IEEE

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The Institute

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March 2006 VOL. 30, NO. 1

NETWORKING NIGERIA

IEEE Helps Engineering Students Get World-Class Internet Facility

Standing at the entrance to the IEEE/HP Telecenter at its dedication in January are, from left, IEEE Past President W. Cleon Anderson, IEEE Nigeria Section chair Tunde Salihu, University of Ibadan engineering chair Ola Fakolujo, IEEE Spectrum *Senior Editor Harry Goldstein, University of Ibadan Vice Chancellor O.A. Bamiro, former section chair Isaac Adekayne, HP representative Stanley Muoneke, and former Ibadan student branch chair Debo Onifade.*

BY HARRY GOLDSTEIN

IT TOOK THE BETTER PART of two and a half years and tens of thousands of dollars, but there I was on 5 January 2006 sitting in the spanking-new computer center in the electrical and electronics engineering department at the University of Ibadan in Nigeria. I was there with the encouragement of my boss, *IEEE Spectrum* Editor Susan Hassler, to celebrate what the IEEE Nigeria Section and the university had accomplished. The project was backed by donations I had helped them solicit from the IEEE, the IEEE Foundation, and the Hewlett-Packard Foundation.

I was alternately banging out e-mail and using a friend's cellphone to call the IEEE office in Piscataway, N.J. The computer center's manager was on another cell, talking with a server technician in Vancouver, B.C., Canada. The clock was ticking. IEEE Past President W. Cleon Anderson, along with a host of students, faculty, university administrators, and Nigerian press, were due to visit the 60-seat IEEE/HP Telecenter for the official ribbon-cutting ceremony in less than 24 hours. And the IEEE Xplore digital library, the centerpiece of the IEEE's donation to the telecenter, had to be accessible from all 60 computer terminals in the building.

The satellite Internet connection had just been switched on, and I took full advantage, sending a message to IEEE's Publishing Technology Department, listing all the IP addresses that IEEE servers had to recognize to give the telecenter's computers access to the 1.2 million documents in IEEE Xplore.

And then it hit me: this unique facility was finally online. Although there are a few computer labs scattered among African universities, the one at the University of Ibadan is special in two ways. First, it supports 60 users at any given time, thanks to 15 Hewlett-Packard 4-4-1 workstations, computers that have had their processors and hard drives partitioned four ways to feed four different monitors and keyboards. The IEEE/HP Telecenter is the first [Continued on page 7]

IEEE Web Site Works Smarter, Looks Sharper

BY WILLIE D. JONES

THE IEEE'S WEB SITE not only has a new look, unveiled in mid-January, but it is also better organized and easier to navigate. The remake, which took more than a year, began when the IEEE conducted its first-ever study to find out just how easy—or difficult—it was to use the site. The results were not encouraging.

A group of IEEE members and prospective members was each asked to find specific content—such as a particular conference or technical paper—from the Web address http://www.ieee.org. They were then asked to grade the experience; the grades were so poor that in June the IEEE Board of Directors elevated the project to revamp the Web site from the need-to-do list to the must-do-immediately list.

"The Web site was overdue for more than just a cosmetic update," says Senior Member Marc Apter, who, as Vice President, IEEE Regional Activities at the time, was one of the volunteer leaders who pushed for the overhaul and is a [Continued on page 8]

Some of the people behind the Web update. From left: Sally Waselik, David Green, Joanne Vara, and Marc Apter.

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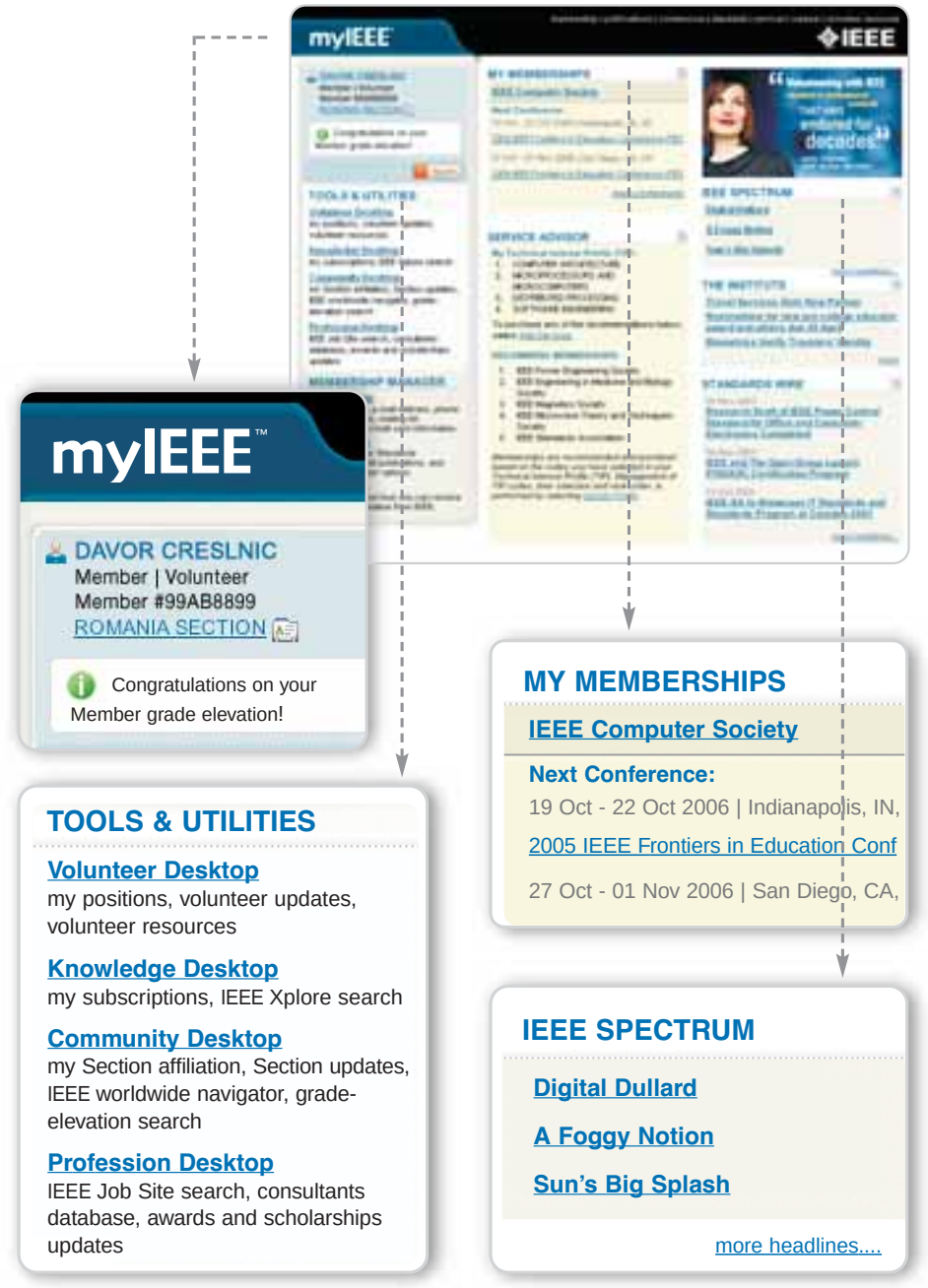

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Look for these articles on 7 March

ELECTION A new way to get to know the candidates for 2007 President-Elect.

NEWS The IEEE Foundation launches a program to promote technical literacy.

FEATURED CONFERENCE Learn about the latest in eco-friendly electronic design, manufacturing, and research at the IEEE International Symposium on Electronics and the Environment to be held 8–11 May in San Francisco.

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NEWS

FROM AROUND THE IEEE & THE WORLD

Microelectronics Pioneer Awarded IEEE Medal of Honor

IEEE LIFE FELLOW James D. Meindl is the recipient of the 2006 IEEE Medal of Honor for his contributions to microelectronics, including his research into solving the key problems of the physical limits of gigascale silicon technology integration and on-chip interconnections. The award also recognizes his work with the novel low-power integrated circuits and sensors that he developed for a portable electronic reading aid for the blind.


James D. Meindl

Meindl has been involved with solid-state electronics for nearly his entire career, most recently as the director of the Joseph M. Pettit Microelectronics Research Center at the Georgia Institute of Technology, in Atlanta. He has been the Joseph M. Pettit Chair Professor of Microsystems since joining the university in 1993.

At Georgia Tech, Meindl developed a method to predict the future of microelectronics more accurately. He calls it a "hierarchy of theoretical and practical limits." The hierarchy starts with very fundamental laws of physics and moves up the scale to very complex systems. His system uses five distinct levels: fundamental, material, device, circuit, and system. By applying his hierarchy of limits, he believes he can better understand the physical laws that govern what can be done on a microchip.

Meindl began his work with ICs in 1965 as the founding director of the Integrated Electronics Division of the U.S. Army Electronics Laboratories, in Fort Monmouth, N.J. He researched micropower ICs for portable military equipment used by foot soldiers.

He left there in 1967 to join Stanford University, in California, as the John M. Fluke Professor of Electrical Engineering and associate dean for research of the School of Engineering. He was the founding director of both the school's Center for Integrated Systems as well as its Integrated Circuits Laboratory. These facilities served as university–industry cooperative research centers in microelectronics.

It was at Stanford that he and a team of other engineers helped develop the electronic print-reading device for the visually impaired daughter of one of his colleagues.

In 1986 Meindl became the senior vice president for academic affairs and provost of Rensselaer Polytechnic Institute, in Troy, N.Y. He was responsible for introducing a computer calculus curriculum for all first- and second-year students. He returned to research in 1993, when he joined Georgia Tech.

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

New Award Recognizes Ethical Practices

DO YOU KNOW of an IEEE member or an organization employing IEEE members that has shown exemplary ethical behavior or practices, or successfully advocated them? Then consider nominating that person or company for the newly established IEEE Award for Distinguished Ethical Practices.

The first award will be presented in 2007. The deadline for nominations is 1 July 2006.

Nominations must come from the general membership of the IEEE. Members of the IEEE Board of Directors, the Awards Board, the Ethics and Member Conduct Committee (EMCC), and IEEE staff may not submit nominations. Self-nominations are not permitted.

A nominating form is available on the EMCC Web site at http://www.ieee.org/ethics and through the Other Awards Programs link on the IEEE Awards Web site at http://www.ieee.org/awards.

Candidates Named For 2007 President-Elect

AT LEAST TWO CANDIDATES will be on the 2006 ballot for President-Elect. The two were recommended by the IEEE Nominations and Appointments Committee and selected by the Board of Directors at its November 2005 meeting. The winner of the election will succeed Leah Jamieson, whose term as IEEE President expires at the end of 2007.


Lewis M. Terman


John R. Vig

LEWIS M. TERMAN, an IEEE Life Fellow, is the associate director of the Systems Department of the IBM Research Division, in Yorktown Heights, N.Y. He was director of IEEE Division I and a member of the IEEE Board of Directors in 2004 and 2005. He also served as vice president of IEEE Technical Activities in 2001.

Terman joined IBM in 1961, and since 1981, he has directed groups doing research on circuits, devices, and technology for advanced MOS memory and logic.

Terman received a bachelor's degree in physics and master's and doctoral degrees in electrical engineering from Stanford University, in California, in 1956, 1958, and 1961, respectively.

JOHN R. VIG has been a researcher and program manager since 1969 at the U.S. Army Communications–Electronics Research, Development & Engineering Center, in Fort Monmouth, N.J. An IEEE Fellow, he works on the experimental aspects of frequency-control and sensor devices.

Vig was 2005 vice president of IEEE Technical Activities and the 1998 and 1999 president of the IEEE Ultrasonics, Ferroelectrics, and Frequency Control Society. Born in Budapest, Hungary, Vig immigrated in 1957 to the United States. He received his bachelor's degree in physics from the City College of New York in 1964 and his master's and doctoral degrees in physics from Rutgers University, in New Brunswick, N.J., in 1966 and 1969, respectively.

Ballots are scheduled to be mailed to voting members by 1 September. The final version of the 2006 election ballot may also have the names of members who have successfully petitioned the IEEE membership to become candidates for 2007 President-Elect. Starting with the 2006 annual election, the petition signature requirement has changed. For an explanation of the change, or for instructions on how to petition for an office, contact Carrie Loh, IEEE Corporate Activities, at +1 732 562 3934, e-mail: c.loh@ieee.org.

Qualifications for petition candidates are specified in the IEEE Policies. The completed petition must be received at the IEEE Operations Center by 9 June 2006.

IEEE Explores Office in China

THE IEEE BOARD OF DIRECTORS approved US $70 000 in November to study the feasibility of opening an office in China, which would provide the IEEE with a "legal and physical presence" in the country. Recommendations were to have been delivered to the board at its 19 February meeting, which had not been held at press time.

Although IEEE societies have held many international events in the country, a China office would perform functions such as assisting members in China with membership issues, helping to organize conferences, and supporting activities of IEEE societies in China and the Far East.

With projections indicating a continued rapid rise in the number of engineering graduates in China, paired with the astonishing growth of engineering activities in the region, it's common sense that the IEEE should explore ways to improve its services for members and other engineers in the country, according to IEEE President Michael Lightner.

"Although we partner with key Chinese technical and scientific organizations, it's getting increasingly complex to work effectively in China without having a legal presence in the country," Lightner says.

"The IEEE is here to serve members and other technical professionals," Lightner continues. "If there's an area where that is hard to do because of an organizational issue, then we should work to try to solve that issue."

—Compiled by Kathy Kowalenko & Shazia Memon

MARKETPLACE OF IDEAS

RESPONSES TO DECEMBER'S QUESTION

Man in Space

NASA Administrator Michael Griffin is quoted as saying that the space shuttle and the International Space Station (ISS) were mistakes. The two projects, he said, are too expensive in terms of astronauts' lives and dollars and haven't produced enough scientific knowledge. What do you think?

Prisoners on Earth

The shuttle and the ISS were expensive and necessary lessons, not mistakes. The shuttle promised cheap, routine access to space via reusable systems instead of wasteful, throwaway vehicles.

I want my children to have the opportunity to go to Mars and the outer planets, rather than being prisoners of this planet. Unquestionably NASA has made many serious errors in the shuttle's design. It has chosen complex, expensive, highly specialized, customized, and difficult-to-maintain high-tech solutions that make minimal contributions to the goal of having a cheap, routine, and reusable vehicle.

Griffin needs to understand the dual nature of NASA's space mission. It is not only to place scientific instruments at distant locations in our solar system but to get human explorers there as well. If he can conceive of a better, faster, and cheaper way to acquire the knowledge needed to get people to those locations, we'll all support it.

GEORGE MCKEE
Centerport, N.Y.

Dubious Economics

Space is important to the future of scientific exploration. We are not satisfied with understanding only our planet. As a stepping stone to reach Mars and beyond, the space shuttle and the ISS are necessary. Both help us move toward our goals. However, it is questionable whether they make economic sense. NASA claimed that the shuttle would be 15 times cheaper to fly than the Saturn vehicles, but it turned out to be three times more expensive.

Originally, NASA expected to reuse the shuttle within weeks of a flight and at a reasonable cost. However, it takes months to refurbish the shuttle for another flight that costs an average of US $760 million. As a result, the most enthusiastic researchers became doubtful. Shouldn't we be more sensible about exploratory projects?

HONG-LOK LI
Vancouver, B.C., Canada

Destined for Space

The space shuttle and the ISS are only one part of the space exploration plan. How do we expect to get rewards when we are only partly into the plan? We need to remain committed. Engineering is about learning lessons, making appropriate adjustments, and moving on. Like discovering America, discovering space is our destiny and our future.

Let's get going. Mr. Griffin, we are where we are. As a U.S. taxpayer, I am not paying you to tell me why, in your opinion, the previous programs are mistakes. I am paying you to move us to our destiny in space. Lead or get out of the way.

JIM LEWIS
Tigard, Ore.

On to Mars!

The United States has wasted 30 years and astronauts' lives on hollow symbolism. Those were the years when most of us had expected to see humans building in space, not pointlessly going around in circles. We should return to the moon and go on to Mars to explore and establish footholds for human colonization and exploitation of space's vast resources.

TOM CRAVER
Chandler, Ariz.

Power for the People

The need to generate electric power without producing greenhouse gases has prompted government officials and even some environmentalists to reconsider nuclear power. How would you feel about a new nuclear power plant in the area where you live?

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

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LETTERS

More Women Are Not the Issue

First I should declare myself guilty of being an old-fashioned male chauvinist. But I encouraged all of my children to go into scientific and technology careers, including a daughter who became one of the first female airline captains in the United States. My answer to Moshe Kam's question in "Why Won't Jane Go to Engineering School?" [December, p. 16] is that Jane simply doesn't want to. Despite the trend toward equality between men and women, the fact remains that women and men are different.

Of course Jane isn't dumb; she just doesn't care for science or engineering. As long as we have enough engineers to do the job, why should we care about the percentage of female engineers?

We shouldn't attempt to sell a career in engineering to anyone. Men or women interested in the field will go into it as long as we don't put any gender-based barriers in the way. If someone has to have a career in engineering sold to him or her, then that person should look for another job.

DEAN S. EDMONDS JR.
Naples, Fla.

Kam's article starts out saying that despite years of promotions, funding, and research studies, few women earn engineering degrees. Kam then jumps to some pretty fanciful conclusions. For example, he says law and medicine, which have much higher percentages of women, offer a "friendly and inviting atmosphere," whereas engineering consists of "long hours, high stress, and competitiveness."

My friends in medicine spent years in school and residency where mistakes can result in death. I work with lawyers who, after law school's grueling training, put in 80- to 100-hour weeks for eight years at a modest salary in the hopes that they make partner at their law firm. If they don't they start all over at another firm.

Most disturbing is Kam's suggestion that universities change engineering curricula in order to attract more women. More important than focusing on the gender of future graduates is the task of improving engineering education and encouraging all students to enter our exciting, challenging, and lucrative profession.

BOB ZEIDMAN
Cupertino, Calif.

Too Inclusive

In reference to the proposed change in the IEEE Code of Ethics mentioned in "Members Weigh In on IEEE Code of Ethics Revision" [December, p. 5], the term "technological" encompasses a broader spectrum of disciplines than just electrical and electronic engineering. It also includes, among others, chemical and civil engineering, which have their own organizations. Unless we expect to incorporate all the engineering disciplines into one big technical society, it is presumptuous to broaden the scope of the IEEE Code of Ethics by using the term "technological."

GEORGE R. TRIMBLE JR.
Princeton, N.J.

Bureaucracy at Its Worst

"Medical Records: From Clipboard to Point-and-Click" [December, p. 1] spoke of the U.S. government's interest in the whole scheme of making "patient medical records available 24/7 anywhere, anytime, anyplace in the world." I feel that once the technology is in place, citizens—doctors and patients alike—will be forced to participate. This information will be linked through Social Security numbers to dozens of other databases—public and otherwise—that can be queried by any number of government agencies. The official concerns over privacy are eyewash. Look at any privacy statement handed out by the government and even private institutions. It's just a rationalization for invading privacy and is not worth the paper it is printed on.

If a private citizen wants to put his or her own medical records on a CD-ROM or memory stick, fine. In the case of electronic medical records, however, we find an example of a profession selling out to earn professional kudos and make a few bucks.

GARY DAMERON
Colorado Springs, Colo.

Correction

In "Herz Award to Honor Outstanding IEEE Employee" [December, p. 4], the eligibility requirement for receiving the award was incorrect. Full-time past or present staff members of the IEEE with at least 10 years of service are eligible for the award.

Enabling Members To Compete Globally

In his best-selling book, *The World Is Flat*, Thomas L. Friedman adds new urgency to what technology professionals already know.

FRIEDMAN USES "flat" as a synonym for "connected," and he writes about how sweeping technical advances—especially in telecommunications—combined with the lowering of trade and political barriers, have eliminated all obstacles to international competition.

"Globalization 3.0," as he calls it, is being driven by enterprising, innovative organizations and individuals around the world. Friedman repeatedly emphasizes how they are using technology to win—not just the low-wage manufacturing and information jobs but, increasingly, the most prized research and design work as well. Friedman advises, "If you want to grow and flourish in a flat world, you better learn how to change and align yourself with it."

Is this scary stuff? To the ill-prepared professional, perhaps it is. But IEEE members already have many of the necessary tools to help them distinguish themselves in this globally competitive environment. Historically, the IEEE has embraced transnationalism, that is, working with a global focus while respecting local and national concerns, and it has demonstrated the global nature of technology through our programs and activities. Indeed, since the IEEE's founding, we have worked to provide access to our programs and activities to engineers and other technical professionals around the world.

For example, the more than 325 IEEE conferences held internationally each year provide an outstanding opportunity to learn cutting-edge information in your field of interest and to meet other professionals with interests similar to yours. At least a few of these conferences are probably near where you live. Also, there are section and chapter meetings—ideal situations in which to distinguish yourself. At the simplest, you can join informal discussions about something new and exciting. You can offer to present a paper on your own work or volunteer to help organize a tutorial or workshop. Leadership opportunities abound in every society, section, and chapter. Volunteering and getting involved are some of the best ways to get noticed and stand out as an effective professional. Another way to make a mark is by participating in an IEEE Standards working group.

Maintaining technical currency is critical for success as a technical professional. This can be done through reading the literature, attending conferences, or taking continuing education courses, including the myriad programs of various IEEE societies, such as the IEEE Computer Society's Distance Learning Campus. In 2006, Educational Activities' Expert Now IEEE, currently available through several institutions, is expected to be introduced to members. It is a set of hour-long, online learning modules with both the latest information on emerging technologies and seminal works presented at IEEE tutorials and workshops.

Looking ahead, the IEEE is exploring new areas where we can further assist technical professionals to distinguish themselves in the globally competitive environment. One possibility is to develop technical currency programs that, upon successful completion, will certify that individuals are up to date in a given area. This currency certification would be valid for a specific time period.

This is just one example of what the IEEE is pursuing for technical professionals. We are considering other ideas, but lack of space prevents discussing them here. IEEE members will continue to enjoy preferential pricing and registration at conferences and for products and services.

We need your input—whether suggestions or concerns. During 2006, I hope this President's Column will provide two-way communications between you and me. Please send your ideas and concerns to me at lightner.column@ieee.org.

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in sub-Saharan Africa to use these low-cost but robust machines. Second, thanks to a US $14 000 donation from the IEEE Foundation to fund Internet access for two years and a matching donation from the IEEE, students and faculty have free access to the IEEE digital library for at least three years, giving aspiring engineers and their instructors a valuable resource found nowhere else in Africa.

COMPUTER-POOR After I visited Nigeria for the first time, in June 2003, to report on the impact of the $640 million SAT-3 fiber-optic cable for *IEEE Spectrum*, I didn't imagine that I would return any time soon. True, I'd made friends among the engineers, students, professors, and many IEEE members I'd met. Although all endured the typical privations one expects in a developing country—bad roads, rolling blackouts, and endemic malaria—the students seemed at a special disadvantage compared with peers in other countries. They had no access to peer-reviewed journals, up-to-date textbooks or computers, or the Internet.

At the Federal University of Technology, Owerri, Nigeria, 800 students shared time on the dean's ancient Intel 486 computer to write their papers. To e-mail someone, they had to write out the message and then take it to a local cybercafé where it was typed and sent. So my new friends didn't have to say much to persuade me to help them find grants for computers and a satellite Internet connection for the University of Ibadan's EE students.

But the project had dragged on, and I feared students would never be able to walk in and do research using the Internet and IEEE Xplore. That's because, first, the university had to decide which of its buildings to donate for the facility and to commit to wiring a 60-seat computer center. Then HP learned that power was so unreliable at the school that the HP foundation would also have to fund the purchase of a diesel generator. Next, a still-maturing African supply chain delayed the deployment of HP's new 4-4-1 computers for several months.

HP made its donations, which total about $125 000, on the condition that the center's server and local area network would be remotely administered, monitored, and maintained by Advanced Interactive, in Vancouver. That meant HP also had to pay for a satellite dish and the first year's worth of service, while my Nigerian colleagues and I had to shop around for the best deal to fit the limited budget.

Unfortunately, the first Internet service provider we contracted with didn't deliver the promised level of service and shut off the connection just weeks after the computers had been delivered. Then there were personnel changes in the university's electrical engineering department and at the telecenter itself, along with the difficulties of communicating about the project across nine time zones in four countries—Canada, the United States, Nigeria, and Switzerland, where some of our HP colleagues are based.

DOUBTS APLENTY So it was with a sense of the miraculous that I hadn't experienced since I posted my first message on an Internet bulletin board in 1991 that I answered e-mail and downloaded papers from IEEE Xplore in Ibadan. It was a day I thought might never come.

I was not alone. As I was composing another message, the university's vice chancellor, O.A. Bamiro, and his entourage walked into the facility for the first time. At the ribbon-cutting ceremony the next day, Bamiro explained to the crowd that he hadn't visited the center until the night before because he had been a doubting Thomas. But now that the center had opened, he and the university pledged to find a bigger building to house it and to play an active role in seeing to its sustainability and success.

Bamiro related the biblical story of Saint Thomas to a crowd of more than 200, who were fanning themselves beneath awnings erected to shield them from the scorching tropical sun. And though the center's ribbon cutting had provided the occasion for them to gather, they had really come to see Past President Anderson, who was greeted with all the pomp and pageantry accorded a visiting head of state.

The IEEE/HP Telecenter connects to the Internet via a well-protected satellite dish.

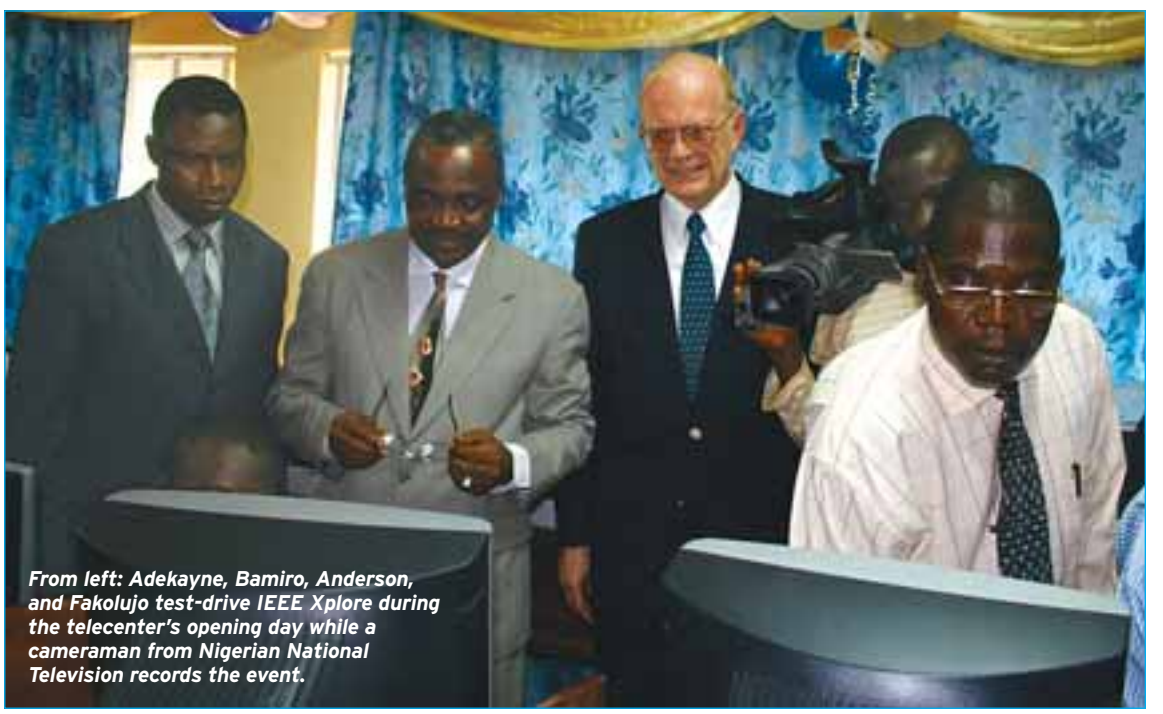
Anderson started his speech by thanking more than a dozen people who had contributed to the success of the project. The first IEEE President to visit Nigeria, he quoted Demosthenes, the ancient Greek orator: "Small opportunities are often the beginning of great enterprises." With a crew from Nigerian National Television recording the proceedings, Anderson went on to say, "This center has the potential to become a model for similar projects in other Nigerian locations and throughout sub-Saharan Africa." Moments later, Anderson and Stanley Mouneke, HP's representative in West Africa, together clasped a pair of scissors and, with onlookers craning their necks for a glimpse, cut the yellow ribbon to officially open the IEEE/HP Telecenter.

The next day Anderson attended the annual IEEE Nigeria Section meeting, which was scheduled to coincide with the commissioning. Inside the meeting hall, where a few feeble fans barely stirred the warm, sticky air, new officers were installed, most notably Tunde Salihu as president. As the section's treasurer and the IEEE's project manager on the Ibadan project, Salihu had worked tirelessly for two years to get the center up and running. He had taken over from Isaac Adekanye, founder of the section, which has grown under his guidance from a handful of members in 2000 to more than 1600 today.

Nigeria is a deeply religious country, and whether one attends church or mosque, references to divine forces are appreciated, even expected. All formal meetings—and even some car trips—begin with a prayer. So when Anderson delivered a keynote speech sprinkled with religious references, section members—Christian and Muslim alike—nodded their heads reverently, applauded, and even spoke along with Anderson's slides, as if responding to a sermon.

"I believe in the nobleness of engineers: they are noble men and noble women because of their creative nature and because of their ability to leave a better community, a better nation, and a better world with their Master's touch," Anderson declared. Then, quoting from the revelation to Joseph Smith, he said, "I believe 'the earth is full, there is enough and to spare; and ... given unto the children of men to be agents unto themselves.'"

"Truly, engineers are not only innovators but creators too," he continued. "Indeed, I believe that there are elements of the divine in the profession of engineering. I think that it is within the calling of the engineer, and the engi-



From left: Adekayne, Bamiro, Anderson, and Fakolujo test-drive IEEE Xplore during the telecenter's opening day while a cameraman from Nigerian National Television records the event.

NETWORKING NIGERIA

neering profession, to find the ways to lead the world out of the miseries of poverty and help fulfill everyone's dream of living in a developed country of one's birth."

HOMEGROWN EXPANSION The last statement underscored why we were in Nigeria in the first place. To stem the brain drain that steals the best minds from developing countries, you first have to provide students with educational tools and opportunities that let them study at local institutions. And then slowly, over the course of years, technology sectors will start up, expand, and begin to employ homegrown engineers. Nigeria has seen this starting to happen in the telecommunications sector, where the country has gone from no cellphones in 2000 to an estimated 10 million in 2006. As more base stations sprout up and fiber-optic cable is finally laid across the country to connect long-haul international calls to the SAT-3 cable I reported on in 2003, there is hope that today's Nigerian engineering students will be able to find a good job in the country of their birth.

But as Anderson said, the Ibadan project is just the start. More companies need to donate new computers to developing countries, not just cast off their used machines for a tax credit. More information providers need to give students and instructors free or reduced-cost access to the world's treasure troves of engineering information. And more professional organizations like the IEEE need to help countries like Nigeria develop their technical communities and network people with their peers across the globe.

Africa is littered with the detritus of broken promises—crumbling roads, pathetic power-generation capacity, poor public-health systems, filthy water, and virtually nothing in the way of safe public transportation or waste disposal. That's not to say the situation is hopeless; on the contrary, the people Anderson and I met on our travels in Nigeria have the will and the intellectual wherewithal to create hope in the midst of grinding poverty. And they can use all the help they can get.

WEB SITE *Continued from page 1*

member of the volunteer group that supervises the project, the IEEE Information Technology Strategy Committee (ITSC). "The old site was trying to be a member site, a site for our volunteers, and also a corporate site to the outside world. None of these constituencies was well served."

Similar concerns were held by another member of the committee, Life Fellow Willis K. King. "Before this update, you had to know exactly where things were on the site to find them, and every section had a different look," he says. "Now the site is far more uniform, with the areas for navigating the site appearing the same way and in the same place on whatever page you're on."

USER FOCUS "The greatest challenge for this Web project was to move away from organizationally focused content to something more user-friendly," says Senior Member David Green, also an ITSC member. He notes that the IEEE has so many products and services, and such a diverse constituency, that it is difficult to present content in a comprehensive way and not overwhelm users.

"We tended to present the information the easiest way we knew how—the way the IEEE was organized," he says. However, that proved far from adequate and it was agreed, partly as a result of the study, that the Web site should focus on the user.

The main navigation bar now found across the top of most pages is the key to the new focus, says IEEE chief information officer Sally Waselik, who led the Web site revamp. The categories on the bar are what members look for most often on the site. The menu tabs include Membership, Publications, Conferences, Standards, and Education. Each broad category links to a page with links to more specific information. Such linked pages are known as information portals.

"Each information portal is accessible from the navigation menu at the top of any page," says Waselik, "making previously hard-to-find content areas like publications or education almost always just a click away."

The navigation structure is applied to most pages and provides access to content areas much faster than before.

In addition to that navigation bar, users will see a box on every page that asks sim-

ply, "What do you want to do?" Links below the box are tied to the most frequently viewed parts of the site, such as the page for renewing subscriptions or one for searching for an article in the IEEE Xplore digital library.

The site's search capability has also been improved. In the past, users looking for, say, a specific IEEE technical article or conference often had to leave the site to use an outside search engine. Then they had to sift through dozens of search returns, most of which were unrelated to what they were looking for. Thanks to the addition of search tools to the IEEE home page—two of which are carried throughout the entire site—users can rely on the IEEE Web site in their quest for information.

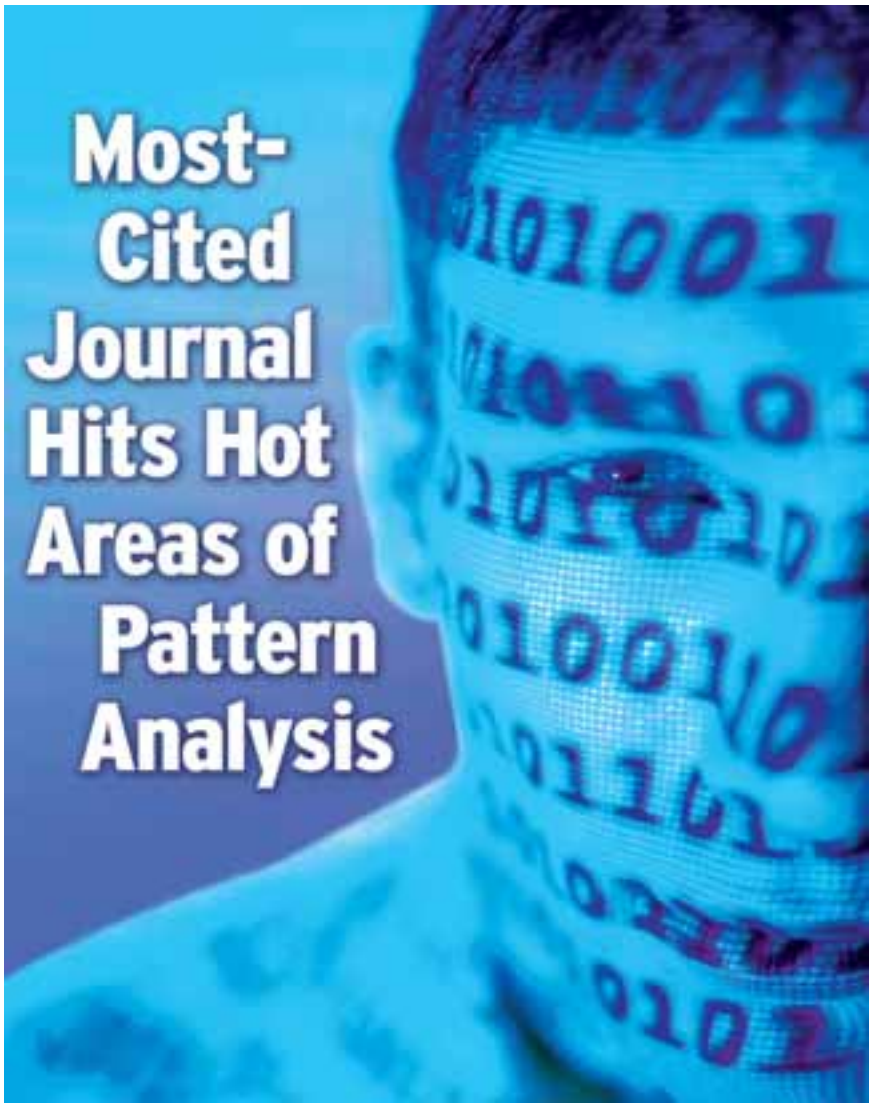
By typing keywords into the search box that appears near the top of any page and clicking on the Google search button, users can retrieve a variety of IEEE information from anywhere on the Web. Users confident that what they're after is on the IEEE site can use the IEEE button, also at the top of the page—which puts the Ultraseek engine to work. Those looking for a specific IEEE technical article or conference proceeding can search in IEEE Xplore.

The revamped site benefited from the collaboration of many IEEE volunteers and staff members, who have worked on a compressed project schedule since July. Waselik and Joanne Vara, the Web site's manager, do not see the current version as final but as a major step toward improved design, content, and navigation.

"This effort is just the beginning," Vara says. "We will continue to gather feedback as we plan the next version of the site. And the measure of our success will continue to be determined by the user."

Member surveys, usability studies, analyses of how users navigate the site, and site updates will be regular parts of the IEEE's monitoring of its Web site, says Waselik. Indeed, standing still is not an option.

"Users' expectations have been raised by their experience with other sites that are continually becoming more sophisticated," King explains. "While we're not where we want to be yet, this is a significant improvement."



BY TRUDY E. BELL

IN THIS AGE OF TERRORISM AND identity theft, many organizations want a fast, secure way of verifying that you are who you say you are. Identification is a pressing problem all over the world, so it's no wonder that an IEEE journal that concentrates on this field turned out to be the most-cited journal in 2004.

Passports, driver's licenses, and other government-issued picture IDs no longer suffice, because they can be readily forged. Automated face recognition, fingerprints, voice identification, corneal or retinal scans, and DNA analysis can identify individuals effectively, but they are too slow for high-volume use, as when thousands of passengers are being screened by airport security. At its core, each of those biometric techniques relies on some form of pattern recognition. A person could be recognized, for example, by the shape and highlights of the face or the colors and shapes in a cornea.

Much R&D is under way to develop techniques for identifying individuals quickly, so it's not surprising that a magazine that covers pattern recognition and analysis should prove popular. In fact, it can be argued that in 2004, the monthly *IEEE Transactions on Pattern Analysis and Machine Intelligence* (known as *TPAMI*) was the most popular of all. Of 209 electrical and electronics engineering publications, the magazine was ranked as the most-cited journal that year, according to the most recent science journal citation report, released in 2005 by Thomson Scientific, a book and journals publisher located in Philadelphia and London. *TPAMI* (pronounced tee-PAM-i) also ranked fifth in citations among 347 computer science journals. Thomson Scientific's citation figures are widely valued because they are believed to be a measure of a journal's impact in its field.

TPAMI introduces both fundamental and advanced techniques for solving problems in computer vision, shape, and texture analysis; artificial intelligence; medical image interpretation; document image processing; and biometrics, which is the study of automated methods for recognizing humans based upon one or more physical or behavioral traits.

"Face recognition is one of the hottest areas of research in biometrics," says IEEE Senior Member David J. Kriegman, the volunteer editor of the 28-year-old monthly, which is sponsored by the IEEE Computer Society. Many researchers are interested in face recognition because of its potential for identifying people quickly. Applications range from video surveillance of crowds to the indexing of commercial or private libraries of photographs.

But the journal is just one way the IEEE disseminates information in the field of pattern recognition. Another way is to hold conferences of experts in the field. The IEEE Computer Society sponsors the annual IEEE Conference on Computer Vision and Pattern Recognition, which is scheduled for 17 to 23 June at the Kimmel Center at New York University, in New York City.

"I'M ME, HONEST!" "Facial images can be captured from a distance, and the images can be recorded, stored, sorted, and processed," points out Shizuo Sakamoto, principal researcher at NEC Corp.'s Media and Information Research Laboratories, in Kanagawa, Japan. Because people's faces are usually exposed, subjects don't have to go through any special actions such as placing a hand or finger on a sensor or scraping the inside of a cheek for a DNA sample. (Sakamoto has written articles for the IEEE Systems, Man, and Cybernetics Society's journals. His most recent article, "Development of Face Recognition Techniques at NEC Laboratories," appeared in the society's September *eNewsletter*.)

But there are innumerable complicating factors to automating the face-recognition chore. People's faces change as they age, or they gain or lose weight. Cosmetics can transform a person's appearance, as can illness or fatigue. "A person's appearance can change significantly, even overnight," says Harry Wechsler, an IEEE Fellow and director of the Distributed and Intelligent Computation Center at George Mason University, Fairfax, Va. Wechsler is also on *TPAMI*'s editorial board. "I would look very different tomorrow morning after a transatlantic flight, unshaven and exhausted, than I would today when I board."

But even absent an actual facial alteration, "the appearance of a face changes drastically when pose and illumination are varied," Sakamoto says. Sakamoto's group at NEC is working on a face-recognition method that resists being fooled by variations in lighting or angle of pose. First they need to figure out how shadows and highlights vary for all angles of lighting and pose for a face; then they want to see whether that knowledge could help a computer identify someone from a two-dimensional image. To that end the group built a physical three-dimensional model of a specific individual's face and set it opposite a single lamp that could be positioned at different angles around the model. With a range finder and reflectance meter that also could be moved around the model, they measured distances to features, plus the brightness of reflections, the darkness of shadows, the angles between visible features, and the length and shape of shadows and the features casting them.

Then, armed with all those biometric measurements as a basis for comparison, they presented a computer with one of 14 000 test images of 200 individuals, made under dramatically different illumination conditions and viewed from angles ranging up to 60 degrees sideward and 45 degrees upward from a frontal pose. Fully 94 percent of the time, no matter the angle of illumination or pose, the computer correctly identified the person, Sakamoto says. Pleased with that early success, he and his group are now exploring ways of applying their technique to a wider selection of human faces while minimizing the computation time required for comparing images.

"NO, IT'S NOT ME!" Getting a computer to recognize and track a single person in a crowd, another potential application for face recognition, is deceptively difficult. "First it has to detect or locate the face—which is not simple where a lot of people are moving, especially when the closed-circuit TV surveillance camera is positioned too high for a full view," Wechsler explains. "Then the computer has to keep track of that face when it disappears behind other people's heads, so it knows it is the same face when it reemerges." For that reason, among others, it is becoming clear that traditional black-and-white closed-circuit TV surveillance systems must give way to color. "Color gives important additional information on the skin and its texture, and on distinguishing skin from cosmetics, fabrics, or other objects," Wechsler says.

Even if a face in a crowd seems to bear a close resemblance to an image in a suspect watch-list database, "how close is close enough?" he asks. "Two pictures of the same person can be more different than pictures of two different people!"

That fact, he says, accounts for the high incidence of false-positive identifications by today's surveillance security systems, alarming innocent citizens when they are detained because of their resemblance to a criminal suspect.

To combat false-positive identifications, Wechsler is investigating open-set recognition, which he and coauthor Fayin Li explain in "Open-Set Face Recognition Using Transduction," which appeared in November's *TPAMI*.

Positive identification of a person assumes that a subject has been enrolled, or

has been seen before—such as when a person is photographed for a company ID card. That's closed-set recognition. But in a surveillance system, the number of people who pass a security camera is far greater than the number of suspects whose images appear in a watch-list database. So, to avoid misidentifying innocent people, "you want a computer to be able to say, 'I've never seen this face before.' That is not at all the same thing as positive identification, which answers the question: 'Who is this person?'" Wechsler explains. "The distinction is not trivial or straightforward."

As much to avoid false positives as to ensure positive identification, Wechsler is intrigued by a new trend of combining methods for identifying people, pairings that "will be part of the next generation of passports," he says. An obvious pairing might be combining faces with fingerprints. Another useful pairing might combine two-dimensional photographs with three-dimensional information, such as a holographic image, he says. But also useful would be a video or sequence of frames lasting a few seconds showing how a person speaks or moves the head or limbs. "People recognize each other at a distance by gestures as well as by appearance," Wechsler says, referring to the way a person stands or walks and the way people gesture with their hands and make other expressive movements. Gestures might be especially helpful when searching for a suspect walking in a crowd, he says.

FOR GOOD GUYS, TOO Because changes in appearance, gestures, and coloring also reveal information about a person's health, researchers are interested in potential medical applications of what's coming to be called "face processing," Wechsler says. "Suppose an elderly person has a stroke and is paralyzed and can't speak but can understand conversation," he says. "We would like to have the computer as an assistant, so face processing might help family and friends understand what the person is truly feeling and thinking."

Some early commercial applications of face processing may help people in their everyday lives. "One company is testing face-recognition software to help organize libraries of photographs," *TPAMI*'s Kriegman says, "so you could, for example, ask it to go through hundreds of digital images of your family and pick out all those of your favorite aunt."

Without doubt, the software is improving. "A 2002 test of face-recognition software conducted by NIST [the U.S. National Institute of Standards and Technology] concluded that it is about as accurate as fingerprinting was in 1998—in other words, not too shabby," Kriegman says. Right now, NIST is conducting another round of competitive testing and is scheduled to publish its results this year.

AWARDS

Meet the Fellows of 2006

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 on members who have contributed "to the advancement or application of engineering science and technology." For 2006 the IEEE Board of Directors named 271 new IEEE Fellows.

Magdy Abadir
Bhupendra Ahuja
Muhammad Alam
Roy Alexander
Cesare Alippi
Charles Alpert
Peter Andrekson
Andreas Andreou
Jorge Angeles
Yasuhiko Arakawa
Mituhiko Araki
Bruce Archambeault
Kultegin Aydin
Mark Balas
Harrison Barrett
Andrew Barto
James Barton
Issa Batarseh
Paul Bernhardt
Gary Bernstein
Steven Best
Vijay Bhatkar
Antonio Bicchi
Marc Bodson
Philip Bolin
Dushan Boroyevich
Karlheinz Brandenburg
Jack Brassil
Andrei Broder
Leslie Brown
Mary Capelli-Schellpfeffer
James Carlo
Carlo Cecati
Chung-Ju Chang
Hsinchun Chen
Tongwen Chen
William Chen
Daizhan Cheng
Giovanni Cherubini
Ali Chowdhury
Christos Christopoulos
Steve Chung
Yun Chung
Donald Clark
Rowland Clarke
Patrick Combettes
Susan Conry
Ingemar Cox
David Culler
Nadir Dagli
Richard Davis
James Day
Wijesuriya P. Dayawansa
Christopher Deeney
Jesus del Alamo
Hector De Los Santos
Carlos de Souza
Simon Deleonibus
Seshu Desu
Leonard Dissado
Petar Djuric
Ian Dobson
Marco Dorigo
Hugh Durrant-Whyte
James Dymond
John Eidson
George Eleftheriades
Brig "Chip" Elliott
Michael Erdmann
Eric Evans
Charles Falco
Jeffrey Fessler
Marc Fossorier
Paul Franzon
Nicholas Frigo
Tohru Furuyama
Heyno Garbe
J.J. Garcia-Luna-Aceves
Rene Garello
Shuzhi Ge
Alex Gershman
Carlo Ghezzi
Arindam Ghosh
Joydeep Ghosh
Martin Giles
Ronald Gilgenbach
Allen Gorin
Dimitry Gorinevsky
Venugopal Govindaraju
Frans Groen
Stephen Grossberg
Gregory Hager
Blake Hannaford
Masanori Hara
Shinji Hara
Ramesh Harjani
Hideki Hashimoto
Hideki Hayashi
Thomas Henzinger
Kazuhiro Hirasawa
Ian Hiskens
Tin Ho
Charles Holland
Larry Hornbeck
Wen-Lian Hsu
Qin Huang
Johannes Huber
Todd Hubing
Katsuo Ikeda
Eastwood Im
Naoki Inagaki
Waguih Ishak
Andre Ivanov
Hamid Jafarkhani
Kanti Jain
Sandra Johnson
Geza Joos
Janusz Kacprzyk
Makoto Kaneko
Muhammad Khan
Masatsugu Kidode
Tetsuro Kobayashi
Ljupco Kocarev
Gerhard Koepf
Kazuhiro Kosuge
Alex Kot
Youji Kotsuka
William Krenik
Raghu Krishnapuram
Frank Kschischang
Anurag Kumar
Vijay Kumar
Luis Kun
Wolfgang Kunz
Tadahiro Kuroda
Hideo Kuwahara
John Larson
Swamy Laxminarayan
Michael Lebby
Ellsworth LeDrew
Raphael Lee
Shawmin Lei
Ye Li
Mong-Song Liang
Zhi-Pei Liang
David Lilja
Bin-Da Liu
Johan Liu
Yu-Hwa Lo
William Lockley
Darrell Long
Michael Loui
David Lucantoni
Charles Luther
Richard Lynch
Enrico Macii
Armand Makowski
Jitendra Malik
Gary May
Steven McLaughlin
Ian McNab
Michael McShane
Nancy Mead
Vladimiro Miranda
Daleep Mohla
James Moore
Amir Mortazawi
William Moses
Marek Moszynski
Hiroshi Murase
Malakondaiah Naidu
Masao Nakagawa
Janardan Nanda
Erich Neuhold
Paul Nielsen
Yoram Ofek
Juro Ohga
Sedat Olcer
Richard Olshen
Ariel Orda
Alon Orlitsky
William Osborne
John Osburn
Douglas O'Shaughnessy
Roberto Ottoboni
Thomas Overbye
Thrasyvoulos Pappas
Edward Petersen
Marios Polycarpou
Sitthichai Pookaiyaudom
Douglass Post
Frederick Raab
Muralidhar Rangaswamy
Richard Ranson
Sudhakar Rao
Carey Rappaport
Ulrich Reimers
Yves Robert
Thomas Robertazzi
Hermann Rohling
Yves Rolain
Joseph Rose
David Rosenblum
Emmanuel Rosencher
Alfred Rufer
Alain Sabot
John Sahalos
Hiroshi Sakou
Resve Saleh
Guenther Schmidt
Henning Schulzrinne
David Seiler
Gianluca Setti
Jeff Shamma
Naresh Shanbhag
Amit Sheth
Chuan-Jin Richard Shi
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Vijay Sood
Richard Spencer
Rayadurgam Srikant
Göran Stemme
David Su
Gary Sullivan
Masatoshi Suzuki
Madhavan Swaminathan
Katia Sycara
Shuichi Tahara
Yu-Chong Tai
Frank Talke
Tomohiko Taniguchi
Reese Terry
Craig Thompson
Kenneth Thompson
Tsuneo Tokumitsu
David Townsend
Chi Tse
Charles Turner
Jan Uddenfeldt
Nikolaos Uzunoglu
Luc Vandendorpe
Paul Van Dooren
Usha Varshney
Venugopal Veeravalli
Dinesh Verma
Richard Vinter
Ian Walker
Huei Wang
Lihong Wang
Roy Want
Katsuyoshi Washio
Tadashi Watanabe
Werner Weber
Andreas Weisshaar
Burnell West
Edgar Williams
Gerald Witt
Martin Wong
Sally Wood
Dennis Woodford
Min Xie
Murty Yalla
Hong Yan
Jan Zehentner
Lixia Zhang
Qi-jun Zhang
Nanning Zheng
Reza Zoughi

Millionaire Member Rockets Into Space

BY STEPHEN CASS

GREG OLSEN has had a long and accomplished career so far. He's an IEEE Fellow, the cofounder of two successful high-tech companies, and the recipient of a string of awards. And if that isn't enough, last October he spent 10 days in outer space, visiting the International Space Station—a trip Olsen funded himself, paying some US $20 million from his self-made wealth for a seat on board a cramped Russian Soyuz spacecraft.

IEEE Fellow Greg Olsen floats inside the International Space Station. He spent 10 days in space.

Olsen's journey to the station stemmed from a lifelong interest in space, sparked by the launch of the first satellite, Sputnik I, in 1957. Olsen was in seventh grade and already knew that he was marked for a technical career. His father was a New York City electrician, and as a young child Olsen considered his father's toolbox an extension of his toy box. But Olsen's aspirations ran into trouble in high school.

"I was a classic '50s greaser type, more interested in fooling around, cars, and chasing girls than studying. I was actually convicted of juvenile delinquency, suspended twice from school, and flunked trigonometry in my senior year," Olsen says.

He decided to join the U.S. Army. However, because he was only 17 years old, he needed his parents' consent on the enlistment forms, and his father persuaded him to try college for six months, with the understanding that if Olsen didn't like it, his father would sign the army paperwork. Olsen agreed, and after retaking trigonometry during the summer, he scraped into Fairleigh Dickinson University in Teaneck, N.J.

THE RIGHT CROWD A chance meeting with some foreign students as he was waiting to register for his college classes proved to be a turning point in Olsen's life. They invited him to study with them, and they turned out to be extremely motivated scholars. "If they flunked out, they were going back to their home countries. Now, I could have just as easily met a fraternity crowd, and it would have been all over for me," Olsen remembers. Within a few semesters, Olsen had turned around his academic career. He completed his undergraduate years with two bachelor's degrees—one in physics and the other in electrical engineering.

The IEEE played an early role in Olsen's life when, in 1967, he attended its annual trade show in New York City. "We'd go to get the free pens and stuff like that," he says, "but I met someone from the University of Virginia, in Charlottesville, and he talked me into going to Virginia." There Olsen completed a Ph.D. in materials science, which turned out to be the foundation of his later commercial success. "My life has been a series of stories like that. I never had this grand plan; it's always just been a series of random turns," he says with a chuckle.

After the University of Virginia, Olsen spent 18 months as a visiting scientist at the University of Port Elizabeth, in South Africa, before joining RCA Laboratories (now the Sarnoff Corp.), in Princeton, N.J. "I thought I'd retire at age 65 still working for RCA as a scientist, but [after 11 years] I developed a photodetector made of indium-gallium-arsenide," Olsen says. The detector was moved to production in 1981, and "as we were doing this, it just occurred to me that I could do this better, faster, and cheaper." Despite his lack of business experience, in 1984 he cofounded Epitaxx, a company that made emitters and detectors for fiber optics. Olsen found the entrepreneurial life suited him: "I think I found myself professionally." he says. "I was a good research scientist—I wasn't the best. When I started a business, I finally felt, This is my niche."

Olsen sold the successful Epitaxx in 1990 and, after casting around for a few months, decided to cofound, with Marshall Cohen, an infrared-imaging company called Sensors Unlimited, in Princeton. It, too, proved a commercial success, and Olsen recently sold it as well.

BLASTOFF AT 60 By 2003, though, Olsen was ready—and wealthy enough—to consider pursuing his Sputnik dreams. In addition to the $20 million price tag on the flight, Olsen submitted to two years of rigorous training in Moscow and Houston—which almost came to naught when a medical condition caused the Russians to bench him. Fortunately, the problem was resolved in time for Olsen, now 60 years old, to complete his training, and he blasted off from Baikonur Cosmodrome, in Kazakhstan, for the space station in the company of cosmonaut Valery Tokarev and astronaut Bill McArthur.

McArthur and Tokarev were relieving the previous station crew, Sergei Krikalev and John Phillips, at the end of their six-month tour. Olsen spent his week on board the station happily helping the crews swap over, conducting some biomedical experiments for the European Space Agency, talking to students via amateur radio, and looking out the window.

Olsen returned to Earth with Krikalev and Phillips, and not without some drama. A still-unexplained pressure drop prompted Krikalev to periodically order Olsen to crack open an oxygen valve—which only Olsen could reach—during the descent from the vacuum of space, in order to maintain the cabin atmosphere. (Olsen hazards that a strap may have gotten caught in a hatch seal, causing a slow leak.) In retrospect, Olsen realized the potential danger, "but while it was happening, there was no panic; Krikalev was right on top of it." The crew landed back in Kazakhstan safely.

Since his return, with the sale of Sensors Unlimited wrapped up, Olsen is considering what his next big project will be. Meanwhile, he spends about half his time talking to school groups. He worries that the lack of interest in technical careers among America's youth will be damaging: "The U.S. achieved its greatness in large part through its advances in science and engineering, and I want to see us remain strong in that," he says. By using his experience in space as a way to encourage interest in science and technology among students, Olsen says he feels that his expensive voyage will benefit many others.

"If it just ended as a joyride in space, it might be hard for me to justify the money," he says. "But the more time I can spend with kids, the more I can justify it."

Biography of Legendary Stanford Professor Wins IEEE-USA Award

BY EVAN KOBLENTZ

WHEN FREDERICK EMMONS TERMAN graduated in June 1924 from the Massachusetts Institute of Technology, the holder of only its eighth doctorate in electrical engineering, he could not have known what a marvelous career lay ahead. He would become one of the best-known university teachers of electrical engineering in the United States; he would write *Radio Engineering*, which would become a standard textbook following its 1932 introduction; and he would work with some of the industry's best-known people and companies. Nor could he have known that his career would be immortalized in an award-winning biography.

Similarly, neither could C. Stewart Gillmor have known when he entered Stanford's engineering school in California as a freshman back in 1956 that he would write that biography. On 4 March in St. Louis, Gillmor will receive the IEEE-USA Award for Distinguished Literary Contributions Furthering the Public Understanding of the Profession, for *Fred Terman at Stanford* (US $70, Stanford University Press).

Gillmor remembers how he met the already well-known Terman during his very first day on campus. He introduced himself to Terman as "Kansas City, and radio engineering." "Good man!" Terman replied, and Gillmor found himself engrossed with Terman and his career ever since that moment.

He never knew Terman personally, except for a few random encounters with him on the Stanford campus, although he did befriend Terman's son, Lewis, when both were student disk jockeys at the university's radio station. (The younger Terman is now a candidate for 2007 IEEE President-Elect.) And Gillmor himself later was a guest lecturer in Stanford's electrical engineering department. He now is a professor of history and science at Wesleyan University, in Middletown, Conn.

Information for his book came to Gillmor from a variety of sources, with the most important items coming from the Terman family. Gillmor also mined material he found in Stanford's archives and at the foundations set up by William Hewlett and David Packard, of the well-known Hewlett-Packard Co., who were Terman's students in the thirties. And Gillmor conducted scores of interviews with Terman's former colleagues. "And I've got stories hardly anyone knows anything about, because they're based on letters never made public before," he says.

Terman's formative years were not exactly ordinary, according to Gillmor. For example, Terman studied at MIT under Vannevar Bush, the American engineer and noted science administrator, and he was a friend and tutor of Herbert Hoover Jr., the son of the 31st president of the United States. Terman also excelled at track and field, but a bout of tuberculosis forced him to leave athletics until he was cured.

Stanford professor Frederick Terman [near left and above] advised his students William Hewlett [left center] and David Packard [far left] to start a company based on then state-of-the-art research on the resistance-tuned oscillator. Hewlett-Packard Co. is now a multibillion-dollar maker of computers, printers, and instrumentation equipment. [The photo at left was taken in 1952, the one above in 1965.]

Most of the book focuses on Terman's career from the time he accepted a Stanford teaching post in 1925 until his retirement as Stanford's university provost in 1965. (He was born 7 June 1900 and died 19 December 1982.)

Terman's influence extended well beyond Stanford's undergraduate program. For example, when Hewlett and Packard were his students, Terman persuaded them to start a new company based on what was then state-of-the-art research on the resistance-tuned oscillator, according to Gillmor. The result of their following his advice was the Hewlett-Packard Co. Based just off the Stanford campus in Palo Alto, it began as an instrument maker and is now a global multibillion-dollar maker of digital computers, printers, and instrumentation equipment.

Terman moved to New York City in 1941 to serve as president of one of the IEEE's predecessor societies, the Institute of Radio Engineers, and worked with Bush on radar countermeasures for the military during World War II. He returned to Stanford as dean of engineering in 1946, and he helped set up and then lead the new Stanford Industrial Park in the early 1950s.

It was Terman who, in 1956, persuaded transistor coinventor William Shockley to relocate from Bell Telephone Labs, in New Jersey, to start his own company on a site near Stanford. The area soon came to be known as Silicon Valley because of the great number of companies exploiting silicon technology that sprang up there. Terman had become interested in transistors in 1948, and Shockley, as it happened, was a longtime friend and Palo Alto native, Gillmor explains.

Only a year after Shockley founded his firm, in 1957, eight disgruntled engineers on Shockley's staff left to start their own company, Fairchild Semiconductor, which eventually led to Intel and dozens of Silicon Valley success stories. Another initiative of Terman's was the Stanford Linear Accelerator Center, which opened in 1966. It took 12 years to plan and has produced five Nobel Prize winners.

Despite Terman's many professional accomplishments, he was not always well liked by his peers, Gillmor notes. After meetings, "people would go out very angry, or they'd go out scared. But he didn't do it to be malicious." He was just very focused on getting things done, Gillmor explains. "To some historians he was this cold, mean guy. He wasn't. He was just extremely hard-working," Gillmor asserts, "and Terman's peers ultimately came to respect him."

All royalties from the book are being donated to Stanford's Hewlett-Packard Graduate Engineering Fellowship awards. Gillmor's research for the book was cosponsored by the William R. Hewlett Revocable Trust and the David and Lucile Packard Foundation. Gillmor's next project is a biography of Hal Middleton, the last student of the renowned Scottish physicist James Clerk Maxwell.

Program Promotes Engineering to Young People

BY ALLISON ICKOWICZ

Sure, teenagers love listening to their favorite music on iPods and snapping pictures of their friends with camera phones, but do they know who made those gadgets possible? Most aren't aware that engineers are behind these cool technologies. To help youngsters understand how engineers affect the world they live in, the IEEE Educational Activities Board (EAB) has been working on a program aimed at familiarizing preuniversity students with basic engineering concepts.

The driving force behind the project is the IEEE Center for Pre-University Engineering Education, an outreach organization that encourages students to study engineering in college. It is hoped that the center, set up and directed by the EAB, will be of use to educators, engineering associations, and industry. The center was funded last year by a US $98 000 grant from the IEEE Board of Directors.

"The ultimate objective is to reach several tens of thousands of young people every year—students who will read our materials and use our Web sites for information," says Moshe Kam, IEEE Vice President, Educational Activities. "We want to provide this audience with a new, fresh, and exciting introduction to engineering and give them the resources they need to make informed decisions about engineering as a career."

The center is working on two projects:

- Expanding the EAB's existing Teacher In-Service Program, which offers professional development workshops on various subjects that include technical topics.
- Developing a fun and informative Web site for school counselors, students, teachers, and parents that links to a searchable database of engineering information.

TEACHER IN-SERVICE PROGRAM Preuniversity teachers would be taught a hands-on activity related to a technical subject—on such topics as the basics of motors, switches, and simple machines—during in-service days. IEEE volunteers would help the teachers work their way through an activity. The idea is for the teachers to return to their schools and lead the same activity in their classrooms. (For more on the Teacher In-Service Program, see "Teaching Teachers Technology," *The Institute*, March 2005, p. 11.)

The program has been going strong since 2001, beginning in Florida's West Coast Section in Region 3 (the southeastern United States). IEEE volunteers have worked with more than 600 preuniversity teachers, who have had more than 63 000 students in their classes during the time.

In July more than 60 representatives from 23 IEEE sections in Region 3 received training on developing activities and learning how to form long-lasting collaborations with educators. The EAB wants to expand the program to all IEEE regions.

"We think that the Teacher In-Service Program offers a great way for IEEE members to impact their local school system through their volunteerism," says Bill Marshall, chair of the Atlanta Section. "Everyone who attended the July session was extremely supportive of the program and looked forward to participating in it."

The EAB has set a goal for the volunteer trainers to collaborate with approximately 1000 educators by the end of 2006, and it is planning training sessions in the northeastern and central United States as well as in Asia, the Pacific, and South Africa.

ENGINEERING WEB SITE The effort to develop a Web site came out of a meeting in February 2005, led by the IEEE. At the meeting were the American Society of Civil Engineers, the American Society of Mechanical Engineers, the American School Counselor Association, and the National Association for College Admission Counseling (NACAC). The groups met to discuss how engineering associations could do a better job of providing counselors with information about engineering careers. The meeting made the IEEE representatives aware that school counselors not only are inadequately informed about engineering but that they also needed a resource to provide them with information on university programs and careers.

To help fill that need, the IEEE began working with IBM to develop a Web site dubbed "Try Engineering." IBM had helped build a similar site called "Try Science" (http://www.tryscience.org), which will provide a link to the Try Engineering site. Now under construction, Try Engineering (http://www.tryengineering.org) is expected to be ready in June. Plans call for the site to provide general information on engineering and familiarize visitors with the profession and its various disciplines.

An IBM design team recently finished creating the Try Engineering logo and is working on a number of components such as a description of the life of an engineer, virtual games, and a feature that will allow visitors to ask an engineer a question. The questions and answers will be posted on a public forum blackboard for all visitors to see. Also in the works are lesson plans that teachers can download and use in the classroom.

"This Web site will offer some very valuable tools for people like me who aren't extremely familiar with engineering," says Malika Johnson, the assistant director of college counseling at the Bryn Mawr School, a college-preparatory institution for girls in Baltimore. As chair of the NACAC's National Professional Development Committee, Johnson participated in a focus group that reviewed a prototype of the Try Engineering site. She says she liked what she saw.

"Other career guidance sites cover numerous topics, but this one will help school counselors learn about different engineering disciplines and engineering careers," she says. "In turn, the counselors will be able to speak to their students about engineering and guide them on different careers."

Especially helpful will be the site's University Finder search engine, says Kam. By entering geographic criteria such as a state, province, or territory, visitors can use the tool to find universities with accredited engineering programs. Visitors can also search by engineering discipline. Initially the site will provide information relevant only to the United States and Canada, but data about engineering programs in other countries will be added by next year.

"The unique University Finder feature is one component that will make Try Engineering a valuable resource for the preuniversity education community," says Kam.

Once IBM finishes the site, the IEEE plans to take over, maintaining it and developing additional content. The institute is working with other engineering associations to add information related to disciplines such as automotive, civil, and mechanical engineering. And the school counselor organizations say they will stay involved.

Says Bryn Mawr's Johnson: "Since the Internet plays such a huge role in how children research information and communicate today, I think children will find the Web site convenient and easy to use."

FOR MORE INFORMATION on IEEE preuniversity activities, go to http://www.ieee.org/education

FEATURE

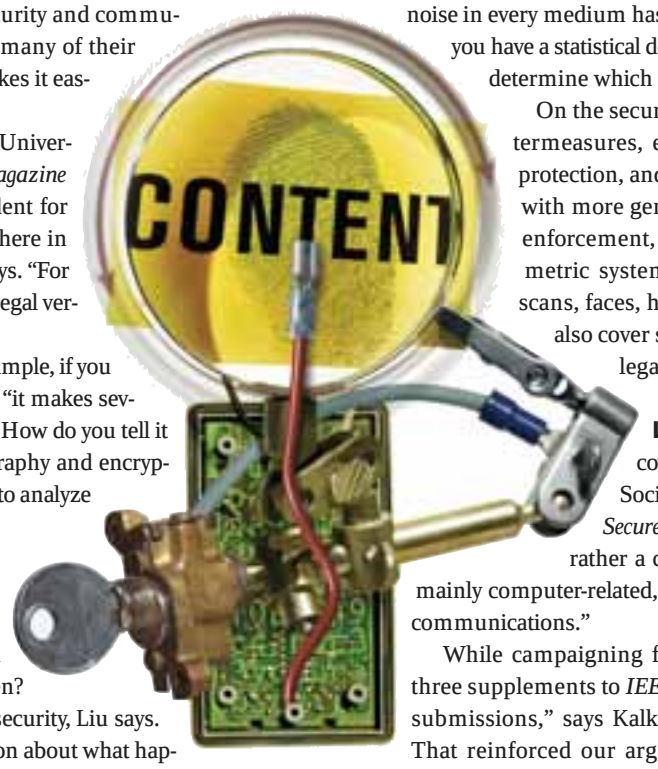
New Forensics Publication Pursues Information Security

Quarterly Journal To Be Unveiled This Month

BY IVAN BERGER

FORENSIC INVESTIGATORS ON TV PROGRAMS deal mainly with physical clues and crime scenes. In the real world, forensic investigators deal more and more with the invisible: information. Researchers in many fields are concerned with safeguarding information, and detecting and tracing or preventing breaks in information security.

Therefore, the IEEE Signal Processing Society is about to launch a new journal, *IEEE Transactions on Information Forensics and Security (TIFS)*. Debuting this month, initially as a quarterly, it will "give a home to research that is currently scattered," says IEEE Fellow Pierre Moulin, its editor in chief. "Information-processing people, biometrics people, photographic experts—all these sources have security and communication and signal-processing theory in common. And many of their problems have a common math framework. A journal makes it easier for such people to share ideas," he says.



Why now? The answer comes from K.J. Ray Liu of the University of Maryland, editor in chief of *IEEE Signal Processing Magazine* and the IEEE Signal Processing Society's new vice president for publications. "Today, when content can be delivered anywhere in the world, we have to worry about how to protect it," Liu says. "For example, music downloads or DVD downloads—legal or illegal versions? How do you trace it? Who did it illegally, and how?

"Forensics and security are inseparable," he adds. For example, if you receive an important image from, say, Iraq or Afghanistan, "it makes several hops to the United States. How do you tell it is secure? How do you tell it has not been tampered with? For security you use cryptography and encryption. If you think it leaked, you want to do forensic analysis to analyze what happened to the data en route."

DATA CLUES But forensics involves more than security. You want to know who the culprit is. You want to know, Who infringed on digital rights management? Who tampered with content? And you need to analyze: Who did it? When? These are forensic issues, which have nothing to do with security, Liu says.

Information forensics consists of "extracting information about what happened to data," explains Moulin, professor of electrical and computer engineering at the University of Illinois, Urbana-Champaign. "You have data in hand and you want to infer what was done to the data before you got it, what channels it may have gone through, what kind of transmission media, and what kind of tampering it may have undergone."

One forensic technique useful for multimedia is watermarking, which embeds content-identification data that eludes human senses. Like perceptual coding, which is used for compressing audio and video, "watermarking takes advantage of the fact that our eyes, ears, and brains are not sensitive to certain stimuli," Liu says. "The purpose is to hide information being added."

The U.S. Academy of Motion Picture Arts and Sciences uses watermarking when it wants to keep movies sent to its members voting on the Oscars from "pirate" duplication. Today, each disc is individually watermarked, so the source of pirated copies can be traced. "It would work even on analog tapes," says IEEE Fellow Ton Kalker of Hewlett-Packard Co., a member of the *TIFS* editorial board. "Watermarking survives in any domain—it's holographically embedded in the signal. As long as the signal quality is high, it will come through. It is very hard to get rid of it without destroying the signal."

A somewhat similar technique is extracting "robust summaries" from large media files that will survive modifications of the main file as long as there is sufficient similarity to the original file. "This is similar to what is done in cryptography and referred to as cryptographic hashes," Kalker says, "but with the difference that the smallest change of the main file completely alters the hashing" (an algorithm for rapid data retrieval from large files).

Noise analysis can also trace a signal's history, says Moulin. "If I receive an audio file I may want to determine whether it was transmitted in the digital or analog domain. The noise in every medium has its own characteristics, often physical or statistical. If you have a statistical description of each medium's noise, you can sometimes determine which media were involved," he says.

On the security side, the new journal will cover attacks and countermeasures, encryption and decryption, authentication, privacy protection, and other aspects of data protection. But it will also deal with more general aspects of security (including surveillance, law enforcement, crime prevention, and counterterrorism) and biometric systems that identify people based on fingerprints, iris scans, faces, hands, gaits, voices, or handwriting. The journal will also cover such broad issues as the interplay of technology with legal and ethical issues, security, and privacy.

LARGER FORUM *TIFS* is not the first IEEE journal to cover security and forensic issues. The IEEE Computer Society publishes *IEEE Transactions on Dependable and Secure Computing*. Moulin considers it "not a competitor but rather a complementary journal. The papers they publish are mainly computer-related, whereas ours will be more on signal processing and communications."

While campaigning for approval of *TIFS*, Moulin and Kalker prepared three supplements to *IEEE Transactions on Signal Processing*. "We got so many submissions," says Kalker, "that we did not have enough space for them. That reinforced our argument that we needed a separate journal, with a broader scope. The IEEE community working on information security and forensics scattered its research over different *Transactions*.

"Now there will be a common discussion forum," Kalker says, "bringing together IEEE members in many fields who have forensics and security in common: cryptography, biometry, image analysis, steganalysis (detection of messages concealed through a process called steganography), secure processing, and more."

Moulin also intends to bring to IEEE members "some of the research that takes place outside the IEEE, in areas like biometrics and photography. People working in these areas publish elsewhere because the IEEE has no journals specifically for them." Adds Kalker: "People in our community are members of several organizations, such as SPIE [the International Society for Optical Engineering, http://www.spie.org] and ACM [Association for Computing Machinery, http://www.acm.org]. So we expect lots of cross-fertilization. But this *Transactions* is focused on the IEEE; if we can reach others, fine."

For full details, see the call for papers, at http://www.ieee.org/organizations/society/sp/tifs.html.

Education Partners Offer Classes at a Discount

BY ERICA VONDERHEID

IEEE MEMBERS SEEKING to enroll in continuing education programs need look no further than the IEEE Education Partners Program (IEEE-EPP), which offers classes, seminars, and even graduate-degree programs, online or on campus—and at a 10-percent discount. What's more, the educational institutions in the program have been evaluated and found to meet criteria set by the IEEE Educational Activities Board (EAB).

"IEEE-EPP is the quintessential member benefit," says Barbara Stoler, managing director of IEEE Educational Activities. She points out that the 10-percent discount could cover a member's yearly IEEE dues, depending on the cost of tuition.

Members can choose from more than 6000 courses from 20 providers, including academic and private online learning organizations. The list of partners comprises well-established institutions such as the 136-year-old Stevens Institute of Technology in Hoboken, N.J., and the 30-year-old Thomson NETg, an online professional education company.

The IEEE program offers a good assortment of classes in terms of subject, price, and duration—from one-day seminars for a few hundred dollars to graduate-level degrees for many thousands of dollars. Topics include systems engineering, photonics, and radio-frequency identification technology. Students also can learn project management, business law, and writing skills. In most classes members earn continuing education units or professional development hours, the credits engineers need to maintain professional licenses.

"We're trying to help members develop their careers by offering these classes," says Donald Miklas, director of IEEE Continuing Education. "Members often say in our surveys that they are looking for more continuing education options, and this is one of our responses."

With technology changing so quickly—it is estimated that every five years some 90 percent of technology is replaced by new developments, according to Stoler—it is an axiom that engineers must continue their education after earning a degree. EAB members have long known of engineers' desire to stay current with technology, but the IEEE-EAB does not have the resources to provide the educational content itself. Instead, the EAB searches for quality classes and programs being offered by accredited universities and for-profit learning institutions, in line with the IEEE's goal of advancing technical education.

The IEEE searches for QUALITY CLASSES being offered by academic and private organizations

"IEEE-EPP showcases the EAB's role as a broker for world-class educational programs and helps raise the institute's profile by providing value to IEEE members," says Member Phillip Laplante, who is on the EAB's Continuing and Professional Studies Committee. An educational institution wanting to partner with Educational Activities must fill out a detailed application form that asks such questions as what technical topics are taught, whether students can interact directly with the instructor, and whether the institution is sanctioned by ABET, the U.S. Accreditation Board for Engineering and Technology, or a similar certifying organization. The committee evaluates the institution's application, course catalog, and accreditation to ensure that members can choose from a variety of classes, that the courses cover relevant topics, and that students can gain the credits they desire.

A CLICK AWAY Enrolling in a program is easy once the selection has been made from the list of partnering institutions and subjects that can be found on IEEE-EPP's home page at http://www.ieee.org/partners. Just click on the institution's hyperlink and log in with your IEEE Web account information.

All partners have created Web portals through which members can access course catalogs, register for classes, and receive the IEEE discount, which shows up at the end of the registration process. Because registration for courses is made through the learning institution, not the IEEE, members must abide by any regulations set by the school, such as prerequisites or eligibility requirements for particular courses or programs. Also, all questions about the courses being offered are handled through the educational institutions.

A few programs being offered are traditional campus-based ones, such as those at the University of Washington at Seattle, but most are online classes taught through video conferencing and Internet discussions, or they are e-mail-based correspondence courses. Any student can take an online course regardless of time or place, of course, and thus IEEE-EPP has a 24/7 international reach. Most of the courses are in English, but some, such as those from Thomson NETg, are available in Chinese, French, German, and Spanish.

With 20 providers and their more than 6000 courses at your fingertips on the Web, you may have it easy deciding to continue your education.

For more information on IEEE-EPP visit http://www.ieee.org/web/education/home

Nomination Alert: The Deadlines Near

THE IEEE NOMINATIONS and Appointments (N&A) Committee seeks nominations of IEEE members to serve in 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, right, for dates critical to the nomination and election process. Names of candidates for 2007 must be submitted to the N&A Committee by 15 March 2006. For elected offices see "Up for Election in 2006," below, right.

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

Nominations are also sought for the 2008 IEEE President-Elect and for the 2007 Assembly-elected officers: Vice President, Educational Activities, Vice President, Publication Services and Products, and 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 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 who will be placed on the 2006 ballot for elected positions.

The list will include candidates for IEEE President-Elect nominated by the IEEE N&A Committee and selected by the IEEE Board of Directors. 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 Members-at-Large of the Standards Association Board of Governors; Vice President-Elect, Technical Activities; and IEEE-USA President-Elect and IEEE-USA Member-at-Large. The Board of Directors is also responsible for placing proposed constitutional amendments on the ballot.

Members who are not 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 USA (16:00 Greenwich Mean Time), 9 June 2006. To be eligible for placement on 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.

2006 DEADLINES AT A GLANCE

15 March
- Regional nominating committees submit candidates for the offices of Regional Delegate-Elect/Director-Elect, as applicable.
- Divisional nominating committees submit candidates for the office of Divisional Delegate-Elect/Director-Elect, as applicable.
- Standards Association submits candidates for the offices of Standards Association 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 and Appointments Committee for 2007 Standing Committee members, Assembly-elected positions, and 2008 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 if it intends to put forward any constitutional amendment(s).

15 May
- Deadline for drafts of petitions to be submitted to Board of Directors to be circulated.

9 June
- (Noon EDT USA/16:00 GMT) Petitions for constitutional amendments must be received.
- (Noon EDT USA/16:00 GMT) Petition nominations for candidates to be elected by the membership must be received.
- Initial statements by principal initiators and opponents of constitutional amendment(s) must be received.
- Corporate Activities must receive initial campaign statements from all annual election candidates.

19 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 proposed constitutional amendment(s).

1 September
- IEEE annual election ballots are sent to all voting members.

1 November
- (Noon Central Standard Time USA/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.

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

15 November
- Election of officers by IEEE Assembly.

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

UP FOR ELECTION IN 2006

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:
- 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 I (one-year term)
- Delegate-Elect/Director-Elect, Division III (one-year term)
- Delegate-Elect/Director-Elect, Division V (one-year term)
- Delegate-Elect/Director-Elect, Division IX (one-year term)

Chosen by members of the respective regions:
- Delegate-Elect/Director-Elect, Region 2 (two-year term)
- Delegate-Elect/Director-Elect, Region 4 (two-year term)
- Delegate-Elect/Director-Elect, Region 6 (two-year term)
- Delegate-Elect/Director-Elect, Region 10 (two-year term)

Filling Seats: Pointers on Publicity

BY LINDSAY ELKINS

TO BE SUCCESSFUL, an IEEE event of any kind must be well planned and well executed. But what good are your efforts if word of your event never gets out and few people come?

This is where a little help from publicity—or public relations—is indispensable. If you know how to go about it, publicizing an event inside the IEEE community isn't as difficult as it might at first seem.

First, the basics: publicity is a way of getting information out about anything you want your intended audience to be aware of, be it a technical meeting or information about an organization, product, or service. Publicity often takes the form of a news item, a feature story, or a meeting listing in your local press, according to Marsha Longshore, the IEEE's senior manager of corporate communications, in Piscataway, N.J. Longshore, along with IEEE Member Ahsan Upal, gave separate presentations on some best practices for garnering publicity at the IEEE's 2005 Sections Congress, held last October in Tampa, Fla. Upal is the publicity chair for the IEEE Southern Alberta (Canada) Section's Graduates of the Last Decade group.

Holding an IEEE event is the single best tool for creating awareness of the organization and for bringing in new members and raising funds for operations and scholarships, according to Upal. "A large membership and dedicated volunteers mean greater financial and human resources for offering more services," he says. "Simply put, a more visible organization can meet its mandate more effectively."

KNOW YOUR OBJECTIVES First on your publicity agenda is to determine your objectives based on what you hope your event will accomplish. You might simply want as many of your members as possible to participate in your activity, or you might want to make people in your area generally aware of the impact engineers and technology professionals have on society. Whatever your goal, knowing clearly what it is will start you off on the right foot.

No matter the kind of event, you must identify your target audience, that is, who should attend—be it IEEE members, prospective members, students, or the public. Or it might be one kind of engineer or another. "Understand who might be interested in the event and why," says Syracuse (N.Y.) Section publicity chair Mary Reidy. "Then develop a tailored invitation that includes contact names, phone numbers, and e-mail addresses." Put an invitation in section newsletters or in announcements in local newspapers. Making clear who to contact at your organization will help boost the attendance you get.

It is important not only to know who you want to target but also to understand your target audience, points out Upal. Knowing what your audience would like to get out of an event will help determine the message to convey in your publicity.

If you're holding a technical conference, topics can, of course, overlap several specialties, says Reidy. "For example, an event on advances in nanotechnology may involve chemical, electrical, mechanical, and instrumentation specialties," she says. This means you have to target several audiences.

Longshore notes that once the right audience is identified, you should develop a publicity plan as early as possible. "At a minimum, put together a calendar for yourself that includes dates and deadlines for putting out your publicity and meeting announcements, and add everything else you can think of that will help make your event a success," she says. And remember to provide information to your section newsletter and Web site, as well as the local newspapers.

Try to get several outlets for your publicity, so news of your event will make its way to as many people as possible. Think outside the box and make information available in other places, too. A display at a university can be helpful in getting news of your event to interested people, and even attract new members, according to David Bower, Florida West Coast Section publicity chair. He suggests preparing a simple stand-up display that advertises your event and including with it handout materials that describe the IEEE.

Keep the display simple and focused. Ask yourself what you want to promote, and tailor your display accordingly. With some slight modification, you can use the display at educational institutions to publicize events and at regular IEEE section meetings, as well as at companies employing engineers, as a way to promote membership. Always obtain permission, of course, before placing a display on someone else's property.

KNOW THE LOCAL MEDIA Learning how your local media operate can help you in publicizing your event. "It shouldn't be difficult to get your event listed in community calendars or newspapers' weekly event listings, where they exist—if you do your homework," Longshore says. She notes that in many countries you can readily get access to journalists, although in some countries you must go through press clubs or pay fees for placements. "In all countries, building relationships with the local media can help," she says.

Bower recommends using local newspapers for such events as meeting announcements. Television and radio would be more interested in items involving, say, outstanding accomplishments by a local IEEE member. "Find out how to submit information and how far in advance it's needed," Bower says. Creating and then maintaining relationships with local reporters can keep doors open and make things easier, he says. Identifying local technology reporters can also be beneficial because they may be more receptive than general reporters if you come to them with a technical story.

Longshore advises building a list of local newspapers and radio and television stations, and calling to find out general deadlines, whom to send information to, and if there is a word restriction on community announcements. Tailor your announcements to meet the specifications.

"It's advisable to choose one person in your section to be your section's media liaison, so reporters have one IEEE source to go to," Longshore continues. Build relationships by, for example, personally inviting reporters to local meetings that include technology-based presentations that are of general interest.

Keep putting information out there every chance you get, especially at section meetings. Bower suggests always having a table to display IEEE handouts and literature. Also have an audience attendance sheet at an event and ask for e-mail and postal addresses. Later, you can send promotional materials to the people who attended, notifying them of upcoming events.

At meetings, designate someone as a greeter to welcome members and guests. Making a friendly impression can be important in recruiting members. Providing time to socialize at meetings is also important. You'll meet potential new members and you can talk up the value of your next event.

Download Longshore's and Upal's Sections' Congress presentations at http://www.ieee.org/organizations/rab/sc/2005/SC2005sessions.htm.

Fathers of Internet Receive U.S. Medal of Freedom

BY LINDSAY ELKINS

FOR THEIR DEVELOPMENT of TCP/IP (the Transmission Control Protocol/Internet Protocol), the basis for exchanging information across the Internet, IEEE Fellows Vinton Cerf and Robert Kahn received the Presidential Medal of Freedom, the United States' highest civilian award. Cerf and Kahn were honored with the award at a ceremony on 9 November at the White House, in Washington, D.C. Other honorees included boxer Muhammad Ali, singer Aretha Franklin, and economist Alan Greenspan.

Established in 1963, the medal is given to those who contributed to the security or national interests of the United States, to world peace, or to cultural or other significant public or private endeavors.

Cerf and Kahn designed the basic architecture and communication protocols of the Internet 30 years ago, and "we have continued to work for further expansion of access to the Internet globally and to explore new applications for this protean medium," Cerf says.

Today, Cerf is vice president and chief Internet evangelist for Google, and Kahn is CEO and president of the Corporation for National Research Initiatives (CNRI), a nonprofit organization that provides leadership and funding for research and development of the national information infrastructure.

Vinton Cerf [left] and Robert Kahn [right] received the Medal of Freedom from U.S. President George W. Bush.

The TCP/IP design was first described in a paper the two wrote in 1973, which was published a year later in the *IEEE Transactions on Communications*. All computers on the Internet use the Internet Protocol to exchange information, explains Cerf. "The underlying hundreds of thousands of networks use routers to forward Internet packets from source to destination, routing the traffic with additional protocols used to keep track of the dynamic topology of the Internet."

The protocols were made standard in 1978, and the Internet officially rolled out on 1 January 1983. That same year both men ended up at DARPA (the Defense Advanced Research Projects Agency), where the pair managed the Internet program and related network research efforts. In 1986 Kahn established the CNRI. Cerf joined him there, and until 1994 the pair worked on digital libraries and systems for organizing, storing, and retrieving digital objects, with particular attention to intellectual property issues.

The duo also set up the nonprofit Internet Society in 1992. Today the society supports the standards activity of the Internet Engineering Task Force, which aims to further spread the use of the Internet around the world.

Cerf left DARPA in 1982 to join MCI, serving as its vice president of digital information services until 1986, when he left to join CNRI. He returned to MCI in 1994 to help the company enter the Internet service business. In the subsequent decade MCI became a major global Internet service provider. At Google, Cerf is responsible for identifying new enabling technologies to support the development of advanced Internet-based products and services.

"The Internet is one of the greatest innovations ever launched," U.S. President George W. Bush said as he presented the medals to Cerf and Kahn. "And it's a source of pride to all of us that this progress was set in motion by two talented Americans. Our economy, our lives, and our world have all been enriched by the imagination and the efforts of Robert Kahn and Vinton Cerf."

Hal O. Anger, Nuclear-Imaging Pioneer

BY ALEXANDER GOTTSCHALK

A MIX OF LUCK AND CURIOSITY led to my decades-long relationship with Hal Anger. I was hired in Hal's lab at the Donner Laboratory, in Berkeley, Calif., and I was fortunate enough to have him as my boss—although he was never bossy. When I first met him, I had no interest in nuclear medicine, but his innovative gamma camera, which took better pictures than I was working with, drew me to the field.

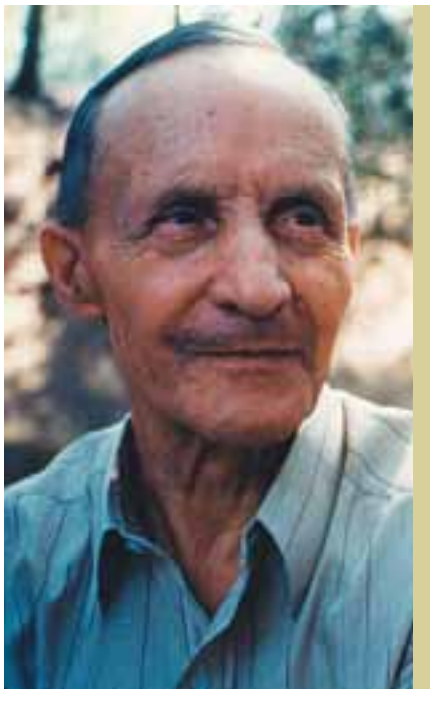
Hal was born in Denver on 24 May 1920 and grew up in Long Beach, Calif. His family was involved with one of the first radio stations in Southern California—which fueled his interest in electronics. While still in junior college, he used components from his physics lab to build one of the first television receivers in Long Beach.

After graduating from the University of California at Berkeley, Hal found a home at the Donner Laboratory, which was part of the Lawrence Radiation Laboratory, a facility originally built to explore the medical and therapeutic use of radiation. His early work was with Donner cofounders John Lawrence and Cornelius Tobias, who were trying to develop the lab's 184-inch cyclotron beam for use in radiation therapy. Hal stayed at Donner from 1946 until his retirement in 1982.

In the early 1950s, Hal began working on an instrument that would allow physicians to observe human organs in action. The gamma camera, later renamed the Anger camera, produced images of internal processes after a patient swallowed a tiny amount of radioactive substances, known as radiopharmaceuticals, which the camera could then track. This was the first clinically successful radioisotope camera and the foundation for the sophisticated imaging systems available today. The Anger camera led to major advances in diagnosing and treating brain tumors, bone marrow disorders, and other life-threatening diseases.

Seen by many as a quiet genius who shaped the future of nuclear medicine, Hal took a hands-on approach to science that also led to his invention of the well counter, which is used daily in nuclear medical labs worldwide to measure small quantities of radioactive substances. He also invented the whole-body scanner, the positron camera, and the multiplane tomographic scanner.

Nuclear medicine has been profoundly affected by Hal Anger. Millions of patients have benefited from diagnosis and treatment that depended on the Anger camera and the innovations made possible by its development.



HAL O. ANGER 85
DIED 31 October 2005
MEMBER GRADE Life Fellow
EDUCATION Bachelor's degree in electrical engineering from the University of California at Berkeley, 1943
FIELD OF INTEREST Nuclear medicine
VOLUNTEER ACTIVITIES IEEE, 1945–2005; American College of Nuclear Physicians, 1992
AWARDS 1964 John Scott Award; 1966 Guggenheim Fellowship; 1971 Gesellschaft für Medizin; 1975 Modern Medicine Award for Distinguished Achievement; 1976 Society of Nuclear Medicine's First Western Regional Award for Distinguished Contributions to Nuclear Medicine; 1984 IEEE Centennial Medal; 1988 Société Française de Biophysique Medal; 1991 Georg de Hevesy Memorial Medal; 1992 Honorary Member and Fellow, American College of Nuclear Physicians

IEEE Member Alexander Gottschalk, a professor of radiology at Michigan State University Medical Center, was Hal Anger's friend and colleague for more than 40 years. Some of this material appeared in the Journal of Nuclear Medicine, *Vol. 46, No. 12, December 2005.*

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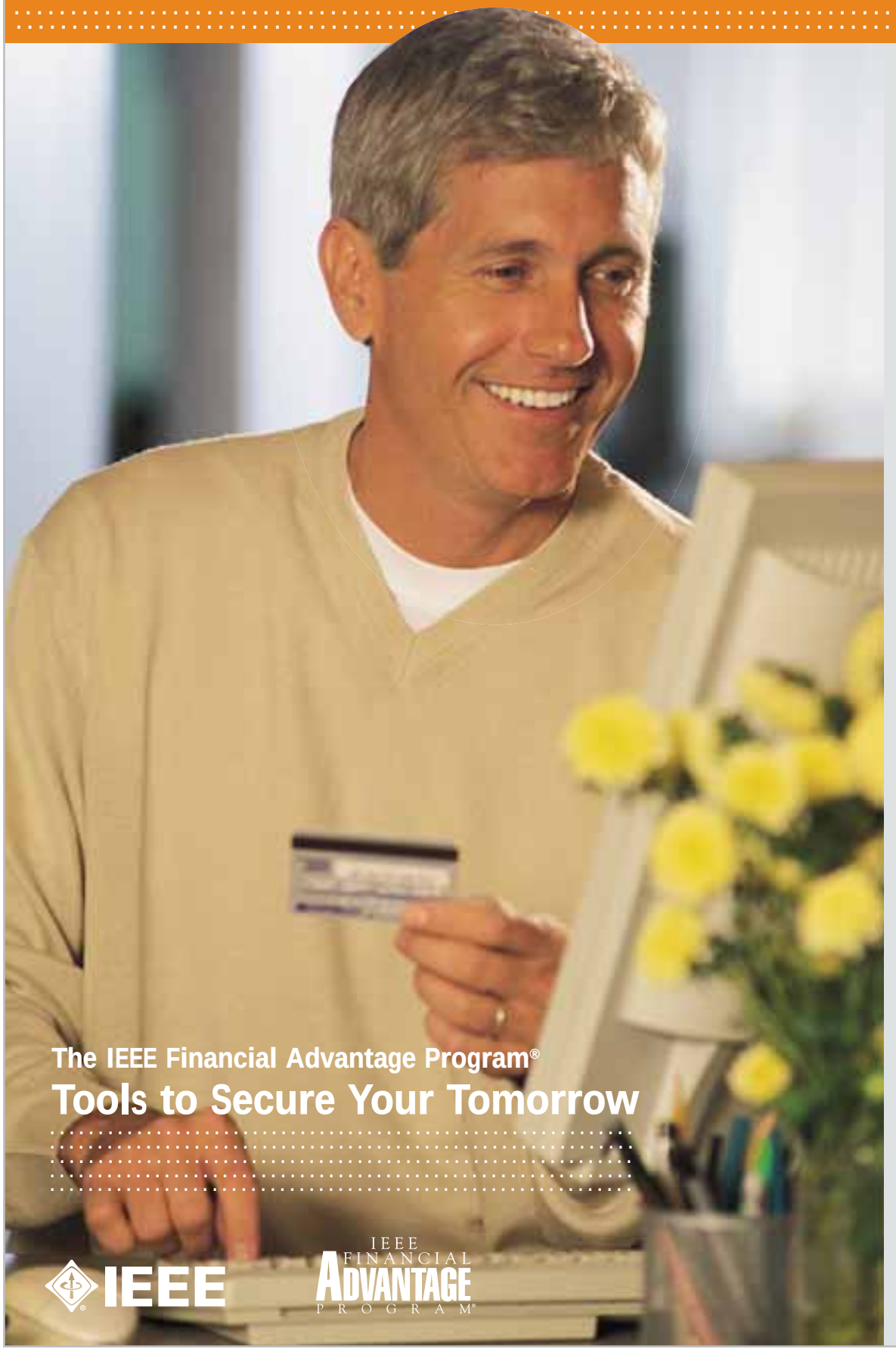

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