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IEEE FELLOW PARALLELS SOUTH KOREA'S GROWTH P. 8

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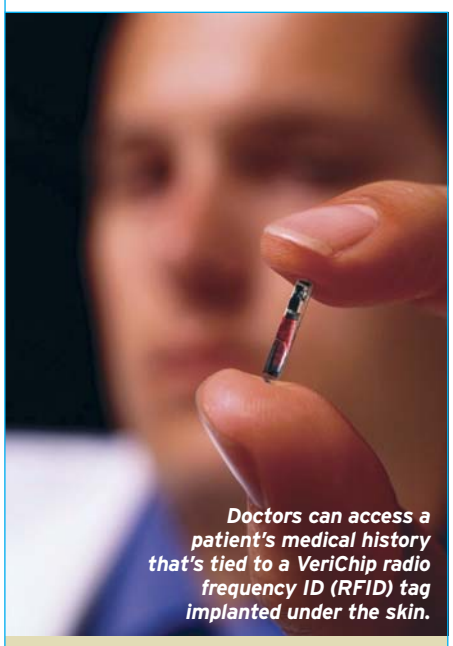

Doctors can access a patient's medical history that's tied to a VeriChip radio frequency ID (RFID) tag implanted under the skin.

RFID Tags Take Hold

IEEE plays role in the rise of wireless ID

BY WILLIAM LEVENTON

YOU MAY KNOW IT AS not-quite-new wireless technology that automatically collects highway tolls and controls access to buildings and offices. But IEEE members, publications, and events are helping to turn this bit of technical wizardry into a 21st-century dynamo that could banish the ubiquitous bar codes on products sold at retail stores and keep track of all manner of shipments, even blocking prescription-drug counterfeiters from selling their knockoffs.

The technology is known as radio-frequency identification, or RFID. How big will it be? It's sweeping across the industrial landscape, according to the program chair of IEEE Wescon 2004, held last September in Anaheim, Calif. The show focused its presentations and

[Continued on page 12]

INFORMATION FREE-FOR-ALL?

BY TRUDY E. BELL

IF OPEN ACCESS—a movement gaining momentum in academic publishing that proposes journal articles be made universally available online to all readers for free—becomes reality, the results could dramatically reshape the activities of all scholarly publishers, including the IEEE.

Three events last year rocketed open access from the realm of the hypothetical to that of a hard-nosed practical concern. In July the British House of Commons published a 114-page examination of academic publishing, which took to task well-known publishers (though not the IEEE) for charging libraries annual subscription rates of up to US $30 000 for a single journal. The Commons recommended that "all [United Kingdom] higher education institutions establish institutional repositories in which their published output can be stored and from which it can be read, free of charge, online."

In November Google launched www.scholar.google.com, a search engine that makes it easier to find academic publications in higher-education repositories as well as in researchers' private Web sites. And finally, in December, U.S. President George W. Bush signed into law an appropriations bill for the National Institutes of Health (NIH) that included the request that authors deposit a digital copy of the final version of a peer-reviewed journal article resulting from NIH-sponsored research into the NIH's public depository, PubMed Central.

These documents would be freely available no more than six months after the article is published in a paid-subscription journal. (Anyone wanting the information immediately would still have to pay for a journal subscription.) This request affects the IEEE, whose biomedical technology journals publish some NIH-sponsored research.

"Good or bad, open access is happening," declares John Vig, IEEE's 2005 Vice President of Technical Activities and the past chair of the Technical Activities Board's Strategic Planning and Review Committee. "It's not a matter of 'if,' but 'when.'"

Accordingly, the IEEE's Publication Services and Products

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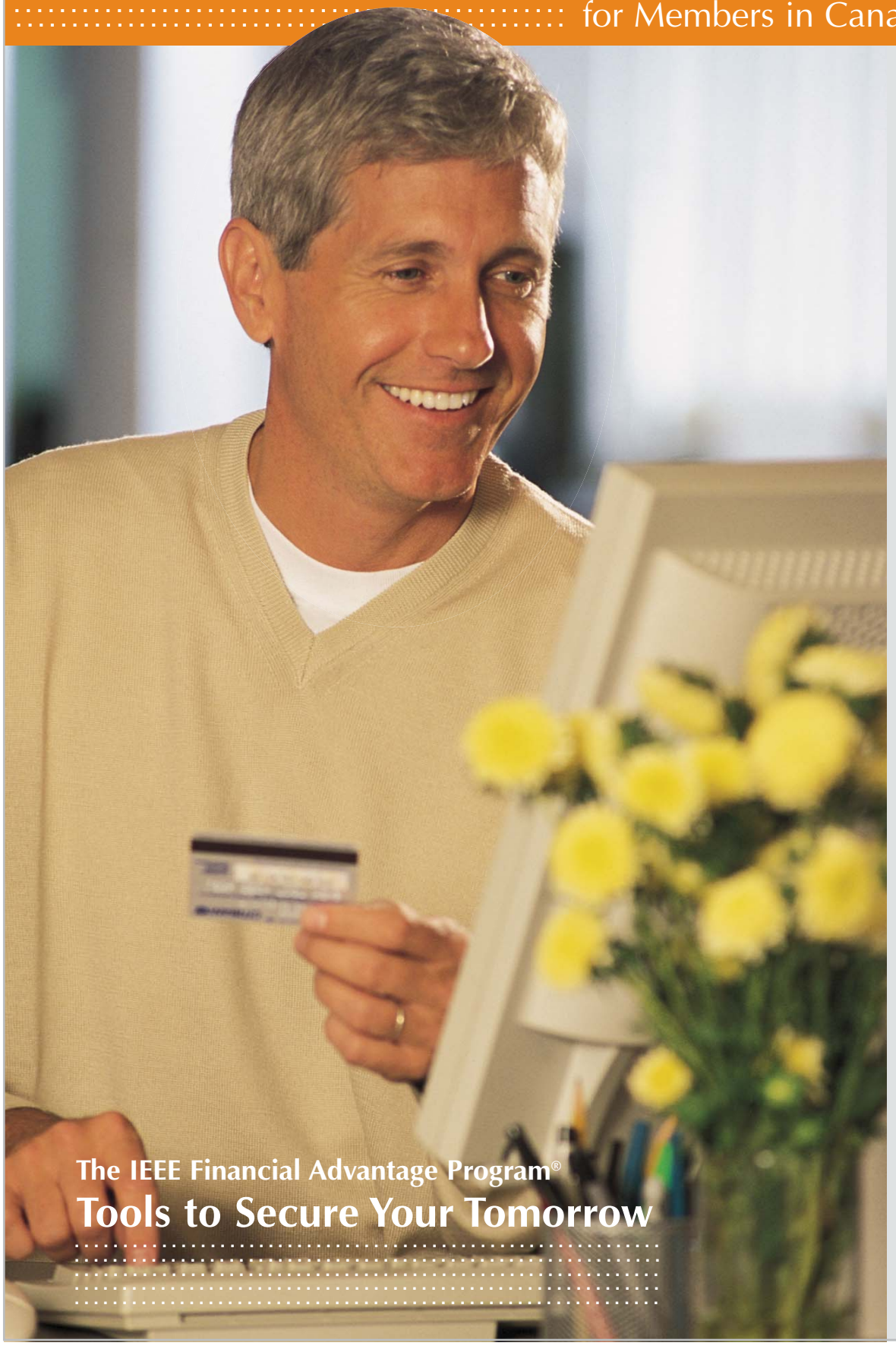

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PLUS **NEWS** The latest reader survey gives *The Institute* a thumbs up.

LOCAL ACTIVITIES In 2004, IEEE volunteers founded new sections in Lebanon, Morocco, and Qatar.

FEATURED CONFERENCE Learn about the latest in oil and natural gas drilling at the 2005 Offshore Technology Conference, 3–5 May in Houston.

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NEWS

FROM AROUND THE IEEE & THE WORLD

Speech Technology Pioneer Receives IEEE Medal of Honor

IEEE LIFE FELLOW James Flanagan is the recipient of the 2005 IEEE Medal of Honor for his contributions to speech technology. Among his achievements, he is credited with inventing autodirective microphone arrays, which help make speech signals clearer in noisy environments. The arrays are used, for example, in teleconferencing equipment. He also pioneered the use of computers for acoustic signal processing.

Flanagan has had successful careers in both industry and academia. He was director of information principles research at Bell Laboratories in Murray Hill, N.J., when he left in 1990 to join Rutgers University in New Brunswick, N.J. He is currently the university's vice president for research and director of its Center for Advanced Information Processing.

He began his career in 1957 with Bell Labs' research department and worked on digital communications and networked systems. As director of information principles, he was responsible for departments conducting research in digital communications and networked information systems. He also contributed to the development of signal-coding algorithms now widely used in telecommunications, voice-mail systems, and automatic speech synthesis and recognition.

In another project, he also started a distributed collaborative conferencing system called HuMaNet. The system uses speech-recognition software to allow conference-call participants to talk to one another via video and to control features of their computers, such as data and image displays, with spoken commands to a speech recognizer. The system allows workers assigned to the same project but in different locations to collaborate via a conference call and networked computers.

At Rutgers, Flanagan researched a multimodal interface to a computer for the U.S. National Science Foundation. Resembling the work at Bell, the goal of this project is to allow colleagues at different locations to interact via their computer screens. They would be able to move files on the screen using voice commands or by touch by means of a force-feedback glove that senses joint and finger motion. Flanagan is working to make those technologies more reliable. The interface also involves image-processing systems that track eye movements and can determine where a person's gaze is directed, and this might be applicable to interaction.

PROLIFIC AUTHOR Flanagan has published almost 200 technical papers in scientific journals, including the *Bell System Technical Journal*, the *Journal of the Acoustical Society of America*, and the *Journal of the Institute of Electronics, Information, and Communication Engineers*. He also wrote *Speech Analysis, Synthesis, and Perception* (Springer-Verlag, 1972), a textbook for researchers that is still in print after five printings and two editions.

In 1986 he received the IEEE Edison Medal "for a career of innovation and leadership in speech communication science and technology." In 1996 he received the U.S. National Medal of Science, the country's highest scientific honor for individuals "who are deserving of special recognition by reason of their outstanding contributions to knowledge in the physical, biological, mathematical, or engineering sciences."

He earned his bachelor's degree from Mississippi State University and his master's and doctoral degrees from the Massachusetts Institute of Technology in Cambridge, all in electrical engineering.

The Medal of Honor, sponsored by the IEEE Foundation, is the institute's highest award. It will be presented to Flanagan at the annual IEEE Honors Ceremony in June, in Chantilly, Va.

—Lindsay Elkins

Book from IEEE to Examine Electronic Voting Issues

THE IEEE HAS PARTNERED with VoteHere Inc., of Bellevue, Wash., to publish a book explaining how technology can enhance electronic voting.

VoteHere is a leading provider of security technology for electronic voting. The book, to be written by the company's founder and CEO, Jim Adler, will explore the technologies behind electronic voting, ballot verification, and vote auditing (better known as recounting).

Tentatively titled *Where's My Vote? A Framework for Securing the Electronic Ballot and Gaining Voter Confidence*, the book is scheduled to be released in August by the IEEE Standards Information Network, which publishes books and products directly related to standards. The IEEE is developing the IEEE P1583 Standard for the Evaluation of Voting Equipment.

—Lindsay Elkins

Two Candidates to Compete For 2006 President-Elect Spot

AT LEAST TWO CANDIDATES will be on the 2005 ballot for president-elect. The candidates were recommended by the IEEE Nominations and Appointments Committee and selected by the Board of Directors at its November meeting. The winner will succeed Michael Lightner whose term as IEEE president expires at the end of 2006.

LEAH JAMIESON is a professor of electrical and computer engineering 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 she cofounded the Engineering Projects in Community Service undergraduate program, which matches teams of engineering students with local community-service programs in order to define, design, build, test, and support projects that improve the community. One example is the university's partnership with the Wabash Center Children's Clinic, which works with the physically disabled. Purdue students helped deliver custom play-group software, including interactive programs to teach the sign-language alphabet.

An IEEE Fellow, 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.

GERALD PETERSON was a senior manager at Bell Laboratories' advanced technologies global strategic standardization department in Murray Hill, N.J., until he retired in February 2003. Peterson now advises Bell Labs on IEEE standardization matters.

He was the 2003 president of the IEEE Standards Association, and he served on the IEEE Educational Activities Board in 2003 and 2004. He also was on the IEEE Communications Society board of governors as a member at large from 2002 to 2004.

A senior member of the IEEE, Peterson has lectured on standards development processes at numerous educational institutions, including Stanford University in Palo Alto, Calif.; the University of Colorado in Boulder; and the U.S. Department of State Foreign Service Institute in Washington, D.C. He received degrees in electrical engineering from the University of Washington in Seattle and Rutgers University in New Brunswick, N.J.

The final version of the 2005 election ballot may also have the names of members who have successfully petitioned the membership to become candidates for 2006 president-elect. Each petition must be signed by at least 1 percent of eligible voting members and received by the IEEE Board of Directors by noon on 10 June. Ballots are scheduled to be mailed to members by 1 September.

—Lindsay Elkins

Agog Over Blogs

More and more people claim they get their news from the estimated 4 million Weblogs, or blogs. Do you read blogs? Why?

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. Your answers will appear in the June issue of *The Institute* and are subject to editing for brevity.

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RESPONSES TO DECEMBER'S QUESTION

Would You Be Willing to Travel to Space If Cost Were No Object?

Childhood Dreams

I think every kid dreams of being an astronaut; it's as common as wanting to be a fireman or cowboy. As I learned more about our universe through an engineering physics class in college, I became more fascinated with space. I recently saw a program about the *SpaceShipOne* project [the first workable "space tourist" vehicle] on television, and it is amazing that a small group of talented engineers could pull off a project that took the U.S. government thousands of people and countless billions of dollars.

NOAH SCHMITZ
Roseville, Calif.

Sign Me Up

Global space travel is a dream of mine, but why limit myself to this planet? Experiencing a new feeling—weightlessness—would give me a better understanding of the world around and above me.

The cost and safety of commercial space travel worry me. Eventually, cost will no longer be a problem, and safety codes will follow suit.

We went to the moon in the 1960s, and we should have continued this work. I would love to see more independent companies traveling into space. *SpaceShipOne*'s success gives me a lot of hope for the future.

KEVIN MIKA
Austin, Texas

Future Customer

I'd absolutely go into space if cost were no object. But that's the point: cost is and always will be an object for any commodity in limited supply. Burt Rutan, founder of Scaled Composites, which developed *SpaceShipOne*, and his team are trying to bring inexpensive space travel into the realm of an affordable vacation for most people. I salute their efforts and hope to be one of their many customers in the not-too-distant future.

MICHAEL POLAKOWSKI
Dayton, Ohio

Not Worth the Hassle

No, I wouldn't go, but the reason might be surprising. I have confidence in the *SpaceShipOne* engineers and wouldn't worry about safety. I wouldn't go because I think that the trip is too short for the hassle. I wouldn't want to go outside Earth's atmosphere just to see the great view for a few minutes and return. I'm going to wait another 20 years, until there is a spacedock, a space station like the International Space Station, that I can go up to and stay for a night.

NICK FOWLER
Brown Deer, Wis.

No Question

I would definitely go. I grew up during the Space Age. I remember being ushered into the auditorium in grade school to watch the Mercury and Gemini launches and landings on television. I stayed up late to watch astronaut Neil Armstrong step onto the moon. I waited and hoped with everyone as the damaged Apollo 13 managed to return to Earth.

I want to go into space. It is romantic, it is daring, and it is the chance to do something that only a handful have ever done before. The advent of *SpaceShipOne* and other vehicles now provides many like me the chance to realize those childhood—and adulthood—dreams.

ROBERT S. McGANN
Mechanicsville, Md.

LETTERS

Correcting the Piracy Problem

"IEEE Urges Changes to Online Piracy Bill" [December 2004, p. 1] says that "the costs of...copyright infringement have added up to a staggering US $19 billion worth of purloined work, according to U.S. entertainment industry groups." This analysis assumes that every person pirating music would have purchased a copy of a CD at full retail price if he or she didn't obtain one illegally. If we assume, on the other hand, that none of them would have purchased a copy, then the cost of pirated music is nothing. The truth is somewhere in between. The entertainment industry groups brandish these large numbers as a scare tactic.

The staggering figures of $19 billion worth of pirated music and 97 percent of music, movies, and games on the Internet illegally traded that were provided by the Recording Industry Association of America and other entertainment lobbies are self-serving estimates. These groups are, in fact, marketers whose sole purpose is to sell product. If you listen to them, you would believe that the real pirates are the youth of America and the world.

While I'm sure there are many kids ripping, burning, and sharing files, the real threat to the entertainment industry's livelihood comes from the organized pirates. These are the people who burn the entertainment industry's megahits, package them in formats of their own, and then sell them on street corners for half of what you would pay for them in a store.

MARK WALLACE
Lake Forest, Calif.

Ten years ago, it was knockoff cassette mixes in Saudi Arabia or CDs in Korea. Today, I can find DVDs with movies for sale on the streets of New York City, the beachfront boardwalks of Barcelona, or the back room of a small store in Dubai. It isn't kids who are producing these pirated copies in massive quantities. It is organized groups with access to software and hardware that normal, middle-class, American or European teenagers would not even consider spending money on. The problem needs to be addressed through international cooperation.

EDWIN MARTINEZ II
Stuttgart, Germany

More Complete Guidelines

The IEEE plagiarism policy expressed in "How to Handle Plagiarism: New Guidelines" [December 2004, p. 20] addresses copying or paraphrasing from publications written by others without giving credit. There should also be a clear statement about giving credit to others when information was communicated to you but not published, as when a paper was circulated and reviewed for publication but was rejected. Also, the policy should cover the crediting of e-mail communications and material extracted from a public Internet forum such as a Usenet newsgroup posting.

ANDY GLEW
Hillsboro, Ore.

Accessible to Everyone

I agree that continuing education is the main attraction of the IEEE, as stated in "Members Rate IEEE's Value" [December 2004, p. 17], but I believe [the institute is] missing an opportunity.

Tutorials and lectures are readily accessible to members in the Boston area, but not to those in central New Hampshire or other "remote" locations. It's not feasible for me to drive [160 kilometers] each way to attend a tutorial at the end of the workday. Why don't you record the lectures, with question-and-answer sessions, and put them on CDs?

I believe you could reach a much wider portion of the members and increase their perception of the IEEE's value.

DAVE PRINCE
Belknap, N.H.

Ensuring Stability in an Engineering Career

Some of the best career advice I ever received was what one of my professors said to me: "To be successful in electrical engineering, you must be a member of the IEEE."

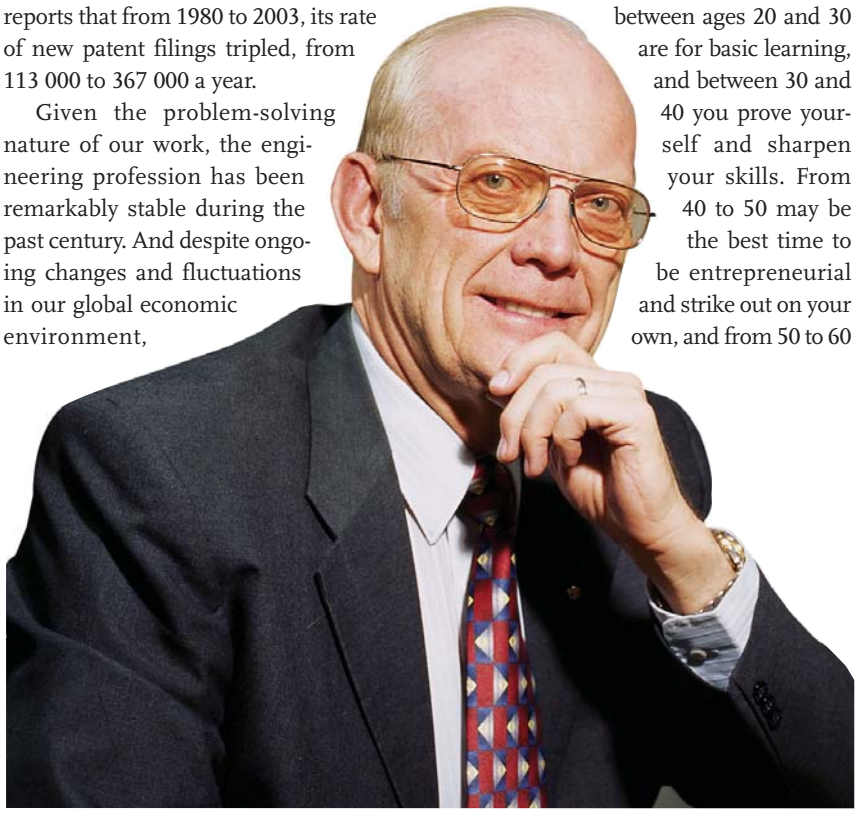
I LISTENED, AND I JOINED the IEEE in 1970 as a student member. I have tried to repay this professor for his good words by advising all the talented engineering students I meet to do the same thing.

My years of membership have helped me fulfill many of my personal and professional needs, and have enabled me to enjoy a successful career. My membership also helped me develop a perspective on how to find career stability.

Any discussion about ensuring a stable engineering career starts with analyzing what we do. Engineers solve real problems but, to paraphrase aerospace pioneer Theodore von Karman, we also develop solutions to problems that never were—that is, they were not yet identified as problems. It is the creative process involved in solving problems that drives and satisfies us.

But, there is a downside to this profession: as engineers and technologists, we are always working ourselves out of a job. After all, there is little future in solving the same problem twice. The good news, however, is that there is a seemingly endless supply of problems to solve. Indeed, just 100 years ago, some people predicted the U.S. Patent Office would soon close because all of the world's significant inventions had already been made! Of course, the fallacy of this notion is now clear. In fact, the U.S. Patent & Trademark Office reports that from 1980 to 2003, its rate of new patent filings tripled, from 113 000 to 367 000 a year.

Given the problem-solving nature of our work, the engineering profession has been remarkably stable during the past century. And despite ongoing changes and fluctuations in our global economic environment, great opportunities lie ahead for the engineering student who plans his or her career properly. Interestingly, many of the same principles we apply to solving control-systems engineering problems—such as the analysis of phase and gain elements—can also be applied to developing an effective career plan.



Managing Your Career Broadly speaking, an engineering career can be broken into four phases: the years between ages 20 and 30 are for basic learning, and between 30 and 40 you prove yourself and sharpen your skills. From 40 to 50 may be the best time to be entrepreneurial and strike out on your own, and from 50 to 60 you can consolidate your gains into an early retirement. But if you're lucky, you won't ever want to retire. It is critical to avoid getting 180 degrees out of phase with your career, especially where any gain is left in the system.

The essential gain elements in an engineering career are education, experience, and access to knowledge. Other gain elements are a person's sponsors, advocates, counselors, mentors, and confidants. All are vital, but the network of people you create, shape, and maintain will assign these critical elements with appropriate amplification to either the forward or the feedback paths that will ensure career stability.

Creating a stable career also requires that you identify the elements in your "SWOT" list—your strengths, weaknesses, opportunities, and threats. With the list as your guide, use your strengths (S) to contribute to the vitality of your network; work to minimize your weaknesses (W); exploit the network to uncover new opportunities (O); and stay ahead of possible threats (T).

Finally, maximize your career potential by investing your time as an IEEE volunteer. Volunteers learn professional and people skills not found in the classroom. Volunteers also have access to people with specialized knowledge and to leaders at all levels of the profession. Volunteering your time and abilities in the IEEE will nurture a successful engineering career and help move you closer to the cutting edge of your professional and technical disciplines.

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IEEE Fellows of The Class of 2005

AN IMPORTANT PART OF THE IEEE's mission is to recognize the professional achievements of its members. The institute's highest honor is the rank of IEEE Fellow, bestowed to members who have contributed "to the advancement or application of engineering, science, and technology." For 2005, the IEEE Board of Directors named 268 new IEEE Fellows.

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Laurence W. Nagel
Robert Everest Newnham
Cam Nguyen
Truong Quang Nguyen
Paul Nikolich
Dorothee Normand-Cyrot
Thomas Novak
Mohammed S. Obaidat
Hidehito Obayashi
Yutaka Ohmori
Shingo Ohmori
Shinji Okazaki
Frank Greta Olyslager
Geoffrey Charles Orsak
Mari Ostendorf
Jorn Ostermann
Nikhil Ranjn-Pal
Fang Zheng Peng
Hoang Pham
Rosalind Wright Picard
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John Anderson Plumer
Gregory Joseph Pottie
Demetri Psaltis
Kadangodek K. Ramakrishnan
Kannan Ramchandran
Manijeh Razeghi
Jeffrey Hugh Reed
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Johan H.C. Reiber
Amy Ruth Reibman
Kurt R. Richter
Mark Stephen Rodder
Thomas D. Rossing
Edward Joseph Rothwell
Christian Roux
Leszek Rutkowski
Ahmad Safari
Hiroshi Saito
Septimiu (Tim) Edmund Salcudean
Tariq Samad
Enrico James Sangiorgi
Marcus Theodore Schilling
Stanley O. Schriber
Vagan V. Shakhguildian
Yung-Qing Shi
Phillip Miles Smith
Aleksander M. Stankovic
Bruce Paul Strauss
Charles E. Stroud
Bjarne Stroustrup
Tangali S. Sudarshan
Richard Szeliski
Tatsuro Takahashi
Hidehiko Tanaka
Fred James Taylor
Shoji Tominaga
Lang Tong
Ljiljana Trajkovic
Benjamind M.W. Tsui
Yonhua Tzeng
Javier Uceda
Thierry Henri Van Cutsem
Alle-Jan Van der Veen
Juzer M. Vasi
Sophie V. Verdonckt-Vandebroek
Adrianus Johannes Vinck
Chandu Visweswariah
Constantine (Costas) D. Vournas
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Albert J. Williams
Walter Willinger
Perry Falknor Wilson
Jason Chik-Shun Woo
Thomas H. Wood
Jinshown Wu
Donald Coolidge Wunsch
Wilsun Xu
Kazuo Yano
Junku Yuh
Xiaoping Yun
Zhengyou Zhang
Xunyu Zhou

FELLOWS IN A NEW CATEGORY

This year, a new Fellow category went into effect that was created specifically for IEEE members working in industry. The application engineer/practitioner category applies to those who work in areas such as process or production engineering, quality control, or systems integration.

Nominees in this new category, as in the three other Fellow categories—research engineer/scientist, technical leader, and educator—are evaluated primarily on the basis of achievements that are of significant value to society. Nominees must also be senior members. The IEEE Board of Directors can name as Fellows no more than 0.1 percent of the voting membership as of the end of the preceding year.

The board approved the new category in June 2003 in response to suggestions made by a task force appointed by Michael Adler, then president.

Distinguished Career Parallels South Korea's Revival

BY GLENN ZORPETTE

THE 16-YEAR-OLD SOUTH Korean schoolboy looked up at the chalkboard as his teacher wrote out the words of a U.S. Army general who had been reporting back to the Pentagon on Korea's prospects in the decade following World War II. "Korea can never attain a high standard of living," the teacher wrote. "There are virtually no Koreans with the technical training and experience required to take advantage of Korea's resources and effect an improvement over its present rice-economy status."

The year was 1951. The words so influenced the boy, Jung Uck Seo, that he now carries them in his laptop computer (a Samsung, made in South Korea) wherever he goes.

South Korea, of course, would rise from the even greater devastation of Korea's civil war to become the most dazzling industrial success story of the past decade. And that schoolboy would become an IEEE Fellow and IEEE Region 10 (Asia & Pacific) director and play a pivotal role in South Korea's technological development, overseeing the design and installation of telephone and cellular networks that helped lay the foundation for the country's rise in broadband communications—a linchpin of the nation's success.

IEEE Fellow Jung Uck Seo, chair of the Transnational Committee and former Region 10 director, aims to boost the IEEE's stature in nations, such as China, that are using technology as a cornerstone of development.

FROM PIG BRISTLES TO HIGH TECH Sitting in a restaurant high above Seoul's fashionable World Trade Center district in October, Seo, whose term as region director ended in December, reflected on his country's economic rise, his remarkable career, and his new duties as chairman of the IEEE's Transnational Committee. With a grin and a practiced air, he recited a few poignant economic statistics: in 1961, South Korea exports totaled US $41 million, mostly pig bristles and cuttlefish. As 2004 came to a close, the country was on track to export $240 billion worth of goods, led by semiconductors and automobiles. Not only is South Korea home to Samsung, the world's largest maker of dynamic random-access-memory chips, the country also boasts the world's greatest penetration of broadband Internet, with an estimated 23 subscriptions for every 100 inhabitants.

South Korea's rise is even more remarkable when taking into account the devastating effects of the 1950–1953 civil war. In the early 1950s, Seo notes, South Korea did not have electricity, because the North, which controlled the country's hydroelectric generating plants, severed connections to the South.

Seo still recalls the sunny, muggy morning of 25 June 1950, when civil war erupted. His family lived near the old king's palace in central Seoul in a classic Korean house that broke from tradition by adorning the thatched roof with radio antennas—put up at significant expense for the benefit of young Seo, who loved amateur radio. He heard artillery fire in the hills around the city, but he didn't pay it much attention, assuming it was just military units conducting field exercises, as they had been off and on since the division of the country after World War II.

But the high-school freshman knew something was up later that day, when he heard on his radio that all Korean troops were being called to their bases. North Korean troops were invading, and the war that would devastate so much of the country had begun.

ACCEPTING THE CHALLENGE Seo and his family fled to the city of Busan (Pusan) on the peninsula's southeast coast, where he continued his studies and graduated high school in 1953. By then, the words of that U.S. Army general had inspired him to choose a career. "I decided, 'What this country needs is engineers,'" he recalls thinking. "My grandfather was so disappointed," Seo confides with a laugh, explaining that he came from a family of doctors, lawyers, and educators.

After receiving a bachelor's degree in electrical engineering from Seoul National University in 1957, he taught electronics courses in the Korean Air Force Academy—which led to a U.S. Air Force scholarship to study at Texas A&M University in College Station. There he earned a master's, specializing in radio wave propagation. After another working stint in Korea, he returned to A&M in 1965 and earned a Ph.D. in microwave antennas and propagation in 1969.

During the next 13 years, Seo held a series of military research and development positions in Korea, as a civilian. In the early 1970s, he dazzled his superiors—and even the South Korean president, Park Chung Hee—by designing a rugged, transistorized military radio that could do essentially everything that an advanced U.S. Special Forces radio could do, but at 10 percent of the cost. Remarkably, he needed just four months to go from conception to working prototype for the radio, known as the KPRC-6. For that and other contributions to the Korean defense industry, Seo was elected an IEEE Fellow in 1982.

The one constant in Seo's résumé is his WILLINGNESS TO TAKE ON big challenges

In 1984, he jumped to the commercial sector, accepting a position at Korea Telecom as vice president of R&D and heading up a project to digitize the entire South Korean telephone system. When it was over, Seo switched sectors yet again, serving as the South Korean government's vice minister for science and technology in the early 1990s.

Seo went back to telephony in 1993, presiding over another nationwide initiative, this time at Korea Mobile Telecom, the forerunner of the wireless giant now known as SK Telecom. There he oversaw installation of the world's first large commercial cellular telephony system based on code-division multiple access, a wireless technology pioneered some years before by Qualcomm of San Diego.

Today, as chairman of the e-trade promotion committee of the Korean International Trade Association, Seo concentrates on the use of technology, such as radio-frequency identification chips and electronic transactions, to reduce the paperwork and bureaucracy involved in the import and export of products through South Korea's bustling ports.

The one constant in Jung Uck Seo's résumé is his willingness to take on big challenges. As head of the IEEE's Transnational Committee, he will concentrate on bolstering the institute's stature in nations, such as China, that use technology as a cornerstone of development. North Korea, with its totalitarian government, closed society, lack of convertible currency, and limited resources, remains a more difficult challenge. But Seo notes that he has seen references to IEEE publications in North Korean technical journals since the 1970s, although he is not sure how the publications are getting into the country.

He's keenly aware that when promoting the IEEE outside of North America, his main competition comes from countless country-specific and local engineering organizations scattered over the world. As far as Seo's concerned, there's no contest.

"To be a good knowledge manager you have to handle your colleagues or students right," he argues. "How to manage a meeting, how to make a good impression—those are the experiences that come from the volunteerism of the IEEE. The experiences in a local engineering organization are not enough." ●

IEEE Regions by the Numbers

Region 10, which covers countries in Asia and the Pacific—including South Korea—is now the largest IEEE region, ending 2004 with 61 136 members, 17 percent of the total IEEE membership.

Here's how the other regions ended the year in terms of membership:

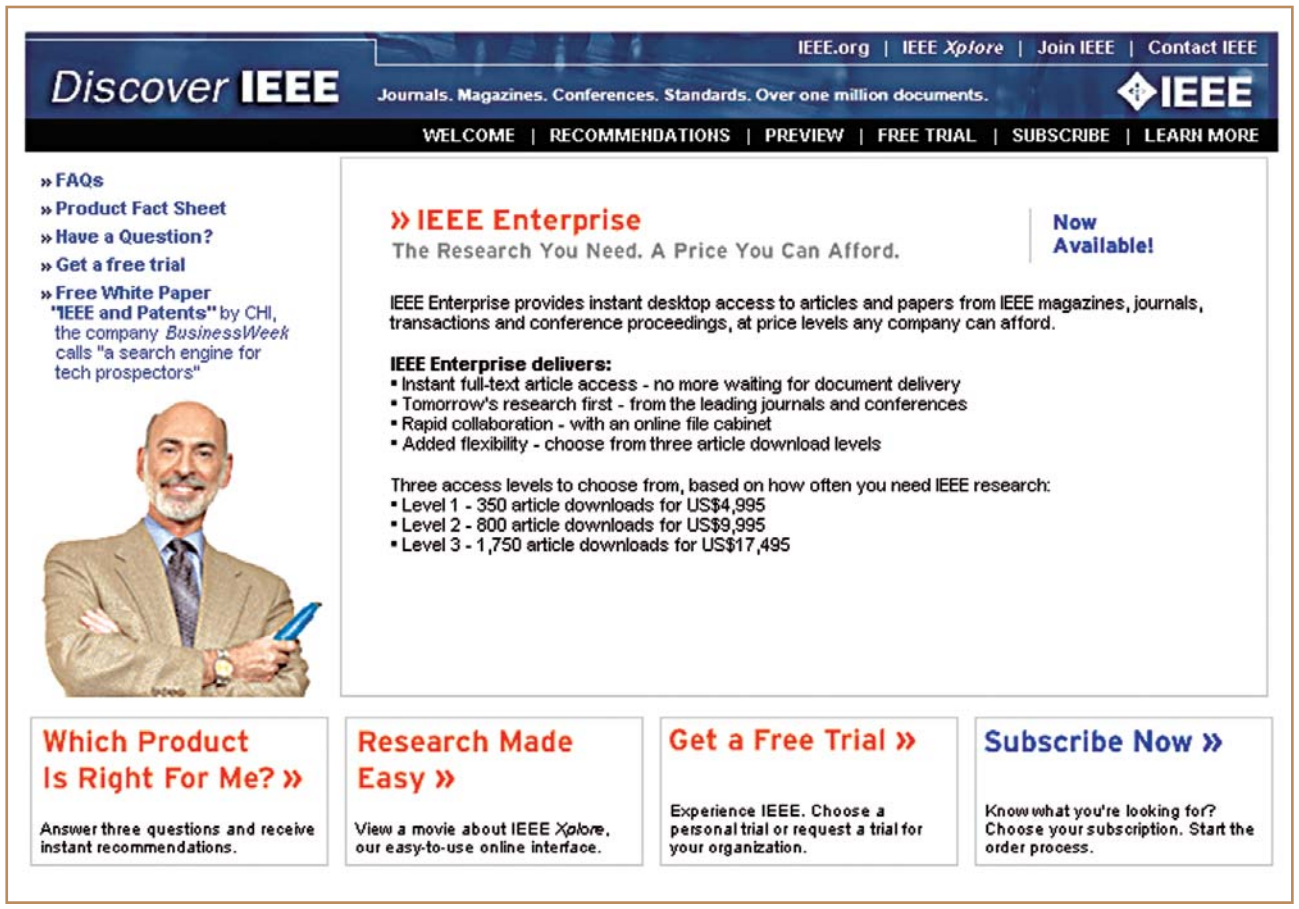
60 991	Region 6 (Western U.S.)	**30 425**	Region 3 (Southeastern U.S.)
52 037	Region 8 (Europe, Middle East, and Africa)	**29 906**	Region 5 (Southwestern U.S.)
		24 549	Region 4 (Central U.S.)
39 628	Region 1 (Northeastern U.S.)	**14 898**	Region 7 (Canada)
33 843	Region 2 (Eastern U.S.)	**11 808**	Region 9 (Latin America)

Publications Library Plan Targets Small Companies

BY PAT JANOWSKI

WHAT YOU CAN achieve often depends on the knowledge you can access. Although online access to the latest research journals makes getting information easier, it's not always affordable, especially for start-ups and small companies.

Enter IEEE Enterprise, a new online subscription plan that gives companies instant desktop access, on a limited basis, to more than a million articles and papers from IEEE magazines, journals, transactions, and conference proceedings. This amounts to nearly one-third of the world's current literature in electrical engineering, electronics, and computer science.



HAVE IT YOUR WAY Companies subscribing to IEEE Enterprise [see home page at right] can search the entire IEEE library and then download only the articles they need. Subscribers can choose 350 articles for a one-time payment of US $5000, 800 articles for $10 000, or 1750 articles for $17 500.

With the three access levels, IEEE Enterprise is reaching "small and midsize companies around the world that can't afford our larger offerings but [whose employees] still need the information," says Jonathan Dahl, staff director of IEEE Sales and Marketing, in Piscataway, N.J. The price for the IEEE/IEE Electronic Library (IEL), which contains every magazine, journal, and conference article published by the IEEE, plus all current IEEE standards, starts at $105 995.

Every subscription level to IEEE Enterprise is provided through the same IEEE Xplore electronic delivery system that powers other IEEE online collections. "It's all designed to give subscribers the chance to see the latest peer-reviewed scientific information that the big companies get," Dahl says. "You receive the same information that the largest R&D centers in the world get, and you can have it in a way that you can afford, in bite-size pieces."

Online papers can be downloaded instantly and are stored in a shared electronic file cabinet. The subscriber's employees retain access to the cabinet for the duration of the subscription. The employees then have access to the articles for 60 additional days, at which time the subscription must be renewed. The plan makes IEEE Enterprise ideal for work groups that need to share research materials applicable to current projects.

The flexible access can generate considerable benefits for smaller companies. "This [IEEE Enterprise] is awesome for a company our size," IEEE Member Matt Felder says. Felder is a senior analog designer at SigmaTel Inc., an Austin, Texas–based semiconductor company that makes mixed-signal integrated circuits for computers and portable MP3 audio players. The 250-person company used to reimburse its employees for their personal subscriptions to the IEEE Member Digital Library, which allows individuals to download 25 articles per month for a monthly fee of $35.

"I've done lots of literature searches in the past using my personal digital library access," Felder says, "but it's easier to have a company-wide subscription." Individual subscriptions to the IEEE Member Digital Library were difficult for the company's accounting department to keep track of, he explains, with each employee paying the monthly fee and then charging it back to SigmaTel. Not only is the accounting less complicated now, but the single IEEE Enterprise subscription for the entire company costs less overall, Felder says.

Previously, he says, through the individual member subscriptions, the same papers might have been purchased multiple times by different engineers. Now, with the shared file cabinet, they all can use the same documents for only a single fee. And anyone who likes to browse "can discover articles that other people in the company found valuable," Felder adds.

NONTRADITIONAL USERS Small and midsize companies in electrical engineering and computing aren't the only ones taking advantage of IEEE Enterprise. According to Dahl, the package is also a good choice for many consultants and nontraditional users, including lawyers and patent searchers. These users may find it especially helpful, since patent references citing research in IEEE papers have increased 267 percent in the last decade.

Even large corporations are choosing IEEE Enterprise for their research needs. Current subscribers include departments within large automotive and consumer products companies. Dahl notes that these companies take advantage of the low-cost, limited subscriptions to assess how expanded access to the IEEE library might benefit their business.

"IEEE Enterprise provides a way for a larger company to take the IEEE library out for a test drive before it trades up to the full IEL package," Dahl says.

To sign up for a 14-day trial with unlimited searching capabilities and 10 free article downloads, visit http://www.ieee.org/enterprise.

FEATURE

Teaching Teachers Technology

BY WILLIAM LEVENTON

THIS YEAR'S NATIONAL Engineers Week in February marked the fourth anniversary of an IEEE outreach effort designed to boost the quality of technical education in precollege classrooms. Launched in 2001 by IEEE Educational Activities, the Teacher In-Service Program offers educators lessons on a variety of technical subjects, such as motors, switches, circuits, and simple machines.

As the name of the program suggests, the subjects are taught during so-called "in-service" days that are regularly set aside for teachers to take part in continuing education activities. In the last four years, IEEE volunteers, many of whom learned the subjects as undergraduates, made 29 presentations to 568 precollege teachers in nine U.S. states and South Africa, according to Douglas Gorham, the IEEE's director of educational outreach.

Members participating in the program come from 14 IEEE sections. Most active in the effort are members from the Florida West Coast Section (FWCS), where a pilot program was launched in February 2001. IEEE volunteers there have made presentations to classroom-size groups of about 30 elementary, middle, and high school teachers, says IEEE Member Ralph Painter. He has been involved in the program since its inception.

According to Painter, the presentations cover a minimum of technical theory. Instead, the emphasis is on a hands-on activity related to a technical subject. The subjects are aligned with state education standards and the requirements of local school districts. Painter has gotten subjects from textbooks, teacher feedback, and high-school physics laboratories. Members looking for topics can also turn to the IEEE Educational Activities Web site, where they can find 15 lesson plans based on past in-service presentations. The plans cover topics such as circuit design, equilibrium concepts, and robotics and they are available in English and Spanish. The lessons also include teaching summaries and project worksheets for students.

The IEEE volunteers provide the materials and then help the teachers as they work their way through an activity. "By walking them through a project, we get the teachers to the point where they feel comfortable enough to present it on their own," Painter explains. The idea is for the teachers to return to their schools and lead the same activity in their classrooms.

Although a single volunteer can preside over a session, Painter recommends three or four. With several volunteers on hand, one can present the information while the others walk around the room helping teachers who are having difficulty.

For the best results, Painter advises volunteers to develop hands-on activities based on topics they deal with on the job. "When you take something you're working on and bring it down to a high school level, I think it comes across much better because you're speaking from firsthand experience," he says. Dealing with a familiar topic also helps presenters overcome their own shyness in front of an audience, he adds.

COLLABORATIONS Teachers leave in-service sessions with more than just a little technical knowledge. "They always get something to take with them—a lesson plan or some other printed material," notes Doug Wagner, who has attended many in-service sessions for teachers in Florida's Manatee County school district. "The main thing that attracts teachers to workshops is knowing they're going to leave with something they can give their kids," says Wagner, the director of adult, career, and technical education in his district.

Ideally, teachers will also leave with a greater understanding of engineers and their careers, Painter says. This understanding is often gained when teachers and engineers chat during breaks and other "downtime" periods during the sessions. By passing on information about their occupations, Painter and his colleagues fulfill another objective of the Teacher In-Service Program: to increase the likelihood that teachers will introduce their students to the engineering profession.

Teachers from Hillsborough County schools near Tampa, Fla., assemble a spectroscope kit.

With a focus on local school districts, the program tries to encourage long-lasting collaborations among local engineers and educators. This type of collaborative relationship has developed in the FWCS, according to Wagner. "If we want training on a particular topic, we'll tell [IEEE volunteers] about it, and they'll try to set up a training session for us," he says.

In other cases, the IEEE decides on the subject of a session, which draws teachers interested in that topic. For example, Wagner says, the IEEE section in his area once arranged for teachers to tour a local power plant. After the tour, engineers gave a talk on electric power, and they distributed instructional materials.

Then, back in the classroom, teachers who were on the tour passed their knowledge on to their students, and even assigned them the task of determining how much power was used in their homes during a certain period of time. Data was recorded on worksheets that had to be signed by parents, who themselves learned lessons about power consumption and its cost. "The students loved it because they were teaching their parents something," Wagner reports.

In Hillsborough County, Fla., Painter worked with Nancy Johnson Marsh, the school district's supervisor of secondary science, to schedule workshops for local science teachers. In a workshop Marsh cites as particularly effective, IEEE volunteers showed teachers how to make a spectroscope, an optical instrument used for studying the characteristic wavelengths given off by different molecules, and distributed materials that students could use to make the device themselves.

"Not only did they give teachers the plan of what to do, but also the means to do it with," Marsh says.

IEEE workshops would be even more effective if teachers knew more about how the concepts they teach are applied in the real world, according to Marsh. She also would like to see workshop topics such as the spectroscope tied to actual technical careers when the activity is presented to students.

A long way from Florida, Nico Beute and an IEEE colleague have held sessions with about 100 precollege teachers in the IEEE South Africa Section. They travel to schools on a bus outfitted with interactive technical exhibits dealing with subjects such as energy-efficient lighting. The IEEE volunteers also leave behind instructional materials and descriptions of experiments that teachers can use in their classrooms, says Beute, dean of the engineering faculty at the Cape Peninsula University of Technology in Cape Town.

POSITIVE FEEDBACK Most teachers who have attended an in-service session found the experience worthwhile, according to responses to a program questionnaire. More than 95 percent of respondents said the program added to their technical knowledge, and more than 90 percent said they plan to use information from the program in their classroom instruction.

Those results are consistent with the feedback Painter has received over the years. After a session, teachers are usually enthusiastic, he says. "Generally," he reports, "they say they'll use the material in the classroom right away. And they usually ask for more sessions."

FOR MORE INFORMATION about the Teacher In-Service Program, visit http://www.ieee.org/education/precollege/tispt

demonstrations on the use of RFID to keep track of shipments along the supply chain. However, the design of the tags is still a work in progress, and RFID will be the topic of papers presented at several IEEE conferences this year, including ones sponsored by the IEEE Antennas and Propagation, Communications, and Microwave Theory and Techniques societies.

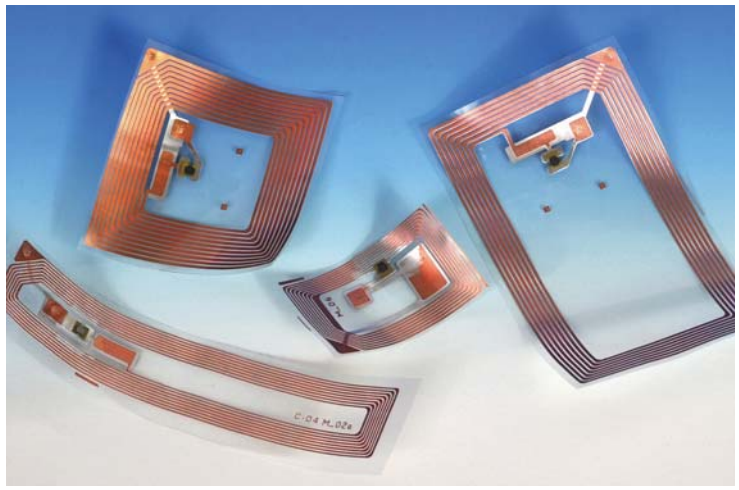
In supply-chain applications, RFID tags, and the infrastructure that goes with them, track products on their journey from manufacture to sale. The system does the job of bar-code readers and more. Each tag holds a microchip surrounded by a printed antenna and protected between laminates that can be pasted, like a label, to a "host" [see photos, right]. The chip holds data in its memory that can identify a manufacturer, a particular product model, and an individual product.

Tags can be read at a distance thanks to a RF signal emitted by a scanner, or reader, placed at various points along the supply chain. Radio waves from the scanners hit the tags with enough power for the tags to retransmit their data back to the scanners. Thus, the path of a tag—and a product—can be traced to its destination.

In addition, many tags can be read at the same time by a single scanner, which speeds up the overall reading process. Applied in retail stores, RFID systems could tell managers which products are selling well, thereby helping them keep shelves stocked. Such benefits have sold the technology to large retailers, including Wal-Mart Stores Inc., based in Bentonville, Ark., which mandated that its top 100 suppliers tag delivery pallets beginning in January. Individual products will come later.

For now, the cost of the tags remains high so that RFID systems are being tested on pallets and cartons holding products shipped by manufacturers to distributors and then on to retailers' shipping docks.

Relying on a scanner that reads the RFID label on each product, a store manager at a Metro "future store" will be able to tell quickly what's on his shelves and what's been sold.



A rectangular antenna is the most visible element on Tag-it Inlays, RFID transponders from Texas Instruments. Ultrathin but with a chip holding read/write memory, the tags fit between laminated paper or plastic to create stickers, labels, tickets, and badges.

During the next five years, the program could expand to encompass virtually every product that enters a Wal-Mart store, according to Tony Sabetti, retail supply-chain director for RFID systems at Texas Instruments Inc., in Dallas, one of the largest manufacturers of RFID tags and readers. Wal-Mart is only one of many retail companies considering RFID systems. For example, German giant Metro and United Kingdom-based Tesco, have begun to add RFID systems to their supply chains.

Sabetti, keynote speaker at the 2004 IEEE Emerging Technologies Conference held in October by the IEEE Dallas Section, described TI's growing business in supply-chain RFID. He notes that some analysts predict that some seven billion supply-chain tags will be sold in 2008.

For tags eventually to be attached to every item sold, they must be cheap. So TI's primary focus is on reducing the cost of RFID chips and materials. Today, tags sell for 20 cents to 50 cents apiece, but Sabetti expects the price to drop eventually to less than 10 cents, thanks to the lower costs anticipated once the tags are made in very high volume.

In some supply chains, more than tracking is involved. TI's RFID devices are being tried to see if they can reduce counterfeiting of products such as prescription drugs. Recently, that market got a boost when the U.S. Food and Drug Administration and several major pharmaceutical companies announced an initiative to fight counterfeiting with RFID tags on shipments of drugs. The tags will hold encoded identification data that is almost impossible to copy. And a tag from VeriChip Corp., Delray Beach, Fla., holds a unique ID code in a system that allows a doctor to call up a patient's medical history [see photo, p. 1].

LOW- AND HIGH-END USES The IEEE also has been covering RFID developments in its publications. In the April–June 2003 issue of *IEEE Pervasive Computing* magazine, for example, applications editor Vincent Stanford, an IEEE member, pointed out that RFID tags come in low- and high-end versions. Low-end "passive" tags lack their own power source, so they must be activated by the RF signal sent by readers. More expensive, and more capable, high-end "active" tags include batteries and other extra features.

High-end tags figure in Stanford's own work as manager of the Smart Space project for the U.S. National Institute of Standards & Technology (NIST) in Gaithersburg, Md. In the NIST Smart Space Laboratory, small and unobtrusively placed computers and sensors pervade the environment. The project's purpose, which is in an early stage of development, is to help people work more efficiently by providing greater and easier access to information.

For example, people and objects in the Smart Space Laboratory can be located automatically via high-end tags attached to them, Stanford says. These self-powered tags have greater range than passive tags, so there's no need for a tightly spaced grid of sensors in the room. A tag can also store and transmit personal identification and preference profiles. Thus, Stanford notes, "hands-free" services, such as a speech-recognition system trained for a particular individual, could automatically be activated when a scanner reads the person's tag as he or she enters the Smart Space.

Other IEEE members are also busy with RFID-related projects. Raj Bridgelall, for example, is working on sophisticated supply-chain networks that include RFID tags and sensors. These networks yield data on the temperature, humidity, vibration, and other conditions that products encounter along the supply chain, explains Bridgelall, vice president of corporate research and development at Alien Technology Corp. in Morgan Hill, Calif.

Naturally, RFID hardware needs software to do its job. Developing such software is the business of OAT Systems Inc., a company in Waltham, Mass., cofounded by IEEE Member Karl Waldman. The firm's Foundation Suite software package helps to deploy and manage RFID networks spread out in many different locations. It also helps capture and transform the RFID data into information tailored for store managers, for inventory control, and to identify hot-selling products.

As OAT's vice president of professional services and support, Waldman helps customers deploy the company's software. British retailer Tesco recently announced plans to use OAT software in an RFID network spanning facilities in more than 2000 locations. OAT and Tesco are also working with other organizations on standards for supply-chain RFID systems, Waldman reports.

RFID companies must deal with clients' concerns about the technology. For example, some worry about the security of the data in the systems. To foil so-called "rogue readers," Bridgelall's firm is working on a device-authentication system to prevent a "rogue" reader from accessing a tag. Readers would need security codes to allow them to be recognized as part of a given network.

PRIVACY PROTECTION Privacy advocates fret that tags attached to merchandise could be used to gather data on buyers at the point of sale—and even after they have left the store. So among other solutions, OAT and others are developing technology that allows retailers to "kill" a tag when its work is finished. "If you bought a DVD and walked out of the store, the tag would be killed at that point," Waldman explains.

Sabetti says TI is happy to provide tag-disabling features. He believes, though, that growing fears about privacy-invading RFID devices can be attributed in part to movies about make-believe technological marvels gathering data on unsuspecting characters. In reality, he says, RFID technology "is not that sophisticated, and it's easily disabled."

How easily? As Sabetti put it, "The RFID manager at Wal-Mart says that every home has an RFID-disabling mechanism: it's called a pair of scissors."

OPEN ACCESS *from page 1*

Board (PSPB) is undertaking a strategic analysis of the publishing options open to the organization. Vig urges the IEEE to experiment now, "when we have the luxury of income from subscriptions and can afford to," rather than being forced into it from the outside by congressional legislation or other events.

Michael Lightner, IEEE's 2004 Vice President of Publication Services and Products and an electrical engineering professor at the University of Colorado in Boulder, says open access is a revolutionary principle. He likens the movement to the once-revolutionary early 19th-century movements for free public libraries (in contrast to private mercantile libraries, which made books available only to users who paid an annual membership fee). But public libraries are not free, Lightner points out. Today, public libraries are financed by property taxes or other levies exacted from all local residents, regardless of whether they or their children use the facilities.

He explains that open access is a philosophical movement with two premises. "One premise is that the information environment of the Internet is leading people to expect to get all information online for free," he says. "The other premise—so far limited to scholarly publications—is that since much of scientific, technical, and medical research is funded by taxpayers' dollars, why should taxpayers have to pay a second time to access the results?"

WHO PAYS? And therein lies the rub for the IEEE—indeed, for any professional organization contemplating moving from subscription journals to free open access. Producing a journal—sending manuscripts out for peer review, editing them, formatting text and artwork, and proofreading them—costs time and money. So does maintaining enormous online servers to provide access. Many publishers ask, "How can you pay for operating expenses if you give away the journal for free?" Clearly, the business model for any open-access publication is critical.

"Open access sounds like an altruistic social movement, but it's really an alternative business model," says Anthony Durniak, staff executive for IEEE Publications, the area that oversees much of the organization's publishing activities. "The discussions among advocates of various models become emotional, and overlook facts."

For example, the single most widely advocated model to make open access financially viable calls for shifting the burden of paying from the subscriber to the author, who would pay a fee to cover editorial costs—which could range from $1000 to $3000 per article. This author-pays plan—discussed at length in the House of Commons report—is based on the assumption that scientific authors supported by public funds or philanthropic grants can simply write the additional costs of publication into their grant applications. But while an author-pays model might cover current costs of getting an article into print today, in the absence of subscription income the amount might be insufficient to cover all the expenses of maintaining that article online in perpetuity, including migration to future digital platforms.

Durniak also fears that an author-pays model could jeopardize editorial quality controls by creating a fundamental conflict of interest. The current subscriber-pays model encourages a publisher to be circumspect about which articles it accepts or rejects to control operating costs, he explains. "But an author-pays model could motivate a publisher to accept more articles [than it otherwise might] because it would mean more income from authors, thereby tempting a publisher into becoming a 'vanity press,' " he says.

While the physical and medical sciences are largely supported through government (and thus taxpayer) funding, the humanities and social sciences are not, so they might be faced with paying journal fees out of their own pockets. Indeed, Lightner points out that individual consulting engineers might be equally hard-pressed to raise the necessary fees. He worries that publishing could become restricted to those who could afford to pay, rather than being open to all excellent ideas.

BUILT-IN DISADVANTAGE Lightner, 2005 IEEE President-Elect, notes that the author-pays precedent would place at a disadvantage IEEE authors from several countries and regions—such as China, India, Russia, and Central and South America—that encompass a growing portion of IEEE membership. "At typical income levels in many of these countries, these members work hard just to pay their IEEE dues. Asking them to pay to put papers in IEEE journals would effectively bar them from publishing their research," Lightner says.

Moreover, Lightner notes that several large research universities have examined the potential cost of faculty publishing under an author-pays model and have concluded that, for them, open access would not be the most cost-effective publishing solution. He says the schools discovered they would pay more in author fees than it would cost to continue to pay to subscribe to journals from publishers, even at current high prices. That's not only because of the large number of faculty members publishing; it is also because of the additional overhead incurred in having to process paperwork, including individual purchase orders and cutting checks to pay the publishing fees.

In short, Lightner concludes, "the rhetoric around open access does not acknowledge the complexity of the world of publishing."

There is still much to be discussed. All the uncertainties about business models and their potential effects on authors and readers are "why the PSPB is carefully considering a number of options before taking a position on open access," Durniak concludes.

WHO ARCHIVES?

With open access to e-articles stored as electronic bits and bytes in cyberspace rather than in paper journals on shelves, "the traditional role of libraries will diminish," predicts John Vig, IEEE's 2005 Vice President of Technical Activities. He cites the example of his own employer—the U.S. Army Communications Research and Development Center—disbanding its library a few years ago at Fort Monmouth, N.J. Yet requirements for keeping e-articles always accessible means "archiving will continue to be an important function," says Mary Jane Miller, IEEE corporate librarian. " 'Open access' has become almost a magical term, as if articles will become available by themselves."

In reality, she points out, an entire information technology infrastructure is needed for storing and searching materials, including "aggressive plans for migrating the archived information to the latest platform so that access in perpetuity is assured. It's not clear whether libraries will continue to archive or if publishers or yet another entity will assume archiving responsibility."

FOR MORE INFORMATION

The full report of the House of Commons' Science and Technology Committee, "Scientific Publications: Free for All? Tenth Report of Session 2003–04," is available at http://www.publications.parliament.uk/pa/cm200304/cmselect/cmsctech/399//399.pdf

The National Institutes of Health's position on open access can be found at http://www.nih.gov/about/publicaccess

The Public Library of Science's peer-reviewed open-access journals on biology and medicine can be accessed from http://www.plos.org

9 STANDARDS THAT KEEP YOUR COMPUTER GOING

BY ERICA VONDERHEID

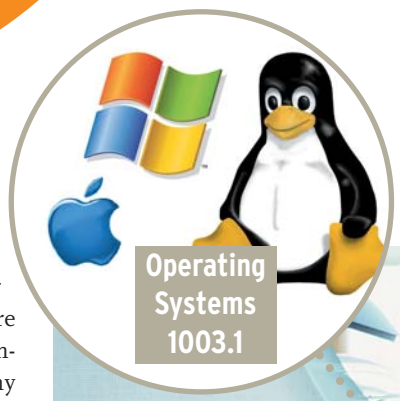
EVER WONDER ABOUT THE role IEEE standards play in your personal computer? They ensure many things go right—for example, that a disk drive from any manufacturer can be cabled to a computer from another, and that data can be readily downloaded from any digital camcorder to a computer.

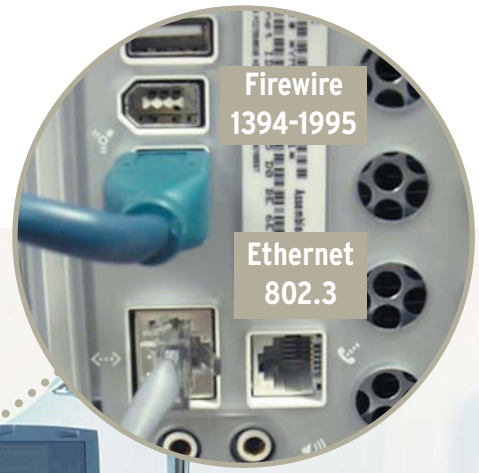
Thanks to nine IEEE standards, data flow in and out of the computer smoothly, software runs properly, and the information in the system can be protected from hackers.

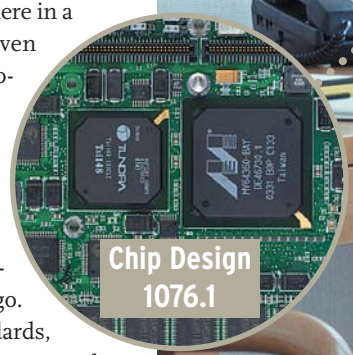
"IEEE standards are everywhere in a computer—for example, even buried way inside the microprocessor chip, where you might not even know they're there," says Senior Member Bob Grow, chair of the IEEE 802.3 Ethernet working group and principal architect in the Intel Communications Group in San Diego.

These days, thanks to standards, "plug and play" is often taken for granted and we're surprised when things don't work.

"If standards development is done properly, consumers get a much better product that gets adopted quickly, is compatible, and lowers users' frustration. When you don't have standards, you have confusion," says Member Larry Stein, chair of the IEEE







Online Learning 1484

Binary Arithmetic 754

Wireless 802.11

1284.3 working group and president of Warp Nine Engineering in San Diego. The 1284 working group produced the standard for parallel ports that hook up to printers, while the 1284.3 working group developed the standard for ports for other peripherals, such as disk drives.

ALL WIRED UP Look at the back of your computer and you'll find a socket for plugging in a networking cable. The physical and data transmission details about the cable and its plugs are spelled out in IEEE 802.3, the Ethernet network standard.

"Ethernet is the most popular connection for communication in the world," Grow says. With Ethernet, your computer can send and receive 10, 100, or 1000 megabits per second to and from an office network or home broadband Internet connection. The Ethernet protocol outlined in IEEE 802.3 is called "carrier-sense multiple access with collision detection." This term indicates that with multiple devices on the network, an Ethernet-compliant network interface listens for anything already on the net before transmitting its data. It holds off sending anything if it detects something else communicating at the same time.

"Ethernet, implemented by almost everybody in communications, adapts how data [are] sent as computing technology improves," Grow says. "It's simple, easy to use, and pervasive. You plug it in and it works."

Even if you access the Internet with the wireless network connection specified in IEEE 802.11 for a wireless local area network interface, Ethernet is involved. Your data may travel wirelessly to an IEEE 802.11 access point, but this access point is usually plugged into a wired Ethernet connection.

GETTING CRYPTIC With so much data flying over Internet, Ethernet, and wireless networking connections, you want to make sure nobody is listening in, which is where IEEE 1363, "Public Key Cryptography," comes in. It makes sure that two computers can talk to each other and that no one else is tapping in.

"Cryptography is the science of data scrambling," explains Member William Whyte, chair of the 1363 working group. "You don't want to scramble the data if the person on the other end doesn't know how to unscramble it. The standard ensures that we can all agree on an unscrambling method that works."

A PARALLEL PORT OF CALL The cable running from the back of your computer to an ink-jet printer is most likely based on the IEEE 1284-2000 standard, which defines the signaling protocols for parallel port connections. The "2000" identifies the year of the last revision and ensures that the computer can talk to your printer regardless of who built the two pieces of equipment.

"IEEE 1284-2000 allows peripherals such as printers to perform better and faster," Stein says. "Pages that used to take 40 seconds to print can now be done in three or four seconds."

In the 1980s, non-standard parallel ports, in which the bits of a data would be transmitted simultaneously on parallel lines, were used for connecting printers. The connection wasn't very quick, but it could transfer information faster than the day's printers could handle. By the 1990s, some companies realized the parallel port could do more than handle printer data; it could handle the much higher data rates associated with external hard-disk drives and could transfer data in both directions.

The IEEE 1284 working group came together to create a bidirectional parallel port standard, and data rates jumped from 15 000 bytes per second to 1 megabyte per second. Manufacturers of peripheral devices—such as Zip disk drives, CD-ROMs, and tape drives—recognized the potential of such a port and got involved along with printer and computer manufacturers in developing the standard. By 1996, Senior Member Don Wright, chair of the IEEE 1284-2000 working group, notes, every computer on the market had an IEEE 1284 parallel port.

"And it was adopted at lighting speed," Wright recalls.

ACTION! After recording digital home movies of a family vacation or taking digital snapshots of a child's first birthday, you have to get that information from the camera to the computer for editing, sharing, or printing. Video needs a high-speed connection, which is why IEEE 1394-1995, "Standard for a High Performance Serial Bus," otherwise known as Firewire, was developed. Plug in the camcorder or digital camera via a Firewire cable to the Firewire port at the back of your computer, and the operating system recognizes the type of device and quickly downloads the data to your hard drive. But it wasn't always that easy.

"In the early days you had to be a wizard and open up the computer and set the data rates," says Member Gerald Marazas, chair of the IEEE 1394-1995 working group. "Consumers didn't want to be engineers. They wanted to plug a device in and have it work."

Firewire is employed by many computer users—from amateurs taking family snapshots to independent filmmakers, who use desktop computers to edit complex movies. The standard quickly gained popularity because, according to Marazas, more people were interested in collecting digital video and then storing and editing it on a personal machine than the developers first believed.

The IEEE 1394-1995 standard is also used to add external storage drives to a computer—to provide another place for storage.

DESIGNED FOR EFFICIENCY Many of the logic chips in your computer are designed using IEEE 1076-2000, "VHDL Language Reference Manual." (VHDL is otherwise known as "very-high-speed hardware description language.") With this standard, computer chip designers can create a component, or subsystem, by using a relatively easy-to-understand high-level language to spell out what the completed component should do. These instructions are then automatically converted into the design of circuits and interconnections, a process that reduces the time required to design a chip, making it less expensive and less prone to design mistakes.

Newer, more sophisticated chips with analog features—such as a radio transmitter—are now designed using an amendment to the original VHDL standard, IEEE 1076.1-1999, the analog and mixed-signal extensions for VHDL. Previously any analog parts of complex chips had to be designed by hand, according to Member Tom Kazmierski, chair of the IEEE 1076.1 working group; the new standard helps to automate that process.

MOVING RIGHT ALONG Application programs written to comply with IEEE 1003.1 will work properly regardless of what operating system you're using.

"When you write an application, you want it to run across multiple platforms," says Member Andrew Josey, chair of the IEEE 1003.1 working group. "This standard allows you, for example, to develop an application for Sun Microsystems' Solaris platform and run it on another operating system, such as a version of Microsoft's Windows or on Linux."

The working group wanted to ensure wide adoption of the standard—especially among open-source software developers—so in 2002 the group posted the standard on the Web for anybody to download at no charge. Since then, the open-source community has embraced the standard, Josey says.

BY THE NUMBERS Many programs, like spreadsheets and tax preparation software, do the number crunching for you. For those programs to run correctly, all numbers are computed and stored in memory or on hard drives in a standard way, thanks to IEEE 754, "Standard for Binary Floating-Point Arithmetic."

Floating point is a way of noting very large or very small numbers, similar to scientific notation in which 50 000 is written as 5×10^4. Instead of a base of 10 in scientific notation, binary floating point uses a base of 2. And IEEE 754 ensures that all numbers are stored on the hard drive the same way and then outlines how the computer must perform arithmetic.

"IEEE 754 specifies how floating-point data are computed and stored, which makes it possible for computing software to work well on different computers," says Member David Hough, editor of the IEEE 754 working group.

LEARNING TO WORK Taking classes and learning new skills on a desktop or laptop computer—whether for work or fun—is common now because the process has become easier thanks to learning systems and courses developed using the IEEE 1484 series of standards. The three standards in the series define how online courses communicate with the systems that deliver them on a computer. Whether using courses developed by your employer, a university, or a commercial publisher, these systems can keep track of what you learned and help you find the content that matches your needs.

"Rather than thinking of learning as something you only do through separate courses, it's being integrated into the software, such as word-processing programs, we use on a daily basis," says Member Robby Robson, chair of the IEEE 1484 working group. "As we become more sophisticated about providing learning experiences, technical standards that operate behind the scenes become crucial for ensuring that we get the information we need to learn, when we need it, and in a format that makes sense."

If standards development is done properly, CONSUMERS GET A MUCH BETTER PRODUCT

FOR MORE INFORMATION on these or other standards, visit the IEEE Standards Association at http://standards.ieee.org

Nomination Alert: The Deadlines Approach

THE IEEE NOMINATIONS & Appointments (N&A) Committee seeks nominations for both appointed and elected volunteer positions. The committee sees to it that nominees for office appear on ballots and also recommends to the IEEE Board of Directors candidates for appointment to standing committees and major boards. See the chart at right, "2005 Deadlines at a Glance," for dates critical to the nomination and election process. Names of candidates must be submitted by 15 March. For elected offices see "Offices Up for Election," below right.

Committees with openings for volunteers are Audit, Awards Board, Credentials, Employee Benefits, Ethics and Member Conduct, Fellow, History, Individual Benefits and Services, Information Technology Strategy, Meetings and Services (chair only), Nominations & Appointments, Strategic Planning, Tellers, and Women in Engineering.

Nominations are also sought for the 2007 IEEE President-Elect and for the 2006 Assembly-elected officers: Vice President-Educational Activities, Vice President-Publication Services and Products, IEEE Secretary/Treasurer or IEEE Secretary and IEEE Treasurer.

General qualifications for volunteers are competence, experience, a willingness to take on the tasks, the time in which to participate, enthusiasm, vigor, and the ability to cooperate with others in achieving the objectives of the committee or board they serve.

Recommendations to the IEEE N&A Committee for positions can be made throughout the year at http://www.ieee.org/nominate, by fax at +1 732 981 9515, or by e-mail at nominations@ieee.org.

ELECTED POSITIONS On 1 May, the IEEE Board of Directors will announce the candidates for elective positions who are to be placed on the 2005 ballot. Their terms begin in 2006.

The list of candidates will include individuals for IEEE President-Elect nominated by the IEEE N&A Committee and selected by the IEEE Board of Directors [see "Two Candidates to Compete for 2006 President-Elect Spot," p. 4]. Other candidates will be nominees for Director and Director-Elect positions submitted by the respective regional and divisional nominating committees. The ballot will also include the nominees for Standards Association President-Elect and Board of Governors Members-at-Large, Technical Activities Vice President-Elect, and IEEE–USA President-Elect and Member-at-Large. The board is also responsible for placing proposed constitutional amendments on the ballot.

Members who have not been nominated but who want to run for office may do so by filing written petitions with the Board of Directors by noon Eastern Daylight Time (18:00 GMT), 10 June 2005. To be eligible for the ballot, a petition must be accompanied by the necessary number of valid voting members' signatures; prospective candidates must meet other requirements as well.

FOR MORE INFORMATION on election procedures, contact Carrie Loh, IEEE Corporate Activities, at +1 732 562 3934, e-mail: c.loh@ieee.org; or Fern Katronetsky, IEEE Corporate Activities, at +1 732 562 3932, e-mail: f.katronetsky@ieee.org.

2005 DEADLINES AT A GLANCE

15 March

- Regional nominating committees submit candidates for the offices of Regional Delegate-Elect/Director-Elect
- Divisional nominating committees submit candidates for the office of Divisional Delegate/Director or Divisional Delegate-Elect/Director-Elect, as applicable
- Standards Association submits candidates for the offices of Standards Association President-Elect and Board of Governors Members-at-Large
- Technical Activities submits candidates for the office of Technical Activities Vice President-Elect
- IEEE–USA submits candidates for the offices of IEEE–USA President-Elect and IEEE–USA Member-at-Large
- Recommendations due to IEEE Nominations & Appointments Committee for 2006 Standing Committee members, Assembly-elected positions, and 2007 President-Elect

1 May

- Board of Directors submits to the voting membership a list of nominees for President-Elect; Delegate/Director or Delegate-Elect/Director-Elect, as applicable; and other positions to be elected by voting members for the coming term
- Board of Directors announces its intention to put forward constitutional amendment(s)

10 June

- (Noon EDT/18:00 GMT) Petitions for constitutional amendments must be received
- (Noon EDT/18:00 GMT) Petition nominations for candidates to be elected by the membership must be received
- Initial statements by principal initiators and opponents of constitutional amendments must be received
- Corporate Activities must receive initial statements from all annual election candidates

20 June

- Corporate Activities mails initial statements by proponents of proposed constitutional amendment(s) to opponents, and opponents' initial statements to proponents

5 July

- Deadline for rebuttal statements from initiators and opponents on constitutional amendment(s) proposals

1 September

- IEEE annual election ballots are sent to all voting members

1 November

- (Noon EST/18:00 GMT) Last day for ballots to be returned by voting members

8 November

- Last day for ballots to be tallied by Tellers Committee

9 November

- Election of officers by IEEE Assembly

11 November

- Last day for announcement of vote tally by Tellers Committee to IEEE Board of Directors

13 November

- Assembly election results announced
- IEEE Board of Directors acts to accept report of Tellers Committee
- IEEE Annual Election results are made official

OFFICES UP FOR ELECTION

Chosen by all voting members:

- President-Elect

Chosen by members in Regions 1–6:

- IEEE–USA President-Elect
- IEEE–USA Member-at-Large

Chosen by members of the IEEE Standards Association who are also voting members of the IEEE:

- IEEE Standards Association President-Elect

Chosen by members of the IEEE Standards Association:

- IEEE Standards Association Board of Governors Members-at-Large

Chosen by members of the respective technical divisions:

- Technical Activities Vice President-Elect
- Delegate-Elect/Director-Elect, Division II *(one-year term)*
- Delegate-Elect/Director-Elect, Division IV *(one-year term)*
- Delegate-Elect/Director-Elect, Division VI *(one-year term)*
- Delegate-Elect/Director, Division VII *(two-year term)*
- Delegate-Elect/Director-Elect, Division VIII *(one-year term)*
- Delegate-Elect/Director-Elect, Division X *(one-year term)*

Chosen by members of the respective regions:

- Delegate-Elect/Director-Elect, Region 1 *(two-year term)*
- Delegate-Elect/Director-Elect, Region 3 *(two-year term)*
- Delegate-Elect/Director-Elect, Region 5 *(two-year term)*
- Delegate-Elect/Director-Elect, Region 7 *(two-year term)*
- Delegate-Elect/Director-Elect, Region 8 *(one-year term)*
- Delegate-Elect/Director-Elect, Region 9 *(two-year term)*

Salaries for U.S. IEEE Members Decline, According to Survey

BY CHRIS MCMANES

FOR THE FIRST TIME IN MORE than 30 years, the median income for U.S. IEEE members fell. That's according to the findings of the 2004 IEEE–USA Salary and Fringe Benefit Survey.

Median incomes are based on primary income sources, such as base pay plus any earnings from being self-employed, commissions, or bonuses for members working full time in their specialty area. In 2003 the median stood at US $99 500, a drop from the $101 000 reported in 2002. Median salaries had shown substantial gains since 1994's figure of $67 000. In 1996, the median was $72 000; in 1998 $82 000; and in 2000 $93 100.

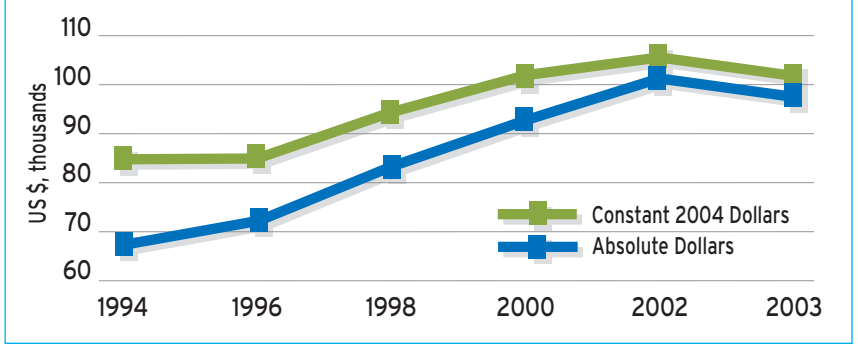
IEEE–USA's Internet-based survey, which went to more than 80 600 U.S. members, was conducted in late 2004 and asked about 2003 income. The 15.6 percent response rate and the 12 584 respondents were the highest ever recorded by IEEE–USA. The majority of respondents—11 182—were full-time workers. Of those, 10 114 were employed in their primary area of technical competence.

The latest survey also doesn't bode well for purchasing power, which showed its first decline since 1988. Adjusted for inflation and stated in constant 2004 dollars, 2003 purchasing power fell to $102 501 from $106 418 in 2002, a decrease of 3.68 percent. The 2003 figure is only slightly above the 2000 figure of $102 480.

Richard Ellis, who analyzed the survey results for IEEE–USA, says he was not surprised by the findings.

"The end of the dot-com and telecommunications booms had obvious negative effects on demand for people with skills in electrical, electronics, and computer engineering," says Ellis, who was director of research for the American Association of Engineering Societies' Engineering Workforce Commission from 1985 to 1996. "When you add in allowances for large numbers of foreign guest workers in the United States and the huge increases in work that's being outsourced overseas, then it's predictable that lots of U.S. high-tech workers would be unemployed and the price of labor would go down, just like any price goes down when supplies are high and demand is low. That's just elementary economics."

The IEEE-USA Salary and Fringe Benefit Survey shows median income fell in 2003



Recent statistics from the U.S. Department of Labor support Ellis' contention. The department reported that in 2000, there were 444 000 employed electrical and electronics engineers, versus 363 000 in 2003, a drop of 81 000.

The salary survey is the basis for the IEEE–USA Salary Service, a suite of tools allowing employers and individual IEEE members to benchmark technical professionals' salaries. The survey can be taken any time, and members who participate receive free access to the Salary Service. This career-management tool, along with the survey, is available at http://www.ieeeusa.org/careers/salary.

U.S. IEEE members using the service also receive individual salary calculators for each year they take the survey. The calculator lets members gauge what their current salary should be, based on what others are earning, and what effect potential changes, such as getting an advanced degree or moving to another part of the country, might have on how much they could earn.

MEMBER RECOGNITION

Lanzerotti Named to Top U.S. Science Board

BY LINDSAY ELKINS

LEADING INTERPLANETARY researcher and IEEE Fellow Louis J. Lanzerotti has been appointed to the National Science Board. The 24-member governing body of the National Science Foundation (NSF), in Arlington, Va., oversees and guides the NSF's activities. The board advises the White House and Congress on policy issues related to science and engineering.

Lanzerotti, a distinguished research professor at the Center for Solar-Terrestrial Research at the New Jersey Institute of Technology in Newark, was first contacted in April 2004 about serving a six-year term on the board. He was in the Netherlands at a meeting on *Ulysses*, a NASA program for understanding the characteristics of the interplanetary medium, when he received a phone message that the White House personnel office was trying to reach him.

"I was surprised to be recommended for the position, but I'm certainly pleased that I am able to serve," he says.

The nomination process was lengthy. Lanzerotti had a number of interviews with the White House that continued through August. His name was submitted to the U.S. Senate in September, and he and five other new members, plus two reappointed members, were confirmed in mid-November.

Louis J. Lanzerotti

Lanzerotti began his career in 1965 as a postdoctoral fellow doing thesis work in nuclear physics at Harvard University in Cambridge, Mass., and later at Bell Laboratories. In 1967, he joined the technical staff at Bell, where he helped build the *Advanced Telecommunications Satellite I*, the first geosynchronous communication satellite (meaning one positioned in a high orbit that matches the Earth's rotation). While he was still at Bell, Lanzerotti also served as an investigator for several NASA interplanetary and planetary missions, including *Cassini*, *Galileo*, *Ulysses*, and *Voyager*.

Through his work, which involved studying the space environments of planets beyond their atmospheres, Lanzerotti became an expert in space plasma physics and the effects of the space environment on space and ground communications. He left Bell Labs in 2001 but still consults for the organization. He also chairs a 20-person panel of the National Research Council, studying whether to prolong the mission of the Hubble Space Telescope.

Lanzerotti is just getting his feet wet in his new science board duties. One of his interests as a board member is to improve recruitment, education, and training programs for young students so as to attract them to science and engineering careers.

"I look forward to participating in fostering excellence in the areas of science and engineering that the NSF supports," he says.

IN MEMORIAM

Andrew W. Smith

Former Editor of *IEEE Industry Applications Magazine*

BY LANNY FLOYD & LOUIE POWELL

ANDY SMITH was an outstanding engineer, a dedicated volunteer to the profession, a great friend and mentor to many in the IEEE, and a true gentleman.

A native of Charleston, W.Va., Andy earned his bachelor's degree in electrical engineering in 1965 from the University of Cincinnati, in Ohio. Eta Kappa Nu, the engineering honor society, inducted him that same year, and shortly thereafter Andy joined the corporate engineering department of DuPont in Newark, Del. Early in his career, Andy worked on problems dealing with the practical application of electrical technology in nuclear and chemical manufacturing processes. Eventually, he managed all aspects of DuPont's electrical engineering design and consulting services, and he retired in 1998 as electrical technology consultant manager.

Andrew W. Smith

In 1975, Andy joined the IEEE Industry Applications Society's (IAS) Petroleum and Chemical Industry Committee (PCIC), where he served in various leadership roles for nearly 30 years. He also helped the committee develop long-term strategic plans. After he retired from DuPont, Andy became editor in chief of *IEEE Industry Applications Magazine*, publishing his first issue in January 1998.

Andy knew that the Society's future lay in recruiting students to the field. To that end, he helped to establish the PCIC Young Engineers Development Subcommittee, which provides opportunities at conferences for young professionals to network with peers. He also helped create the Industry Applications Society Outstanding Young Member Award, which recognizes distinguished achievements by a member of the Society younger than 35 years of age.

Shortly after he became editor, Andy asked engineering students to suggest ways to modernize the publication's appearance and increase readability. He worked closely with the magazine's editorial staff in Piscataway, N.J., and unveiled a major redesign in January 2002 that appealed to younger readers.

The PCIC honored Andy in 1995 with its Russell W. Mills Award for Outstanding Service and Achievement, and then again in 2003 with its Outstanding Emeritus Award. He was named an IEEE Fellow in 1996 "for leadership in integrating IEEE standards with industrial application needs." In 2003, the Industry Applications Society awarded him its Distinguished Service Award.

Andy announced his retirement as editor of *IEEE Industry Applications Magazine* in the September/October 2004 issue, and his last editorial appeared in the November/December issue.

Lanny Floyd worked with Andy Smith at DuPont. Louie Powell succeeded Smith as editor in chief of IEEE Industry Applications Magazine.

ANDREW W. SMITH 62
DIED 15 November 2004
MEMBER GRADE Fellow
EDUCATION Bachelor's degree in electrical engineering from the University of Cincinnati, Ohio
FIELD OF INTEREST Application of electrical technology in industrial processes
VOLUNTEER ACTIVITIES Chair, IEEE Delaware Bay Section, 1980; editor in chief, *IEEE Industry Applications Magazine*, 1998–2004; chair, IEEE Technical Activities Board Magazines Committee, 2002; chair, Petroleum and Chemical Industry Committee, 1989; member, Industry Applications Society (IAS) Executive Committee; member, IAS, for more than 30 years
AWARDS IAS's Petroleum and Chemical Industry Committee Russell W. Mills Award, 1995; PCIC Outstanding Emeritus Award, 2003; IAS Distinguished Service Award, 2003

Stepping Up to Senior Member

BY PAT JANOWSKI

WHAT DOES IT MEAN to be a senior member of the IEEE? At the very least it means you've met some basic requirements: 10 years in the profession, five of which demonstrate significant professional performance, and you've received three supporting references from other IEEE senior members or Fellows. But this tells only part of the story. Senior members often find their status to be an asset in their careers and, according to Michael J. Binder, IEEE's director of membership, senior members frequently become more active in the IEEE than they were before.

Another incentive for becoming a senior member is that only senior members are eligible for certain appointed and elected positions. And, yes, new senior members receive an engraved plaque and a US $25 voucher good toward an IEEE society membership.

Senior Member Fred Garber, chair of the electrical engineering department at Wright State University in Dayton, Ohio, found he had to be a senior member if he wanted to become involved in the Accreditation Board for Engineering and Technology (ABET) review process—something he had his heart set on.

"I wanted to get into the ABET reviewer training program so I could be more involved with the changes being considered for engineering education," Garber explains.

Adds Robert Adams, Regional Activities Board membership development representative, "Many sections have lots of members eligible for senior status, but most procrastinate and don't apply." Adams, former IEEE–USA Vice President of member activities, says he was one of them. "I never did apply until I was asked to run for director of Region 4 [in the central United States] in 1999. I needed to be a senior member, so I quickly applied," he explains.

Some senior members appreciate the cachet associated with the elevated grade. For example, John A. Kassebaum, president of Stellar Wind Development LLC in Indianapolis, finds his senior member grade of value to his business. "As a consulting engineer, I see senior membership as a means of marketing my skills and services," he says. "It is an accolade of sorts, and conveys a high level of competency that clients perceive as valuable."

As for the IEEE itself, more senior members on its membership rolls makes for a more stable organization, according to Binder. Senior members can be counted on to renew their membership year after year; typically 98 percent renew, compared with an 86 percent renewal rate for members and 79 percent for associates, Binder says.

ORGANIZING A RODEO It's not surprising that a number of sections drum up ways to encourage members to apply for senior status. Some sections hold special events at which they streamline the application process and serve refreshments. The easy part is filling out an online form; frequently, the hard part is to find those three senior members or Fellows to provide references. (Applicants must supply résumés and list their qualifications.)

In June, the Central Indiana Section Senior Members' Rodeo, as it was called, proved successful. Alan Stillerman, chair of the section and a senior product research analyst for the Indiana Higher Education Telecommunications System in Indianapolis, organized it. "We reserved a laboratory room with computers at Indiana University-Purdue University Indianapolis," he explains. "We set the hours from 1 to 5 p.m. on a Saturday and had four senior members available to act as references. Right at 1 p.m., 10 people walked in the door," Stillerman says.

"We had a steady stream of applicants right up until we finally closed the doors. People were there from all over the state of Indiana," recalls Adams, who served as one of the senior member references. "I saw people I hadn't seen for years, people I worked with maybe 20 years before. It was just a good time for everybody."

Says Stillerman, "With application forms online, the application process itself was simple. I spent an afternoon and I was essentially done with the paperwork when the rodeo was over."

He recommends publicizing such events early and often. "We sent out invitations to the entire section a month before the event and included links to information and application forms on the IEEE's Web site," Stillerman says. He then followed up with weekly e-mail reminders until the day of the rodeo. Ultimately, 25 members applied for senior status.

Many sections have members WHO ARE ELIGIBLE for senior member status but don't apply

Thomas N. Bishop, a senior engineer at Raytheon Technical Services Co. in Indianapolis, was another who served as a reference for applicants during the event. He recognizes a couple of benefits that he himself got from the experience.

"I became acquainted with the talents of engineers in my geographic area, and I got the chance to foster a professional relationship with a very impressive group of people," Bishop says. In the months since the event, he adds, he has even received tips on job opportunities.

Paul Kladitis, who organized a similar event in Dayton, Ohio, in December, emphasizes the importance of having senior members participate. "A lot of electrical engineers usually don't work with other senior members," says Kladitis, an assistant professor in the department of electrical and computer engineering at the Air Force Institute of Technology in Dayton. "They don't know the people who could act as references."

He considers his rodeo a great success. "We processed 25 applications in two hours," Kladitis reports. "It's one of the most popular things we've done."

Other sections have run successful events as well. In the summer and fall of 2004, sections in Region 7 (Canada) held two sessions at which members submitted applications on the spot. "We had senior members on hand to guide them through the criteria and provide references," says Hilmi M. Turanli, Region 7 membership development chair. The events helped the region meet its goal of 100 new senior member upgrades in 2004, which, combined with all other regions, brought the IEEE's total to 2080 for the year.

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