Department of Science, Technology, and Society, where ethics and social issues facing the practicing engineer are discussed. However, the primary focus is on improving the students’ writing and presentation skills.

These skills come in handy in years two and three, when technology is placed within a larger world in such courses as Technology and Social Change in 19th-Century America; Religion and Technology; and Technology, Aggression, and Peace. And in a two-semester course with a thesis, seniors are asked to examine ethical questions that may crop up when a system is first being designed or a research project is just getting under way. The goal is for students to come away with an ability to recognize and analyze the role that technology plays in important contemporary issues, to appreciate perspectives that differ from their own, and to apply these skills in solving engineering problems. The course also focuses on late-stage ethical issues. These turn up when a system is further along in design—or has already been built.

Many schools offer freestanding ethics courses as electives to fulfill a humanities or writing requirement, while some introduce ethics in the senior year, as, for example, a one-credit section of a required design course. At Texas Tech University, in Lubbock, the faculty is of at least two opinions. Each engineering department has developed its own method of presenting ethics. The civil engineering department, for example, does it in a two-credit-hour engineering ethics course. The electrical engineering department presents seminars and workshops on ethics, but oddly enough, students aren’t obligated to attend.

**TEACHING TEACHERS** Some schools believe it best to weave the discussion of ethics into the standard engineering curriculum. But one challenge has been teaching the engineering faculty how to present the topic, with which they may not be familiar, along with the... (Continued on page 14)
technical material. As Kevin Passino, an IEEE Fellow who teaches a required engineering ethics course at Ohio State University, in Columbus, puts it, “We can jump up and down and say ethics is important to engineering education, but if there are no faculty willing to teach the subject, it’s not going to happen.” Notes Jimmy H. Smith, director of the Murdough Center for Engineering Professionalism at Texas Tech, “[That’s] why we’ve developed materials to help them discuss ethics.”

Smith, along with instructors at Texas Tech, the Illinois Institute of Technology, Western Michigan University, and Notre Dame, worked to develop teaching materials and to hold workshops for engineering faculty, thanks to grants from the U.S. National Science Foundation (NSF). The workshops are aimed at easing the concerns of teachers about conducting ethics discussions or about the difficulty of shoehorning such discussions into already overcrowded syllabi. Notre Dame’s Bowyer, who also teaches a required ethics course, has led NSF-sponsored workshops such as Teaching Ethics and Computing, so instructors will be comfortable dealing with ethical concepts in their lectures. “I hope it isn’t the case that [a required course] is the only place we talk about this,” he says. “To collect this material for a single course and then not touch on it in any other course sends students the wrong message—that ethical and professional considerations are something that can be compartmentalized.”

THE INSTITUTE’S ROLE The IEEE is doing its part to help improve students’ understanding of their ethical duties as professionals. Last January, the institute introduced the ethics competition developed by the EMCC. The competition provides students with experience in applying these concepts to situations that might arise in the workplace. The competition requires two- or three-person student teams to apply ethical concepts to a case study that focuses on any of several issues: public safety and welfare, conflict of interest, ethical dilemmas related to research, or faulty engineering practice.

The committee provides the materials that set forth the problem and guide the teams in their decision making. Materials include the IEEE Code of Ethics and case studies. The first (and only to date) competition was held at Rowan University, in Glassboro, N.J., during Region 2’s (Eastern United States) Student Activities Conference in April. [See “Temple University Wins First IEEE Ethics Competition,” July 2005.]

Gerald H. Peterson, a member of the EMCC who helped develop the ethics contest, reports that representatives of nearly all IEEE regions have expressed interest in holding student competitions. Peterson notes too that the contest is applicable worldwide.

Says Member Shreekanth Mandayam, an associate professor of electrical and computer engineering at Rowan, “Such competitions are probably one of the best ways to teach ethics. The contests can be fun; they get students to think creatively, and the students try to win.”

The IEEE also discusses ethics with students at its Student Professional Awareness Conferences, or S-PACs. Organized by student branches, these meetings bring together students and experienced engineers to talk about, among other topics, professional ethics and responsibility, and engineers and public policy.

The S-PAC Web site (http://www.ieeeusa.org/volunteers/committees/S-PAC) contains information on how to organize such a conference. It also has a list of volunteer speakers organized by topic and region and regional contacts who can be called on for advice. Speakers are available who can deliver talks on topics including “Individual and Corporate Responsibility” and “Shades of Gray: Practical Solutions to Ethical Dilemmas.”

One such speaker, Walter L. Elden, a life senior member, shared his insights on ethics and the engineering profession earlier this year at S-PACs at the Florida Institute of Technology, in Melbourne, and the University of Central Florida, in Orlando. He says he tries to make the students aware of their responsibility to be more than just “widget designers.” He wants to “focus their attention on how their creations will be used so they will consider, ‘Hey, maybe there are some consequences in design that I haven’t thought about.’”

Great
IEEE Credit Cards Around the World

The MBNA Credit Card for IEEE members in Canada, Hong Kong, Puerto Rico & the U.K

• Low annual percentage rates
• No annual fees
• High credit limits
• Every purchase helps support ongoing IEEE initiatives!
• And many other great benefits!

Sign up today:
www.ieee.org/fap

The IEEE Financial Advantage Program®
Tools to Secure Your Tomorrow

Great
IEEE Credit Cards Around the World

The MBNA Credit Card for IEEE members in Canada, Hong Kong, Puerto Rico & the U.K

• Low annual percentage rates
• No annual fees
• High credit limits
• Every purchase helps support ongoing IEEE initiatives!
• And many other great benefits!

Sign up today:
www.ieee.org/fap

The IEEE Financial Advantage Program®
Tools to Secure Your Tomorrow
HISTORY

Voices of Innovation:
The IEEE’s Oral History Collection

BY ROBERT COLBURN
IEEE HISTORY CENTER

THERE IS NOTHING quite like learning about a technological breakthrough from the
person who made it happen. A first-person account of how the inventor of the laser,
Charles Townes, realized while sitting on a park bench that chromium found in rubies
could focus light molecules into a high-energy beam adds an exciting facet to engineering
knowledge. Likewise, reading the explanation by one of the Internet’s creators, Paul Baran,
of why he set up the routing architecture the way he did adds a little extra to an engineer’s
understanding of present-day technology. These are just two of the electronics pioneers
whose oral histories—written transcripts of interviews with technology’s best and bright-
est—are on file at the IEEE History Center.

“Oral histories are special, because you’re reading a personal account,” says senior
research historian Rik Nebeker of the IEEE History Center, located on the campus of Rut-
gers University in New Brunswick, N.J. “These people lived through something
important, and they’re telling us how they experienced it. Details that otherwise would
not get into the historical record—blind alleys, mistakes, and disappointments—often are
found in oral histories.”

The IEEE History Center has developed more than 400 oral histories, a collection highly
regarded by IEEE members and technology scholars and historians, according to Nebeker.
More than half of these histories are in documents that can be downloaded from the History
Center’s Web site, and more are being added all the time. Transcripts of the rest are on file at
the center’s offices.

Oral histories often are part of a collection, such as
the IEEE Merger History Interviews, which were con-
ducted in 1979 to capture the details behind the merger
of the IEEE’s predecessor societies: the American Insti-
tute of Electrical Engineers and the Institute of Radio
Engineers. Another collection, the Japanese Oral His-
tory Interviews, was a joint project between the IEEE
History Center and the history committee of the Insti-
tute of Electrical Engineers of Japan to capture the
reminiscences of prominent Japanese engineers.

The RCA Engineers Interviews focus on the pio-
near ing engineers who worked at RCA back when it
was known as the Radio Corporation of America, and
who developed many of the systems needed for television. In the Frederick E. Terman
Associates collection, colleagues
and former students reflect on the work of that influen-
tial Stanford University professor, one of the founders of Stanford Industrial Park, an important seed for the
sprouting of Silicon Valley. To celebrate the 50th anni-
versary of the wartime founding of the Massachusetts Institute of Technology’s Radiation Laboratory, Rad Lab Inter-
views include a series of oral histories collected in 1991
that deal with the work of the lab on wartime radar.

Oral histories may also offer a lively, inside view of
events with unexpected insights seasoned with the engi-
neer’s humor and perspective, points out Nebeker. Such
interviews provide the backbone—and often the voice and
human element—for many historical articles and books.
For example, IEEE oral histories were instrumental in the
writing of The Marconi Century [Marconi Foundation, 2004], which I wrote. The book describes the work of the innova-
tors behind the telecommunications achievements of the
last 100 years. Oral histories also played an important role
in the writing of Profiles in Engineering Leadership by Greg
Swedberg [Eta Kappa Nu, 2004], a collection of biogra-
phical sketches depicting eminent members of Eta Kappa Nu,
the engineering honor society.

With engineers from all over the world represented,
the IEEE History Center’s oral history collection reflects
the IEEE members’ technical and geographical breadth.

Among the histories in the center’s collection are those
of the radio pioneer Alfred Goldsmith [see photo], an
Institute of Radio Engineers founder, and Russian tele-
vision innovator Vladimir Zworykin. Those interested
in early computing can learn about it through the words
of German computer trailblazer Conrad Zuse and Ita-
lian microchip inventor Federico Faggin. If you’re curi-
ous about the entrepreneurial spirit, you can read the
oral history of William Hewlett of Hewlett-Packard or of
implantable pacemaker inventor Wilson Greatbach.

Internet enthusiasts can peruse the tales of
Internet pioneers Vinton Cerf, Robert Kahn, and
Leonard Kleinrock and British World Wide Web
inventor Tim Berners-Lee.

In 2004, volunteers in the United Kingdom
and Republic of Ireland Section began conducting
oral histories of prominent defense scientists and
engineers such as radar engineer Kenneth Slater
and command and control systems pioneer Ralph
Benjamin. These interviews are part of the IEEE
History Center’s collection.

MAKING HISTORIES

An oral history begins when a
technical society or other IEEE unit, such as a sec-
tion, calls the History Center’s attention to an electrical or computer engineering pioneer whose
memories and experiences should be preserved.

Or a group may request that an oral history be
included in a project celebrating the group’s
anniversary or as part of a history book it pro-
poses to publish. For example, when the IEEE
Communications Society celebrated its 50th
anniversary, it commissioned a series of oral his-

The completed transcript is then published in a book,
newsletter, or monograph—a long, scholarly paper on a
single subject—and posted online. Not only professional
historians but journalists, biographers, and IEEE mem-
bers interested in the history of engineering and tech-
nology also find the IEEE oral histories useful.

Transcripts of the IEEE History Center’s oral his-
tories can be downloaded from http://www.ieee.org/
organizations/history_center/oral_histories.html.

The interview, which is taped, can last anywhere from
90 minutes to many hours spaced over three days. The
History Center staff edits a transcript of the interview for
flow and consistency, then sends it to the subject, who
make clarifications or add more details that could
make the piece more interesting to historians.

The completed transcript is then published in a book,
newsletter, or monograph—a long, scholarly paper on a
single subject—and posted online. Not only professional
historians but journalists, biographers, and IEEE mem-
bers interested in the history of engineering and tech-
nology also find the IEEE oral histories useful.

Transcripts of the IEEE History Center’s oral his-
tories can be downloaded from http://www.ieee.org/
organizations/history_center/oral_histories.html.

The oral history of radio pioneer Alfred Goldsmith, pictured here in 1938,
is one of the 400 available from the IEEE History Center’s collection.
BY MOSHE KAM

THE CAMPAIGN TO ATTRACT women to American law schools had really taken off by the early 1970s. The American Bar Association and state legislatures in the 10 largest states took it upon themselves to double the percentage of female lawyers in a decade. The slogan for the campaign was “20 Percent by 1980.”

Civil leaders, entertainers, and politicians took part in the well-financed campaign to inform girls and young women about the virtues of the legal profession. They highlighted the contributions made by lawyers, judges, and legal scholars to programs involving equality, social justice, and welfare. They publicized the professional and economic rewards of becoming a patent lawyer or a judge. The long-running TV series “Defender of the Damned” highlighted the life and times of Gladys Towles Root, the controversial 1920s Los Angeles lawyer. It was a runaway hit during the 1974 to 1978 seasons, and gave rise to the equally successful TV series on the life of the first black female lawyer in the United States, Charlotte E. Ray.

There were numerous lectures in schools, and public events were held in large and small towns alike. Lawyers and judges descended on schools in their local communities to make presentations to eager female students and to provide the ever-so-needed “human side” of the story. Governors declared “Woman Jurist Day” in state after state. Bus, newspaper, radio, and TV ads promoted “legal summer camps” for girls, heavily subsidized by local bar associations and large corporations. By the time U.S. President Reagan introduced Sandra Day O’Connor to the nation in 1981, as the first woman to be appointed to the U.S. Supreme Court, the leaders of the campaign could point to great successes everywhere.

The percentage of female lawyers doubled in three years (from 9.5 percent in 1971 to 20.1 percent in 1974). By 1981 it was 35.8 percent, certainly better than the original plan of “20 Percent by 1980.” By 1996, the percentage climbed to 44.4. Strong gains for women were recorded in the leadership of the legal profession— the percentage of women among the ranks of federal judges, law school full professors, and law firm partners has been rising steadily. Although some claims about discrimination and a salary gap between men and women in the law persist, there is no doubt that the scene has changed dramatically since the beginning of the public crusade.

If, after reading this, you are puzzled about some of my facts or have somehow missed the reruns of the ever-popular “Defender of the Damned,” I have a good explanation: the numbers I quoted on the increases in the last two decades, continues to be anemic. Between 1983 and 2000 the percentage of female engineers in the U.S. workforce rose from 5.8 percent just to 10.9 percent. The percentage of women receiving bachelor’s and master’s degrees in engineering has hovered at around 20 percent for several years (the Ph.D. fraction is about 17 percent). No matter how we look at these numbers and at related statistics, the conclusion is that we are not moving toward parity; by and large, we are not moving at all.

Not that we aren’t trying. The efforts to understand why young women do not choose engineering as a career path and the various programs designed to reverse the course are numerous. Between 1993 and 2003 the U.S. National Science Foundation awarded 211 grants under the Diversity in Science and Education program. Most of the grants addressed the disinclination of young women to choose engineering. A summary of the NSF-sponsored studies is said to include “helpful tips…about how to best encourage girls in pursuing science and engineering education and careers.” Yet those tips did not make any fundamental change. On average, 10 new Ph.D. dissertations are devoted to this subject every year.

One would expect that with such a growing volume of new work in this area, we would already have discovered some con-
women. This may sound heretic. However, when everything else fails (and I would argue that everything else has indeed failed), it may be time to address the curriculum problem directly rather than ignore it and try to hide it in glitzy propaganda campaigns (which women do not fall for anyway). One likely outcome may be that this new reengineered curriculum would also appeal to many talented men who are repelled by the same deficiencies of the current curriculum that have driven most women away.

Second, we need to work with industry and experts in occupational choices, labor, economy, psychology, and popular culture to develop new engineering workplace models. These models would be designed to be in better harmony with the tastes, sensitivities, lifestyles, and family obligations of the modern, educated middle-class woman. I realize this too may sound a bit of a style after all, we are supposed to enjoy full equality and exhibit unquestionable sameness by now. However, the reality is that with only 10 percent of engineers who are women, the engineering workplace is anything but equal. In other professions and occupations the workplace evolution has occurred naturally, shaped by market forces and social pressures. In engineering we may have to give it a little push.

If we (professional organizations, federal funding agencies, research institutions, colleges and universities, the engineering industry) insist on trying again and again the same formulas, studies, and campaigns that have disappointed us for 30 years, we are certain to get exactly the same unsatisfactory results. In that case it would be much more practical to acknowledge that engineering is for men only and move on to the next problem.
Digitizing Technology's History

IEEE Proceedings Is Going Online, Simplifies Searchability

BY EVAN KOBLENTZ

As NASA safety engineers prepared to return one of the grounded U.S. space shuttles to orbit earlier this year, what their peers had done in previous years was much on their minds. How had the shuttles been made safe when they first began flying decades ago?

For answers, they called on Proceedings of the IEEE, literally NASA contacted managing editor Jim Calder and asked him to send a number of safety-related papers published in the early 1980s, which he gladly did. One topic stands out—a discussion of extravehicular activity. Though no mission outside the shuttle had been planned before the Space Shuttle Discovery was lofted into orbit on 26 July, an extravehicular trip was needed to repair damage that had occurred during liftoff to tiles critical to the shuttle's safe reentry.

Now, however, you don't need a direct line to the managing editor to obtain the older papers from Proceedings, a monthly that publishes research, tutorials, and reviews of electrical and computer engineering technology. In July, the remaining full text of about 12,000 articles dating from 1963 to 1987 was digitized; the more recent issues had been digitized earlier. This makes it possible to search all issues of Proceedings from 1963 to the present by using IEEE Xplore, the institute's digital library.

Users can search through full texts and look for keywords or phrases, or they can search by abstract, author, document title, index terms, or the year an article was published. The IEEE Foundation has given US $250,000 to fund the digitization of issues dating back to 1913, an exercise that is not yet complete.

Most searches are not matters of life or death like NASA's, but clearly an article's accessibility is not just an academic issue, says Calder. "There is a practical component to every article, and that practical component may last longer than we realize," he says.

"To EEs and computer engineers, the Proceedings represents a crucial part of their professional heritage and technical identity," notes Proceedings editor-in-chief Fawwaz Ulaby. "Its pages contain the very foundations of the electronic world of today, affecting every aspect of our way of life, from the way we transact business to the way we communicate and travel."

Most articles fall into one of seven categories: circuits and devices; computers; communications; signals, systems, and control; electromagnetics; energy, power, and industry; and engineering and human environment. But nearly every issue has an article of historical significance.

"The more I read through Proceedings, the more incredible people I find as authors. There are, without exaggeration, a thousand significant authors included in this collection," Calder says.

For example, in January 1949, Claude E. Shannon, considered the founding father of information theory, wrote "Communication in the Presence of Noise," which many historians credit as having defined information technology as a distinct field of research. Three decades later when IBM introduced the modern architecture of the AT model of its personal computer and Apple introduced its Macintosh, Hewlett-Packard cofounder William Hewlett and microchip inventor Robert Noyce each wrote an article about the importance of PCs for the March 1984 issue of Proceedings. Hewlett's was "The Design and Development of a Family of Personal Computers for Engineers and Scientists," and Noyce's, "A Processor Family for Personal Computers."


Transistor inventor William Shockley, who was Noyce's and Moore's boss early in their careers, also took a historical approach when he contributed "The Path to the Conception of the Junction Transistor" [July 1976]. Kenneth Wilson, a physicist awarded the Nobel Prize for work on phase transitions in bulk matter, called on the U.S. National Science Foundation to fund work on networks and supercomputers in "Science, Industry, and the New Japanese Challenge" [January 1984], which promoted work that led to the Internet.

Other highlights of the newly updated online archive cover communications devices. In "Optical Masers—Workhorse or Playboy: The Present Status and Prospects for Optical and Infrared Masers" [March 1963], physicist Charles Townes wrote about the microwave ancestor of the laser. Charles Sandbank, a pioneer in fiber-optic communications, coauthored "New Interconnection Techniques for Multichip and Hybrid Integrated Circuits" [December 1964], which discussed ways of making semiconductor connections, and also wrote "The Evolution Toward High-Definition Television" [April 1985].

Standards for television also had an airing in Proceedings. Donald Fink, Philco scientist and former president of the Institute of Radio Engineers, one of IEEE's predecessor societies, and later general manager of the IEEE, wrote "Perspectives on Television: The Role Played by the Two NTSCs in Preparing Television Service for the American Public" [September 1976]. (NTSC stands for National Television System Committee, the group responsible for TV and video standards in the United States.) In June 1984, Vladimir Zworykin wrote about the first all-electronic TV camera he had invented in "The Iconoscope—A Modern Version of the Electric Eye.

Karl Jansky, known as the father of radio astronomy, told what had been on his mind when he was investigating radio signals that did not originate on Earth in his "Electrical Disturbances Apparently of Extraterrestrial Origin" [June 1984]. And J. R. Pierce, who was director of electronics research at Bell Telephone Laboratories, foresaw the importance of satellite communications in his "Trans Oceanic Communications by Means of Satellites" [December 1984], and then discussed telecommuting in "Communication As an Alternative to Travel" [April 1999].

Issues from 1913 to 1962 will be posted next in IEEE Xplore, with all Proceedings expected to be digitized by mid-2006. Archives may also be digitized from the Boston-based Society of Wireless and Telegraph Engineers and the New York City-based Wireless Institute, which merged in 1909 to form the Institute of Radio Engineers. Authors from that early period include Lee DeForest, Thomas Edison, and Guglielmo Marconi.

Proceedings of the IEEE is available through IEEE Xplore to members with a subscription and to subscribers to the IEEE/IEEE Electronic Library, which provides access to all IEEE online publications. To view the tables of contents of Proceedings in IEEE Xplore, visit http://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=5.
Organize Tours to Technical Facilities

BY KATHY KOWALENKO

Engineers are an inquisitive lot; they like to know how things work. The IEEE’s local organizations can help feed that curiosity by arranging tours of nearby technical facilities, such as manufacturing and electric power plants, satellite ground stations, and telecommunications facilities. Members—and non-members, who are also welcome to come along—learn about equipment they may have wondered about, and they may also have the opportunity to meet with an organization’s top management, which sometimes can even lead to a new job.

Senior Member Ghatt Khazami sees the tours not only as educational but also as a way to boost his membership. Nonmembers who take the tours have been impressed enough to wind up joining the institute, he says. Khazami has arranged several tours as chair of the Florida West Coast Section’s IEEE Power Engineering and Industry Applications societies’ combined chapter. Most of his tours are free; if food is provided, a nominal fee is charged.

The section arranges about four tours a year of facilities in and around Tampa, Fla. This year’s visits included a couple to manufacturing plants, General Electric’s instrument transformer plant in Tampa and its power transformer plant in nearby Bradenton. Each tour draws an average of 30 people.

The engineers aren’t the only ones who benefit from the tours, adds Senior Member Tom Blair, the combined chapter’s vice chair and the section’s membership development chair. The companies get to know some of the local engineering talent, he notes. “It’s a good networking opportunity both ways,” he says. “And the engineers get to learn about the businesses and the technologies involved in running the facilities.”

CHOOSE A SITE It’s usually the job of the chapter chair, a section’s membership development chair, or the councilor of a student branch to organize visits, which should have an engineering or technology bent. But it’s not a one-person job, according to Blair.

“Organizing a tour is a team effort, from choosing the venue, picking the date, and contacting the company to arrange things to publicizing the event on our Web site and in our newsletter and taking registrations,” Blair says. Most organizers take registrations via an online form, but some use the telephone or e-mail.

Members are asked to suggest venues, but more often than not the organizers end up scouring local newspapers looking for announcements of a “grand opening” of a new plant, high-tech upgrades to existing facilities, or local engineering issues being discussed in articles. Tour organizers also tap their co-workers, friends, and relatives for ideas on places to visit.

Tours are NOT ONLY EDUCATIONAL but also a way to boost membership

Senior Member Alan Storms decided on a tour of the Brayton Point Power Plant, in Somerset, Mass., after reading an article in a local newspaper about the operation of this largest fossil fuel–burning plant in the Northeast. Storms is the membership development chair of the Providence (R.I.) Section, which has about 1,500 members. “I disagreed with the treatment Brayton was getting in the press, so I wanted our members to see for themselves how the plant was run,” he says. “The tour was educational; there was no attempt to try to influence anybody.”

It turned out to be the section’s most popular trip, attracting 45 members and guests. The visitors learned what it takes to run a coal-burning plant, the impact of the U.S. Clean Air Act on the company’s operations, and how the plant was trying to meet the government’s emission limits. Many on the tour came away with a more positive view of the plant, according to Storms.

For another visit, Blair, of the Florida West Coast Section, found out through friends that the Bay News 9 TV station in nearby St. Petersburg had recently installed robotically controlled cameras to replace ones operated by humans, so he organized a visit to the studio.

“The station manager gave us a tour of the control room and showed us how its robotic cameras work,” says Blair. “Members of the general public would not get to see this.”

TIMING IT RIGHT Scheduling the tour at the right time of day, and occasionally even the right time of year, can affect attendance. For example, Florida West Coast’s nronmentally friendly operations of its Green Substation, and the Power Quality Center.

The IEEE student branch at the Universidade Estadual Paulista in Bauru, Brazil, has attracted a goodly number of attendees by scheduling a plant visit as a special event during the school’s Engineering Fair Week, a celebration to recognize contributions made by engineers to society. The branch chartered a bus for three days in May to take 38 students to southern Brazil, where they visited the Itaipu hydroelectric plant, the largest in the world, and its Furnas electricity distribution plant. In August, the group visited the Barra Grande sugar and alcohol factory in Lençóis Paulista, which produces electricity from sugar cane waste.

“Students like these visits because they get to see the real world,” says Natalia Reolon dos Santos, the student...
branch’s chair, who spent three months organizing the visits. “They’re also in contact with professionals, people they probably wouldn’t have the opportunity to meet until after they graduate.”

For students, plant tours offer an inside look at how technologies they’re learning about in school are applied in real life. “Tours give students an opportunity to enhance their practical knowledge of the exciting work going on in the fields they’re studying,” says Adnan M. Qureshi, chair of the newly formed IEEE student branch at the Institute of Space Technology, Islamabad, Pakistan. Through the branch’s “A Day With an Engineer” program, the six visits this year attracted a total of about 150 student members. One tour went to the country’s telecommunications and aerospace facilities, which are off-limits to members of the general public.

In Bangladesh, Asif Islam Khan, chair of the IEEE student branch at Bangladesh University of Engineering and Technology (BUET) reports that plant tours can boost students’ career prospects because companies use the tours as recruitment opportunities. “Companies often recruit students who are about to graduate to full-time positions,” Khan says. “And sometimes, students are asked to work part-time at the company while they’re going to school.”

Tours that BUET arranges usually draw about 40 students. So far this year, student members have visited the Talibabad earth satellite station, the Haripur power plant, and the offices of SITA, an international society devoted to aeronautical telecommunications. “The tours are at the heart of making the IEEE BUET branch popular among students,” Khan says. “And the tours help them become enthusiastic about the different fields of electrical engineering.”

Financial-Planning Discounts Available to U.S. Members

IEEE members in the United States can now receive member negotiated discounts on estate, life, retirement, insurance, and college financial plans from Grogan Financial Planning Services.

Members: Sign up for your free portfolio review!

To learn more, visit: www.ieee.org/fap

The IEEE Financial Advantage Program®
Tools to Secure Your Tomorrow
THE FOUNDATION

Support the IEEE Foundation With an Estate Gift

BY KAREN GALUCHIE

There are many ways members give back to the IEEE. Some donate their time by holding volunteer executive positions, writing articles for IEEE publications, or teaching young students about engineering. Others donate money to the IEEE Foundation, the IEEE’s philanthropic arm, which supports projects that promote public awareness of engineering’s long-reaching effects, bring the excitement of scientific discovery to young students, foster technological innovation, and preserve history.

Last year, more than US $1 million was donated to the foundation. Nearly $100,000 of that amount came from members who had designated contributions from their estates upon their deaths. For example, Life Fellow Charles “Bud” Eldon, 1985 IEEE president, has earmarked a gift in his will for the foundation. He has a number of reasons for doing so.

“My diverse assignments for the IEEE and for the foundation have made me extremely proud of their many contributions,” he says. “Both offer innumerable opportunities for IEEE members and for society at large to understand and benefit from our technology—and to learn about those who have created it.”

After IEEE Member Jaclyn Spear served a one-year stint as an IEEE-USA Congressional Fellow, she made a bequest in her will to the IEEE-USA Government Fellows Program. IEEE-USA sponsors fellowships for members to spend a year in Washington serving as advisors to the personal staff of a senator or representative, or to the professional staff of a congressional committee. Fellows learn firsthand about the public policy process through their personal involvement.

“Through this gift, I know I will be helping to ensure that other IEEE members are afforded the same opportunity that I had to participate in the unique experience of serving as an advisor to the U.S. Congress,” Spear says.

If the IEEE has made a difference in your life and if you believe in the importance of furthering the scientific and educational goals of the institute, consider making a planned gift to the foundation through your estate. Typically, gifts are included in:

- **Wills and Living Trusts:** These allow you to bequeath a fixed sum or a percentage of your estate to the foundation, a specific IEEE program, or an IEEE entity, such as a society, for which you have a special affinity. Or consider arranging for the foundation to receive the amount left in your estate after all other bequests have been made.
- **Retirement Plans:** Designating non-spouse beneficiaries—such as children—as the heirs of a U.S. retirement plan makes them subject to estate taxes and also responsible for paying income tax on the funds they withdraw from the plan. To avoid this double taxation, which can add up to as much as 70 percent of the assets, consider naming the foundation as the beneficiary. You can make gifts to your heirs from other assets not subject to income tax.
- **Life Insurance:** If you have a life insurance policy, consider transferring the policy’s ownership to the foundation or naming it as a beneficiary. Or think about purchasing a new policy and naming the foundation as the owner and beneficiary.
- **Charitable Remainder Trusts:** With these, you put cash, securities, or other highly appreciated assets in an irrevocable trust. The trust then provides income payments of at least 5 percent annually to you or another beneficiary. Depending on how you set up the trust, these payments will continue for a defined period or until the death of the beneficiary. At that time, the remaining assets are transferred from the trust to the IEEE Foundation.

The IEEE Foundation is a tax-exempt U.S. organization, and contributions are tax-deductible in the United States. Taxation laws on charitable contributions vary in other countries.

Whatever your goals, the IEEE Foundation’s Development Office will work with you to ensure that your charitable objectives correspond to your financial, tax, and estate plans. Contact the development office at +1 732 562 3860 or by e-mail: supportieee@ieee.org.

THE GOLDSMITH LEAGUE

Named for Alfred N. and Gertrude Goldsmith, the Goldsmith League is composed of individuals who have left gifts in their wills to the IEEE or the IEEE Foundation or who have expressed the intention to do so.

Alfred N. Goldsmith, a founder of the Institute of Radio Engineers, one of the IEEE’s predecessor societies, made a personal commitment to further the goals of the profession during his lifetime. He perpetuated that commitment by providing a bequest to the IEEE Foundation, presented after his death in 1974. His wife, Gertrude, who died in 1988, honored her husband’s wishes, making the IEEE Foundation the beneficiary of a generous portion of her own estate. Together their gifts furnished significant seed money for the foundation’s support of philanthropic activities.

Membership in the league is open to any individual who makes a bequest or expresses the intention to make a bequest to the IEEE or the IEEE Foundation. Details of the bequest are kept confidential; donors who wish to remain anonymous will not be included in the published list of Goldsmith League members.


MEMBER RECOGNITION

Communications Expert Receives Gennai Prize

BY SHAZIA MEMON

IEEE SENIOR MEMBER Fuji Ren’s work to develop software that interprets people’s facial expressions and, from that, their emotions has earned him the Gennai Prize from the Ozaki Foundation of Japan. The foundation presents this award for creative research or invention in the fields of electronics, information, or telecommunications. The prize consists of a certificate of merit and 500,000 Japanese yen (approximately US $4500).

A professor and the chair of the Department of Information Science and Intelligent Systems at the University of Tokushima, in Japan, Ren has applied his research to so-called affective computing, which deals with communication between people and computers. One practical application of his research has been to give people with impaired speech the ability to express their feelings more clearly through a computer that can recognize their facial expressions and voice patterns. He hopes that by incorporating emotion in the human-computer interaction, his work will benefit the healthcare industry and social services. “When I look at the recent developments in communication technology, I feel more and more that there is a necessity for emotion to work its way in,” he says.

To that end, he’s created a mental state transition system that allows researchers to simulate changes in a person’s mental and emotional state through software. This is the software that analyzes a person’s facial expressions, words, and speech patterns to recognize emotion. TEAMWORK Ren credits the research team he formed in 2001, at the university’s Faculty of Engineering with helping him create the system. The six-person team focused on aspects of the human mind and the development of a program that could carry out the process of emotional communication. The group, which eventually grew to 46 students, analyzed information contained in brainwaves, voice and speech patterns, and facial images. It also evaluated statistical data based on the latest results of neurological and psychological studies. The program the group designed uses the data to recognize human emotion and then relays the results to a computer. Ren donated the prize money to his university because it helped him “develop our project, and I wanted to set a good example for our students,” he says: “They give me energy and make me stay interested in my research.”

Seeing the number of his students expand and their interest grow over the years has motivated Ren to continue his work. Currently he leads four research projects that are trying to establish additional methods of communicating emotion and delve further into the world of natural-language processing. The latter field involves the study of problems inherent in the processing and manipulation of natural language as it is spoken by humans for general-purpose communication, as opposed to computer-programming jargon.

Ren received both his bachelor’s and master’s degrees in computer science in 1982 and 1983, respectively, from the Beijing University of Posts and Telecommunications. In 1991 he received a doctorate in natural-language processing from Hokkaido University, in Sapporo, Japan.

IN MEMORIAM

Berthold Sheffield

Communications Pioneer

BY DONALD CHRISTIANSEN

THOSE OF US WHO KNEW Berthold Sheffield well could be confident that any job he undertook would be done with great diligence and attention to detail.

Bert, an IEEE life senior member, was born in Heilbronn, Germany, in 1910, and came to the United States with his parents when he was 13. As a youth he read accounts of Heinrich Hertz’s and Guglielmo Marconi’s work, and at 19 was personally congratulated by RCA Chairman David Sarnoff when he won the Sarnoff scholarship for fledgling radio operators. He often recalled trying times as a radio operator aboard a freighter that plied its way in rough seas between Norfolk, Va., and New York City.

When Bert joined RCA in 1937, he hardly imagined that it would be a relationship that would last nearly four decades. During that time he earned a degree from the Polytechnic Institute of Brooklyn (now Polytechnic University) and did graduate work in mathematics and modulation theory. Whenever his ideas were in conflict with those of his colleagues, he would clearly express them—but always in a dignified and gentlemanly manner. Asked to review a book or technical manuscript, Bert would read it thoroughly and, if questions of authenticity or accuracy arose, he would be sure to carefully document his concerns. On more than one occasion, he had been heard to say “I’d rather speak to the author directly on this one,” wanting no deterioration of communication through an intermediary.

His projects at RCA were wide ranging, including many in the field of satellite communications. But the one that most fascinated him resulted in his design for the first centralized traffic control system for a railroad using radio to operate both signals and switches. The successful installation, which took three years, was made for the Orinoco Mining Co., in Venezuela, a transporter of iron ore from mine to ore-carrying ships on the Orinoco River and, ultimately, to U.S. steel refineries in Pennsylvania.

When he retired from RCA in 1973, Bert consulted for the RCA Space Center and others, including MCI and Western Union. He also taught telecommunications courses at Mercer County Community College, in West Windsor, N.J., and the College of New Jersey in Ewing. His teaching skills were recognized by his students and by the College of New Jersey when it honored him with the Distinguished Adjunct Professor Award in 1996.

Bert joined the IEEE as a student member in 1930. He published numerous papers and contributed to several books. He was active as a member of Eta Kappa Nu, the electrical engineering scholastic honor society. Many of us knew him best as a colleague on the Eta Kappa Nu Outstanding Young Electrical Engineer Award and Vladimir Karapetoff Award committees, where his conscientious evaluation of candidates was unmatched.

His colleagues may disagree as to whether “gentleman engineer” or “engineers’ engineer” best fits Bert. The point is moot. Either is apt. Donald Christiansen, an IEEE Fellow, editor emeritus of IEEE Spectrum, and an Eta Kappa Nu Eminent Member, served with Sheffield on the society’s committees.
## AWARDS

### Nominations Needed For IEEE Awards

The IEEE Awards Board invites IEEE Sections, Societies, and individual members to submit nominations for medals, recognitions, and prize papers that will be presented in 2007. The deadline for the board to receive nominations is 1 July 2006.

### IEEE MEDAL OF HONOR
For an exceptional contribution or an extraordinary career in the IEEE fields of interest.
Sponsor: IEEE Foundation

### IEEE JOHN VON NEUMANN MEDAL
For outstanding achievements in computer-related science and technology.
Sponsor: IBM Corp.

### IEEE HONORARY MEMBERSHIP
For meritorious service to humanity in IEEE's designated fields of interest.
Sponsor: IEEE

### CORPORATE RECOGNITIONS

#### IEEE CORPORATE INNOVATION RECOGNITION
For outstanding and exemplary contributions by an industrial entity, governmental or academic organization, or other corporate body, which have resulted in major advancement of electrotechnology.
Sponsor: IEEE

### IEEE SERVICE AWARDS

#### IEEE RICHARD M. EMBERSON AWARD
For distinguished service to the development, viability, advancement, and pursuit of the technical objectives of the IEEE.
Sponsor: IEEE Technical Activities Board

### IEEE PRIZE PAPER AWARD
For outstanding survey, review, or tutorial paper in any of the IEEE transactions, journals, magazines, or proceedings.
Sponsor: IEEE Life Members Committee

---

**FOR MORE INFORMATION** visit the Awards Web site at [http://www.ieee.org/about/awards](http://www.ieee.org/about/awards) or contact IEEE Awards Activities, 445 Hoes Lane, Piscataway, NJ, 08855-1331 USA; telephone, +1 732 562 3844; fax, +1 732 981 9019; e-mail, awards@ieee.org.
IEEE Member Digital Library

The information you need to succeed can be at your fingertips when you subscribe to the IEEE Member Digital Library.

- The only way for individuals to access any IEEE journal or conference proceeding
- 900,000+ full-text documents
- The latest online research, plus a 50 year archive for select titles
- Access to the top-cited publications you need to make your project a success

Power up. Learn more at: www.ieee.org/ieeemdl

Subscribe by 31 December — Get your first month FREE!