

the institute

geekchic



Meet Professor Karen Panetta, an IEEE Fellow who's breaking the stereotype of the nerdy female engineer. **P.18**

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A senior member in Indiana is a cowboy. In California, a member takes her stunts up, up, and away. **P. 20**




ONLINE

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ELECTION RESULTS Find out the winners of the annual IEEE election.



SECTIONS CONGRESS WRAP-UP Get the scoop on what happened during the IEEE Sections Congress, held in Quebec City.



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IEEE AROUND THE WORLD

REGION 3: Southeastern United States and Jamaica

- 75th anniversary, Jacksonville (Fla.) Section.
- 25th anniversary, Central Georgia and Tallahassee (Fla.) sections.

Region 7: Canada

- Victoria Section, B.C., forms WIE affinity group.
- 50th anniversary, Southern Alberta Section.

REGION 1: Northeastern United States

- Long Island and Mohawk Valley sections, both in New York, form GOLD affinity groups.
- Franklin W. Olin College of Engineering and Worcester Polytechnic Institute, both in Massachusetts, form Women in Engineering (WIE) affinity groups.

REGION 8: Europe, Middle East, and Africa

- IEEE student branch at Middle East Technical University, Ankara, Turkey, receives a \$4000 IEEE Foundation grant to support the Efficient Internship Program.
- IEEE student branch at the University of Cape Town forms WIE affinity group.
- IEEE student branches formed at the University of Kalamoon, Syria, and at Helwan University, Egypt.
- 50th anniversary, Portugal and Saudi Arabia sections.

REGION 4: Central United States

- 100th anniversary, Toledo (Ohio) Section.
- Ann Arbor Hands-On Museum, in Michigan, receives US \$10 000 grant from the IEEE Foundation to open a Kids Connect to Wireless Technology exhibit, which includes interactive experiments with Morse code and amateur radio.

REGION 2: Eastern United States

- 100th anniversary, Cleveland Section.

REGION 5: Southwestern United States

- St. Louis Community College forms IEEE student branch.
- 50th anniversary, Forth Worth (Texas) Section.

REGION 9: Latin America

- 50th anniversary, Colombia Section.
- Atlantic Technical Institute, Colombia, forms student branch.
- Peru Section receives the IEEE Outstanding Large Section Award.

REGION 10: Asia

- IEEE Computer Society forms a chapter in Bangalore, its fourth in India.
- WIE affinity groups formed in India in the Bangalore Section and at the Sri Muthukumar Institute of Technology.
- IEEE student branches formed at University of Newcastle in Callaghan, Australia; in Dhaka, Bangladesh, at Brac University and East West University; and in India at Chaitanya Engineering College, Visakhapatnam, Sri Nandhanam College of Engineering and Technology, Tirupattur, and Valliammai Engineering College.
- IEEE South Australia Section receives the IEEE Outstanding Small Section Award.

LEGEND

- REGIONS 1–6
- REGION 7
- REGION 8
- REGION 9
- REGION 10

Send your region or section news to institute@ieee.org.

Anniversary Celebrations Planned Worldwide

From San Jose, Calif., to Boston and from Bangalore, India, to Beijing, excitement is spreading about IEEE's 125th anniversary, taking place next year. Sections in those four cities are among the eight selected by the IEEE Anniversary Committee to hold celebrations sponsored by the IEEE Board of Directors. The other four Board-sponsored section events are slated for Austin, Texas; London; Munich; and Tokyo.

"These major world cities were selected to bring members and IEEE's customers together to celebrate and bring attention to IEEE and the contributions of the technology professions to humanity," says 2008 IEEE President-Elect John Vig, chair of the anniversary committee. "But they are by no means the only

anniversary celebrations. We're encouraging all IEEE groups to plan anniversary events throughout the year and throughout the world."

The eight anniversary parties represent only a small percent of the celebrations scheduled to take place. Representatives from 218 of the 239 sections who attended the IEEE Sections Congress, held in September in Quebec City, committed to hosting a local anniversary event in 2009 with their members and student branches. In addition, many IEEE societies plan to highlight the anniversary during their major conferences and local meetings. The number of planned events on the anniversary site's calendar continues to grow each day.

Here's a sample of anniversary plans in the works:

- The College of Engineering in Chengannur, Kerala, India, is set to celebrate the anniversary in January during a three-day biennial technical festival for students. Summit '09 is expected to bring together more than 1000 students from colleges across the country for activities designed to enhance the participants' technical competence and managerial skills.

- Organizers of the IEEE International Solid-State Circuits Conference, being held 8 to 12 February in San Francisco, plan to recognize the anniversary in conference materials and at selected sessions.

- The Eurocon 2009 conference, from 18 to 23 May in St. Petersburg, Russia, is set to celebrate IEEE's 125th along with the 150th anniversary of the birth of Alexander S. Popov,

the Russian physicist who first demonstrated the practical application of electromagnetic waves.

- One of the most prestigious celebrations of the year is taking place in Los Angeles on 27 June at the 2009 IEEE Honors Ceremony, which has adopted the anniversary theme Celebrating 125 Years of Engineering the Future. Among the honorees are the top three winners of the IEEE Presidents' Change the World Competition for students. [See "Competition Challenges Students to Change the World," September, p. 4.] (There's still time to submit entries by the 28 February 2009 deadline.)

For more information about these and other anniversary events, visit the IEEE 125th anniversary calendar at <http://www.ieee125.org>. —Marsha Longshore

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NEWS

Ten Suggestions for Improving Services

Here are the top 10 recommendations for improving IEEE, worded exactly as they were voted upon by the 293 primary section delegates during the IEEE Sections Congress, held 19 to 22 September in Quebec City.

- 1** Every member to have an annual entitlement to a limited number of free IEEE Xplore downloads.
- 2** Payment flexibility for members, especially students and those in developing countries who do not have credit cards.
- 3** Providing "Leadership Training Handbook (text and multimedia) for Section Officers" to include such things as volunteer recruitment, and roles and responsibilities of section chairs and section committees.
- 4** The Member and Geographic Activities Board to assign staff to develop, by June 2009, a user-friendly system and support to enable sections, chapters, and affinity groups to deliver collaborative technologies.
- 5** For digital libraries: developing additional, smaller tiered packages that will allow members to purchase defined quantities of digital content.
- 6** Improving the implementation of recommendations identified at Sections Congress.
- 7** There are several IEEE member benefits that are only accessible to Regions 1-6 members. IEEE should implement similar benefits across the regions.
- 8** Creating a Web-based payment solution for sections and chapters for small local events that is low cost, secure, and capable of depositing into a Concentration Banking account with payer identification.
- 9** Providing support for creation and maintenance of easy-to-update section Web sites with "single sign-on" authentication.
- 10** Implementing sustained membership options for all membership grades exclusive of student grade with single dues payment for multiple years and increasing benefits in proportion to the length of renewal.

These 10 recommendations were to be presented to the IEEE Board of Directors at its November meeting. The Board was expected to assign each recommendation to a specific IEEE business unit for action.

Herz Staff Award Goes to Katronetsky

Fern Katronetsky, executive director of IEEE Foundation and Awards, received this year's Eric Herz Outstanding Staff Member Award. The annual award recognizes leadership and contributions to the success of IEEE over a long period of time. Katronetsky was cited for "extraordinary commitment to the goals and objectives of the Institute and unwavering leadership and invaluable support of volunteers and staff for more than 30 years."



She received a certificate and honorarium at an award presentation held 14 November during the Board of Directors meeting series in New Brunswick, N.J.

She joined IEEE in 1977 as a clerk

typist with Educational Activities, became manager of the Technical Activities administrative services department in 1992, and then served as manager of administrative services for Corporate Activities from 1993 until 1999. She was named director of the IEEE Foundation and Corporate Activities

administrative group in 1999 and has been executive director of the Foundation and Awards group since 2004.

The IEEE Board of Directors created the award in 2005 to honor Herz, a longtime volunteer and former staff member who was IEEE general manager and executive director before retiring in 1992.

The nomination deadline for the 2009 Herz Award is 31 January. For more information, visit <http://www.ieee.org/portal/pages/about/awards/sums/ericherzsum.html>.

www.ieee.org/theinstitute

TECHNOLOGY



The Manus robot helps a stroke victim use her disabled hand to move targets on the screen.

with Neville Hogan, professor of mechanical engineering and brain and cognitive science at MIT, Krebs designed the robot specifically to work with patients interactively.

With Manus, a patient's dysfunctional arm is strapped to the robot's arm, the fingers wrapped around a cylinder, and the patient is asked to play a video game in which she moves a cursor from point to point on a computer screen by trying to move her arm and hand [see photo]. If she does that successfully, the robot does nothing but monitor her actions. But if she cannot, or is too slow or wanders too far off-course, the robot assists her by moving the hand and arm for her or by resisting off-course movements, giving the patient the sensation of coming up against a spongy wall. The farther she deviates from the desired path, the harder she has to push. As Hogan puts it, the spongy wall doesn't stop you from deviating from the nominal movement, but it discourages it. A critical feature of the system is that the amount of assistance and the degree of challenge (for example, how the robot defines "too slow") varies with how well the patient is doing. If the patient does well, the assistance decreases while the challenge increases.

Movements are repeated many times during a therapy session—up to 1200 movements in an hour. A human therapist offering similar hand-over-hand assistance is lucky to be able to do 50 or 60 movements per session, according to Volpe. He says that advantage is a major reason for the success of the robotic approach.

Robots in Rehab

BY MICHAEL J. RIEZENMAN

The good news: contrary to what many clinicians say, the human brain exhibits considerable plasticity. It can change its internal structure, particularly its synaptic connections, throughout its lifetime, not just during the formative years. That means it is possible to ameliorate the effects of a stroke, cerebral palsy, and other afflictions caused by brain damage.

The bad news is that those beneficial changes require prolonged sessions of highly repetitive movements that are difficult for therapists to perform. Adding to the problem is that insurance providers apparently believe, incorrectly, that recovery is possible for no more than a few weeks after an injury such as a stroke, and they are willing to pay for only short periods of therapy.

However, specialized robots being built by a team at MIT are able to help deliver much of the therapy. What's more, the robots have proven their effectiveness in reducing elbow and shoulder impairments in stroke victims, according to a recent article by IEEE Senior Member Hermano Igo Krebs, researchers Bruce Volpe and Neville Hogan, and others. The article, "A Paradigm Shift

for Rehabilitation Robotics," appeared in the July/August 2008 issue of *IEEE Engineering in Medicine and Biology Magazine*. In the opinion of Volpe, a professor of neurology and neuroscience at Weill Cornell Medical College, in New York City, when robots have demonstrated an inarguable ability to "bring your wrist and hand back, then it will be something that everyone will clamor for, and the [attitude of insurance providers] will change."

RETHINKING REHAB In stroke patients, neurons in the brain die from lack of oxygen. The resulting neurological deficit has long been thought irreversible. But researchers such as Volpe, working with MIT mechanical engineers, have demonstrated that reversing that neurological deficit in stroke patients is possible even after many years. "The brain is a learning machine. Just because it is damaged doesn't mean it can't learn," Volpe says. "It learns with the kind of entrainment that a robot can deliver: prolonged, highly reproducible, high-intensity, interactive therapy."

The robot he is talking about is the MIT-Manus, developed by Krebs, a principal scientist in MIT's mechanical engineering department. Working

ENGINEERING RECOVERY The big challenge in building Manus is to have it move a patient's arm to a desired position while remaining unobtrusive when it's not needed. That is, its mechanical output impedance should be as low as possible. According to Hogan, the impedance depends mainly on the rotational inertia of the robot's motor.

For their next generation of robots, Hogan and his team at MIT are working on a controller that senses when the patient is applying a force to the robot arm and then tells the motor to drive the arm in the direction of the force. Such an active control scheme could lead to robots capable of generating forces greater than body weight while still maintaining a feather-light touch for the patient.

Krebs is studying how to adjust treatment variables to produce the best outcome. He found that treatments of one hour per day, three days a week for six weeks, produce much better results than a more intensive regimen of two hours per day, three days a week for three weeks, even though the total number of hours is the same. He says such issues will be the main focus of his research for the next 10 years. ■

FOR MORE INFORMATION about this topic, download the abstract of the cited article at http://ieeexplore.ieee.org/xpl/freeabs_all.jsp?isnumber=4558059&arnumber=4558140.



Lee Stogner (far left) explains the benefits of joining IEEE at a conference.

of the MRRC and director-elect for Region 3. "If every member recruited just one person, IEEE membership would double."

To provide the volunteers with guidelines, the staff and volunteer team developed the *IEEE Membership development Manual*. It outlines what chairs and volunteers need to know about recruiting members, including an explanation of IEEE benefits, how to analyze their section's report on membership statistics, and where to look for prospective members.

OPPORTUNITIES It should be no surprise that some of the best places to find new and existing members are the recruiting booths at IEEE conferences, according to Senior Member Marko Delimar, vice chair of Region 8 membership activities. The booths are stocked with fliers describing member benefits, and volunteers are on hand to answer such frequently asked questions as "What is the value of membership?" and "What if I can't afford the dues?"

"Many potential members do not belong to IEEE because they've never been exposed to the organization and don't know its benefits," Delimar points out. Having someone around to answer questions also helps retain current members, according to Stogner. "Sometimes it's that one question they can't find an answer to that's been holding them back from renewing," he says.

Staffing booths at IEEE conferences has helped the South Africa Section increase its membership by nearly 25 percent in the past three years, says Member Saurabh Sinha, the section's chair-elect. "Seeing the impact of my work motivates me to keep volunteering," Sinha adds.

Another popular recruiting tool is the Member-Get-a-Member card. The business cards, which include the URL of IEEE's online membership site, are part of the membership recruitment kit sent to the volunteers each year. Each volunteer's name and member number are printed on the cards so they'll get credit for the members who join, provided prospective members enter the volunteer's information when they fill out the membership application. The cards, which resulted in about 14 000 new members last year, earn volunteers a US \$15 discount

on their membership dues. The volunteers also can earn up to \$90 in credit, which they can apply to the purchase of IEEE products or donate to the IEEE Foundation.

Starting next year, those Member-Get-a-Member cards won't be limited to volunteers. All members will get the cards when they join or renew, and they'll also be eligible for discounts and credit toward future purchases.

Other recruiting methods rely on joint section or chapter activities with student branches. They include discussions on the importance of staying with IEEE after graduation; advertising upcoming IEEE events in local newspapers; and, with the company's permission, posting notices of IEEE events on office bulletin boards.

KEEPING IN TOUCH One Saturday each month Stogner hosts a Webcast for more than 50 section and society membership-development volunteers from around the world to review their member statistics, discuss what recruiting methods are working, and go over their plans to boost participation for the following month. The volunteers generate reports using SAMIEEE, an online database that breaks down membership statistics section by section. With the program, volunteers can tell whether membership grew after a recruiting drive at a conference and what other activities may have spurred people to join.

"When someone in Hawaii wakes up at 4 a.m. on a Saturday just to stay informed about how to grow membership, that's a testament to the dedication these volunteers have," says John Day, senior manager of IEEE Membership development, the staff team that provides support to the MRRC. There is also an online community for membership-development volunteers, where they can share recruitment advice, ask each other questions, and check out analytical reports.

What motivates the volunteers to do so much work? "I want to help IEEE continue as an organization that's worth joining," Delimar says. "To accomplish this, we must continue to grow, because each new member brings something special to IEEE." ■

FOR MORE INFORMATION about membership-development efforts, visit <http://www.ieee.org/md>.

Meet The Volunteers Driving Membership Recruitment

BY ANNA BOGDANOWICZ

Getting new members to join IEEE doesn't happen on its own. It takes the hard work of a dedicated group of volunteers from the IEEE Membership Recruitment and Recovery Committee. As of September more than 57 000 new members had joined this year, some 3300 more than the number joining during the same period last year.

The MRRC has two goals: recruiting new members and making sure that current members stay. IEEE relies on more than a thousand volunteers around the world, not a paid sales force, as its primary recruiting team. Along with those are eight staff members from IEEE Member and Geographic Activities in Piscataway, N.J., who provide strategic, logistical, and administrative support.

The committee is composed of

a membership-development chair and two members who represent society membership development. The MRRC helps membership-development chairs and volunteers from each IEEE region perform a variety of recruiting activities. They include setting up recruiting booths at IEEE conferences, handing out recruiting cards and fliers that list the benefits of joining the organization, and contacting former members to encourage them to renew. The volunteers meet once a month via the Internet to compare their efforts. And they take what they learn back to their sections to try to get more members involved in recruitment.

"We want to make every section, chapter, and student branch realize that everyone can be a membership-development volunteer," says Senior Member Lee Stogner, chair

Hands-On Projects For Budding Engineers

BY KATHY KOWALENKO

If you're an instructor looking for hands-on projects for your first-year class in electrical engineering, computer engineering, or computer science, your search is over. Eight projects covering such assignments as designing a prosthetic hand and developing error-correction codes for wireless communication systems were the 2007 winners of IEEE's Real-World Engineering Project contest. They are now available online for free.

Launched last year, the program aims to change how first-year engineering is taught by introducing practical projects that address real-world problems whose solutions can benefit society [See "Real-World Projects Can Make a Difference," March 2007, p. 14]. The projects resulted from a request to engineering faculty around the world to submit two-week-long projects. Submissions included a summary lecture that discusses the project's challenges and trade-offs, as well as its possible impact on society. The eight projects were selected from more than 40 submitted last year. But the program isn't over. Projects received this year are being evaluated, and still more are being requested for next year.

FOR ALL STUDENTS While the original intent of the initiative was aimed at encouraging women to pursue degrees in electrical engineering, computer engineering, and computer science, "in reality what we're talking about is high-quality first-year education for all students," says the program's cofounder, IEEE Senior Member Amy Bell, an associate professor of electrical and computer engineering at Virginia Polytechnic Institute and State University in Blacksburg.

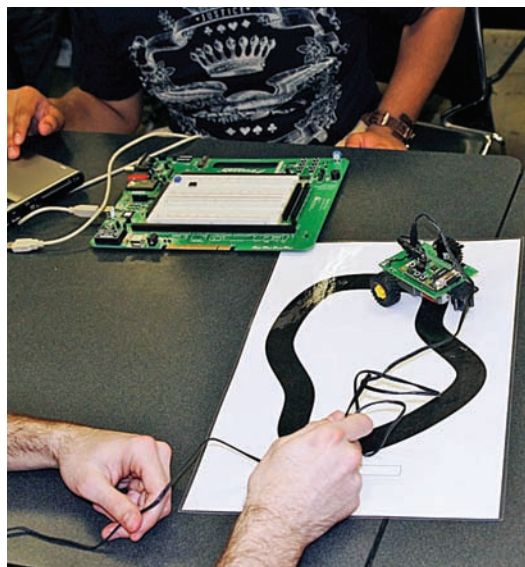
"The program makes explicit the connection of how society is

served by engineering," Bell adds. "Societal benefits appeal to women, but also to men."

And, she notes, there's the added bonus of the projects showing students how engineers serve society. "It's not nearly as clear to an average first-year student how our disciplines serve society compared with other professions," she says.

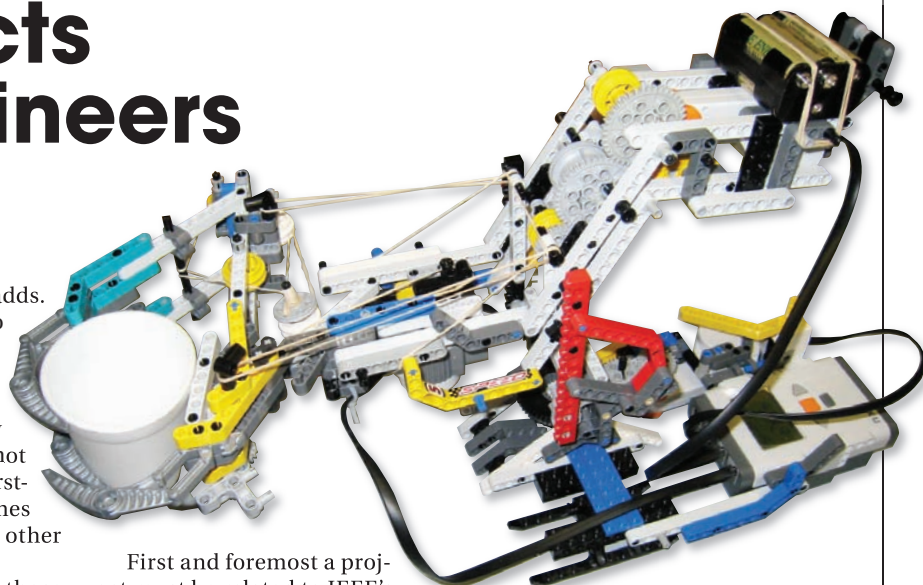
The program also benefits those who work in academia. "It's a tremendous service to faculty members for a respected organization like IEEE to provide them with two weeks of high-quality curriculum," Bell says. "Being able to download all the materials makes these exciting first-year projects possible."

HURDLES Projects are judged in three stages. The first step is to submit a one-page summary of the proj-



Winning projects include small, motorized cars that make their way around a curvy track (above) and a prosthetic hand that grips a foam coffee cup (top, right).

ect, which is reviewed by a committee of IEEE members. The reviewers look for relevance, quality, and "discovery," according to the 2008 program chair, Joan Carletta, associate professor of electrical and computer engineering at the University of Akron, in Ohio.



First and foremost a project must be related to IEEE's fields of interest and must involve a contemporary problem. The activities planned for the students must employ problem-solving strategies. In addition, the review panel looks for projects that lead the students to discover some underlying basic engineering principles.

"We don't want students doing some cookbook, follow-the-steps project," Carletta says. "We want them to see that engineers deal with trade-offs, so they get a taste of that in these design projects."

If a summary is accepted, a more detailed proposal is requested. And if that's accepted, a full project—which includes a syllabus, lesson plans, teaching notes, reading materials, and a sample test—comes next. The review panel provides feedback at every stage, Carletta says.

For their efforts, the winning authors each receive \$5000, and they are invited to submit their work for publication in *IEEE Transactions on Education* and to present it at workshops.

SOLUTIONS Among this year's winners were Chris Macnab and Laurence Turner from the department of electrical and computer engineering, at the University of Calgary, Alberta, Canada. They teamed with James Smith of Ryerson University, in Toronto, and Karl

Kalvaram of the Institute of Sports Science at the University of Jena, in Thuringia, Germany. Their project, "Manipulating Everyday Objects with Prosthetic Hands" [above] uses the Lego Mindstorms NXT kit, found in most engineering labs, to build a hand that grips and lifts both an empty and a full foam coffee cup. The kit includes a programmable microprocessor, sensors, encoders, and electric motors. "Robotics has many applications that have social benefits, with prosthetics foremost among them," Macnab notes.

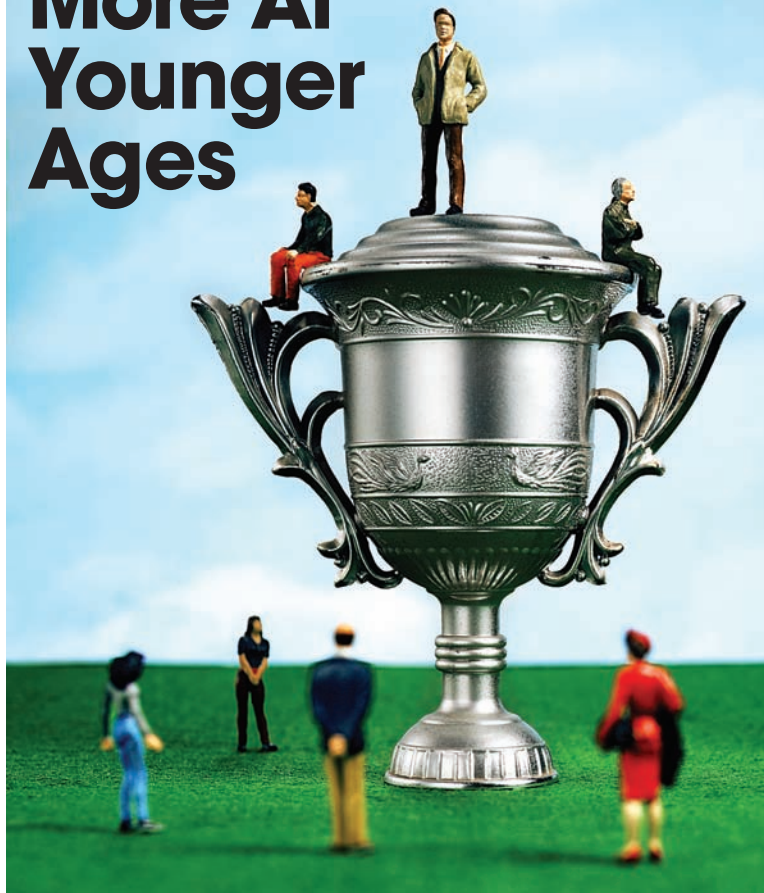
Sami Khorbotly, an assistant professor of electrical and computer engineering and computer science at Ohio Northern University, in Ada, won for his "Error Correction Codes for Wireless Communication Systems." Students work in Matlab to code two simple error-correction schemes and simulate their use in a wireless channel. "The project doesn't need much of a math background, so it was a good fit for what the initiative was looking for," Khorbotly says.

Other projects deal with small, motorized cars that traverse a track [left], solid-state lighting for the developing world, and feedback-controlled brushless dc motors.

The winning 2008 projects are scheduled to be announced by 31 January. Abstracts for next year are being accepted; the deadline to submit is 1 February. New for 2009 is the addition of biomedical engineering as an eligible field. ■

FOR MORE INFORMATION, visit <http://www.realworldengineering.org>.

IEEE Fellows Accomplishing More At Younger Ages



BY JOHN R. PLATT

IEEE Fellows are a select class of members. To become a Fellow, nominees must have achieved an extraordinary record of accomplishments in one of the IEEE fields of interest. The accomplishments should have contributed in an important way to the advancement or application of engineering, science, or technology and have provided significant value to society. But how long does it take to make such outstanding contributions? Must you work decades, or can you be acknowledged for breakthroughs made early in your career?

This year's class of IEEE Fellows proves that you need not be in the twilight of your career or have worked in your field for many years to have accomplished something significant. The 2008 class boasts

182 out of 295 new Fellows between the ages of 31 and 54.

Four of the "young" Fellows have something in common: they're working to make everyday life easier.

A WIRELESS LEADER The next time you use your laptop to check your e-mail, think about William Webb, whose work in wireless technology helped make Wi-Fi possible. Webb, 41, is head of R&D and is senior technologist at the UK telecommunications regulator Ofcom. He was elevated in the Fellow technical leader category for his "leadership



William Webb

in the deployment of third-generation mobile and wireless LAN technology."

Webb began making his mark in 1991 with variable-level modulation, which he developed while at British Telecom (now known as BT). Webb observed that the strength of a wireless signal—and therefore the amount of information that could be sent over it—varied depending on how close the user was to a base station or tower.

"I came up with the idea of dynamically varying the amount of information you send based on the strength of the signal the users are receiving," he says. That concept has become the basis of Wi-Fi technology.

ONLINE EDUCATOR Manuel Castro's research has helped universities expand their services to students learning at home or in the office. The 50-year-old is an electronics technology professor in Spain at the National University for Distance Education (better known as UNED). He was cited in the educator category for contributions to distance learning in electrical and computer engineering education. Castro's research has touched a number of fields, including advanced microprocessor system simulation and telematics, as well as distance learning.

It's that last area where Castro has had his greatest impact. His research has examined and helped overcome some of the barriers to online education, including providing effective and secure access to course materials to a variety of locations and over differing hardware platforms, remote support and training, designs for teaching environments, and the use of multimedia as a learning resource.

He also has examined how course content and teaching styles can be adapted to online learning. With many thousands of students now taking online classes every semester, Castro's work is already influencing the future of education.

LIVING ENVIRONMENTS Diane Cook, 45, a professor of computer science in the School of Electrical Engineering and Computer Science at Washington State University, in Pullman, is working to make your home smart enough to monitor your health and to automate functions for people with disabilities. Cook's research encompasses a broad range of fields, including artificial

intelligence, machine learning, data mining, robotics, smart environments, and parallel algorithms for artificial intelligence. She was elevated for "contributions to machine learning algorithm design and application" in the research engineer/scientist category.

Cook's smart-home research first used sensors to gather information regarding such things as motion, temperature, lighting, humidity, the use of doors, and interaction with electronic devices. The data was then mined to find the sequences of events that frequently recurred and predict when they would happen again. Actions were then automated. "Now we're trying to adapt to higher-end applications like health monitoring and improving energy efficiency—which will impact a significant part of the population," Cook says.



Diane Cook

SIGHT TO THE SIGHTLESS Gianluca Lazzi's work may make it possible for blind people to see someday. Lazzi is a professor in the department of electrical and computer engineering at North Carolina State University, in Raleigh. At 38, he was honored for his work as a research engineer and scientist for "contributions to bioelectromagnetics and implantable devices."

Lazzi's research in the field of bioelectromagnetics led to his becoming a principal investigator on the U.S. Department of Energy's Artificial Retina Project, a multi-institutional collaborative effort among government agencies, universities, and companies to develop and implant an array of microelectrodes into the eyes of people blinded by retinal disease. The project aims to restore limited vision and thereby enable mobility, facial recognition, and even reading.

If you know of an IEEE senior member doing outstanding work, consider nominating that person for the Fellow class of 2010. The deadline is 1 March 2009. ■

FOR MORE INFORMATION about IEEE Fellows, visit <http://www.ieee.org/go/fellows>.

All Eyes Are on IEEE

Public Visibility Initiative raises awareness with articles in major news outlets and taps tech icons to promote the profession **BY KATHY KOWALENKO**

USA Today, Newsweek, The Economist, Kuwait Times, RedOrbit.com, and NBC's "The Today Show" are just some of the news outlets that have interviewed IEEE members during the past few months. The wave of publicity was launched by the organization's Public Visibility Initiative, a communications program that seeks to raise IEEE's global visibility and improve the image of the engineering profession [see "Boosting IEEE's Visibility and Prestige," September 2008, p. 8]. IEEE Corporate Communications, which oversees the initiative, estimates that the 70 articles and interviews that have run since June reached about 29 million people, based on circulation and TV audience. That's equivalent to more than US \$1.5 million in free advertising.

For example, in August, an article dealing with the use of alternative energy technologies at Anheuser-Busch breweries and other companies quoted IEEE Fellow Saifur Rahman, vice president of the IEEE Power & Energy Society. He noted that many organizations were looking at hybrid systems involving landfill gas plus wind and solar power to gain higher levels of energy efficiency. That article appeared in 17 news outlets,

CULTURE
By JESSICA BENNETT and JENNIE YARROFF

IT'S SWELLING IN BOSTON, AND A DOZEN TUFTS UNIVERSITY students are on in shorts and tanks, attracting the usual stares. Only today the stares are for a different reason: the girls are huddled around a 200-pound machine that looks like a space-age, long-and-wide with a bubble-shaped cockpit open to reveal a mass of pipes and wires. It's actually a solar car—but they're built from the ground up and hope to race next year. Suddenly sparks fly, and the girls jump back. They may be engineering whizzes, but they know a hazard when they see one. They call a teacher over to help solve the problem, as Alex McCourtly, 21, gets ready to take the wheel. A junior with blond hair and freckles, she built her first car engine in high school a handful "years" earlier. She ran on McDonald's fries and, McCourtly says, out of the driveway, and almost immediately disintegrated her car's chassis. Compromised like that, she and the handful team, just returned from practice, limped to work. "Look out," construction workers yell. "It's the Nerd Girls!"

The Nerd Girls may not look like your stereotypical pocket-purse-wearing middle-class suburban. Karen Panetta, a leading force for geek chic—but they're part of a growing trend of young women who are claiming the nerd label for themselves. In doing so, they're challenging the notion of what a geek should look like, either by intentionally making up their own personas, or by simply finding no disconnect between their geeky parents and interests.

Revenge of the Nerdette

As geeks become chic in all levels of society, an unlikely subset is starting to roar. Meet the Nerd Girls: they're smart, they're techie and they're hot.

traditionally geeky interests such as fashion, makeup and high heels. In fact, calling them "nerd" is no insult at all—the Nerd Girls have T-shirts emblazoned with the slogan. The crew includes Christina Sanchez, a master's student in biomedical engineering (and a former cheerleader) who can talk for hours about nanotechnology. Caitlin Bates, a biochemist, asked her boyfriend for a wedding ring last Christmas. Jennifer Courtney, Mario and Perry have single when they talk about what fascinated them most about "The Country for Old Men." And all the women are geeks!

These girl geeks aren't social misfits; their identities don't hinge on outsiders



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over they choose to geek out, they consciously reveal the two chief archetypes of geeks that they're stereotypical nerds, and that they're made. "For a long time, there's been this stereotype that either you're ugly and smart or cute and not smart or you're in math, science or engineering," says Amanda Nevins, the co-author of "The Nerd Girls" and a 2008 anthology of women writing about math, tech and science. "One of the big differences between Generation X geeks and those in their twenties is really just an attitude—an indication that they're much more comfortable." That comfort level has an much to do with culture as it has with technology. Depictions of geeks as socially awkward

and they've capitalized on that geekish sexuality to allow their way into it.

In 2007, girls from Tufts and the other individual campuses of the Siemens Competitions for high-school students in math, science and technology for the first time in the competition's history. A recent For Women & American Life project found that among users 12 to 18, girls dominate the blogosphere and social-networking sites; they're also being boys when it comes to creating Web sites of their own. Even women gamers far outnumber men ages 25 to 34, according to a 2006 study by the Consumer Electronics Association. "Back when the Nerd Girls began [in 2007], people would say, 'Why do you have to call yourselves nerds?'" like it was a bad thing," says Panetta, an electrical and computer engineering professor at Tufts and the founder of the group. "I never get that question anymore. It's OK, it's smart. It's cool to be a nerd, and the girls are just embracing that."

But there is still a disconnect between the culture and the workplace. Forty years

ago women made up just 6 percent of science and engineering jobs; now they make up about 20 percent. That sounds promising, until you consider that women earn 95 percent of the degrees in those fields. A recent Center for WorkLife Policy study found that 52 percent of women leave those jobs, with 61 percent saying they experienced workplace harassment and more than half believing they needed to "act like a man" in order to succeed. In the past, women dealt with that reality in two ways: some buried their femininity, while others simply gave up their career interests to appear more feminine. "For most of my life I had my passion for all things scientific and tried to focus on pursuits that were 'showable,'" says Cathy Maloney, a Berkeley, Calif., mom who, at 26, is now a young woman don't see any contradiction between being geeky and being feminine.

PHOTOGRAPH BY MARTHA CHAMBERLAIN FOR NEWSWEEK



A sample of publications in which IEEE was featured.

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including USA Today's Web site and the St. Louis Post-Dispatch.

Karen Panetta, an IEEE Fellow and chair of the IEEE Women in Engineering Committee, appeared on NBC's "The Today Show" in July to talk about the Nerd Girls program she created at Tufts University, in Medford, Mass.—which tries to boost the retention rate of female engineering

students by employing hands-on projects [see "Bringing Geek Chic Into Style," p. 18]. The show's Web site, as well as Newsweek, ran articles about the program and interviewed the students, who tackled projects involving green energy, environmental cleanup, and assistive technology for the disabled.

SPEAKERS ON TAP In addition to Rahman and Panetta, more than 80 people are part of a newly created speakers' bureau—a worldwide community of IEEE members who have volunteered to speak with reporters on hot topics. The 10 topics include education, health care, security, nanotechnology, and communications.

The Public Visibility Ad Hoc Committee, the group charged with overseeing the program and led by 2007 IEEE President Leah Jamieson, has also developed an "elevator speech," a summary of IEEE's goals that takes about a minute to describe [see "IEEE's Message in a Minute," left].

In addition, a so-called Ambassadors

Program bureau is being formed, made up of IEEE members who are icons in the corporate, research, and academic worlds, and passionate in support of the organization. When called upon to deliver speeches, these leaders will be ready to promote the engineering profession as well as the benefits of belonging to IEEE.

Due later this month is a six-minute video that explains what IEEE is, what it does, and how it does it. The video is expected to be shown at IEEE conferences, section and chapter meetings, and at next year's IEEE 125th anniversary celebrations. The organization's volunteer and staff leaders can show it when they speak at public events, and the video, available at the IEEE Newsroom and IEEE.tv, will be sent to members of the media who cover technology topics.

FOR MORE INFORMATION about the Public Visibility Initiative, visit <http://www.ieee.org/go/newsroom>.

IEEE'S MESSAGE IN A MINUTE

Suppose someone notices the IEEE pin on your jacket and asks you to explain what the organization is all about. Here are some suggested points you can make in a minute or less.

- IEEE has 375 000 members—which makes it the largest technical professional association in the world.
- It is a trusted source of technical information for the engineering, computing, and technology professions.
- It is the voice of the profession, with a worldwide leadership.
- IEEE fosters technological innovation for the benefit of humanity.

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IEEE Membership: **Connecting Professionals, Advancing Technology**



Celebrating 125 Years
of Engineering the Future



THIS MONTH'S QUESTION

Great Engineering Breakthroughs

As 2009 approaches, IEEE, which traces its origins to the founding of the American Institute of Electrical Engineers in 1884, prepares to celebrate its 125th anniversary. The organization has seen many important engineering breakthroughs over the years, including the development of electric power, radio, television, telecommunications, computers, satellites and space probes, health care technology, and the Internet.

WHAT WAS THE MOST IMPORTANT ENGINEERING BREAKTHROUGH OF THE PAST 125 YEARS? WHY?

MAIL: *The Institute*, IEEE Operations Center, 445 Hoes Lane, Piscataway, NJ 08855-1331 USA
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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. Responses will appear in the March issue of *The Institute* and may be edited for brevity. Suggestions for questions are welcome.

RESPONSES TO SEPTEMBER'S QUESTION

Do Women in Tech Fields Face Bias?

A recent study by the Center for Work-Life Policy, a nonprofit that researches women and work, concluded that women leave science, engineering, and technology in disproportionate numbers because of gender bias. Although women enter the three fields in high numbers—41 percent of employees are women—and 75 percent of them score well on performance reviews at the beginning of their careers, 52 percent later leave.

According to the study, they're driven out by a "pervasive macho culture" in which women face strong bias, dismissive attitudes, and sexual harassment. From your experience, do you agree with these findings?

It's a Matter of Attitude

There is no doubt that there is a glass ceiling for women, but I feel a lot depends on a woman's attitude. If we maintain a professional attitude and show that the quality of our work is excellent, the attitudes of our co-workers can be modified. In a workplace made up of mostly men, I feel my behavior dictates how people behave toward me.

NEERU BISWAS
Noida, India

Know the Possibilities

I find that female engineers do not know their worth when they negotiate their salaries when joining a company. It would help if companies reported salary survey findings focused specifically on women. Explaining what skills are expected for specific entry-level jobs would

help women become more confident in their abilities and the rewards they can obtain.

CONNIE CURTS
Lee's Summit, Mo.

Nice People

If I wore a dress when I started engineering in the 1970s, my co-workers would constantly find a reason to have me climb up or crawl under something. There were dirty jokes and flirting, and one man even refused to give me work. However, I was included in office parties and lunches, and most of my male co-workers were generally nice.

DEBBIE MANN
Lafayette, Ind.

Better Jobs

I haven't found that women are driven out by strong biases. Most of the women I have worked with left engineering to pursue other opportunities. They found different careers that were more rewarding. I believe when we're young we follow our imagination into a profession that stimulates our dreams; however, once we're there, we sometimes find the work doesn't fulfill those dreams, so we change careers.

ROBIN LAWRENTZ
Omaha

Advantage: Women

In the early stages of my career, there was undoubtedly discrimination toward women. They were simply not taken seriously, and sometimes they were targets of sexual harassment. However, now I feel women have a distinct advantage because of government pressure to hire more women and promote them to higher levels. I find that scientists usually don't think about the presence or absence of women in their field, but if you mention that it is becoming an issue, committees bend over backward to hire women whenever possible.

MARTIN LAMPE
Hyattsville, Md.

A Lonely Job

The biggest problem with bias against women is isolation. When I graduated college, I became the first person my company hired right out of school in eight years. I was the

only woman and the youngest engineer in my department, with the next youngest one 15 years older. I had no one I could really relate to. I then moved to another company where, until two months ago, I was the youngest individual in my job category. Today we still have only six women in management positions.

JANETTE SANDBERG
Westwood, Mass.

Baby Boom

I worked at a company for five years, and during that time no female engineer was promoted; however, during the same time span, 17 male engineers were promoted. The male-to-female employee ratio was 7:3 and stayed consistent during those five years. In addition, when one of my co-workers became pregnant, our manager went around to the rest of the female employees and asked us when we were getting pregnant, using the sentiment, "because women always get pregnant in packs."

MIRIAM BRESLAUER
Farmington, Mich.

Weak Link

As women decide to have children, the corporate leaders across the science and engineering disciplines see it as a lack of commitment to the company and as a loss of experience. After women return from maternity leave, many need more flexible hours and time off to take care of their children. Companies might see that as a hassle. Since they pay little attention to helping their employees find a balance between family and corporate goals, many companies believe that women are a weak link in the system.

GREG FOREST
Webster, Texas

Corrections

Federal University of Rio Grande do Sul is in Brazil, not Colombia (*IEEE Around the World*, September, p. 3).

U.S. electricity consumption has been growing at 1.6 percent per year, not 10 percent ("*Perfecting the Power Grid*," September, p. 9).

Envisioned Future Progress

It has been a challenging yet highly satisfying year as your IEEE President. It was challenging because the nature of our organization is inherently complex—diverse culturally, geographically, and technically, and there are always surprises. It was satisfying in many ways, but especially because we embarked on the first year of our IEEE Envisioned Future, completed by the Board in 2007, and our new commitment to strategic planning (see http://www.ieee.org/web/aboutus/strategy/envisioned_future.html).

The Envisioned Future establishes goals, core values, and a vision for IEEE far into the future and helps us focus on directions for success.

Here are examples of our goals and what we are doing to achieve them:

■ **Industry professionals and their employers will value IEEE as a major resource to achieve success.** Continuing to build relationships with industry, IEEE renewed

a memorandum of understanding with Boeing Co. to collaborate on technical meetings and other activities with its staff. Industry professionals are increasingly using IEEE's 1.8-million-document digital library to achieve success. In 2007, IEEE publications were cited 96 000 times in patents—four times as often as any other publisher.

■ **IEEE will improve the professional competencies of students and professionals through education.** IEEE has committed resources to such offerings as IEEE Expert Now, which presents interactive Web-based courses based on tutorials and workshops given at IEEE conferences. The Teacher In-Service Program, designed to improve how science and math are taught in the classroom, has reached several hundred preuniversity teachers worldwide.

■ **IEEE will increasingly be valued by the global community as a catalyst for a balanced dialogue on technology-related issues.** Conference digests and journal articles are key technical sources, and we continually examine emerging areas for new conferences, publications, and tutorials and short courses. The IEEE Standards Association enhances global adoption of IEEE standards through partnerships with the International Electrotechnical Commission, the International Organization for Standardization, and the International Telecommunication Union.

■ **The public will increasingly value the role of IEEE and technical professionals in enhancing the quality of life and the environment.** In 2008, we launched a multiyear public visibility effort—including celebrating IEEE's 125th anniversary in 2009—to promote IEEE and the contributions of engineering, science, and technology to society. This year

IEEE initiated a major focus on the application of engineering, science, and technology to address societal problems—part of the Envisioned Future. Members are becoming involved in humanitarian programs around the world, including the UN Foundation's Humanitarian Technology Challenge and GEOSS, an Earth-monitoring system involving more than 70 nations.

■ **IEEE members will increasingly find value and enjoyment through their involvement in the organization.** Volunteers are IEEE's lifeblood. Efforts began this year to improve their experience as volunteers—an ad hoc committee I initiated and another in Member and Geographic Activities, are both aimed at developing programs to attract volunteers and provide them with training and support to enable their growth and increase their satisfaction as volunteers.

■ **IEEE will operate as a model global association, with aligned purpose, energy, and infrastructure that facilitates the development and execution of coordinated strategy.** In June, the Board reaffirmed its commitment to the Envisioned Future and the strategic planning process, and organizational units and staff departments began to align objectives to support its goals. Continual progress toward our Envisioned Future is a challenge that volunteer and staff leaders at every level willingly undertake for the future of IEEE.

Finally, my thanks to the thousands of volunteers, the Board of Directors, and the staff for their tremendous work during my presidential year. I especially want to thank our 375 000-plus members for their continued loyalty and support of our great organization.

I welcome your comments at Terman.column@ieee.org



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MICHAEL A. ROBINSON

A Decade Of Online Publishing

BY JOHN R. PLATT

November 1998: America Online announces that it will acquire Netscape Communications. The Sega Dreamcast gaming platform premieres in Japan. Astronaut John Glenn once again circles Earth, this time aboard the space shuttle *Discovery*. And IEEE makes a leap into online publishing with the IEEE/IET Electronic Library (IEL).

Ten years later, the IEEE Xplore digital library (<http://ieeexplore.ieee.org>), the interface that powers IEL, holds nearly 2 million documents and serves more than 3.5 million visitors every month. Customers for IEEE online information include 97 percent of the world's top engineering schools and all 10 of the world's most innovative technology companies, including Amazon, General Electric, and Google. IEL also offers such services as multimedia content, downloadable citations, and the ability to search other publishers' digital libraries for related publications.

But how did IEEE get online?

A LOGICAL BEGINNING IEEE started digital publishing in February 1996 with a CD-ROM version of IEL, according to Barbara Lange, director of IEEE Product Management and Business Development, in Piscataway, N.J., the department that now oversees the IEEE Xplore digital library. The searchable disks contained PDFs of all articles from IEEE and IET (now called IET) journals and conferences, as well as IEEE standards.

But publishing IEL on CD-ROM presented logistical challenges. While easier to search than the print publications that were then standard, the digital versions of the articles were accessible to users only through their libraries, which had physical possession of the CDs. Then there was the difficulty of keeping the electronic versions up to date:

"We were updating the CDs monthly with newly published articles and sending out piles and piles of disks every month," Lange says. "We knew that moving the library online would be a golden opportunity for us to better serve the users."



When the online version of IEL went live in late 1998, it offered all the articles and standards from the CD-ROM version—marking the first time that multiple users at subscribing institutions could access IEEE publications simultaneously.

That was only the beginning. Only large institutions could afford IEL subscriptions, so IEEE continued to look for other ways to make its publications available to a wider range of users. That led to two years of developing a system that became the IEEE Xplore

digital library, the content engine that now delivers access to all IEEE online publications.

IEEE Xplore launched in May 2000, and with it came the ability to offer electronic access to IEEE publications, not just to IEL subscribers but also to a wider variety of companies, as well as to IEEE members. IEEE Xplore also made it possible to offer a variety of packages that provided online access to smaller selections of publications from the entire IEEE collection. That led to the IEEE All-Society Periodicals Package and the IEEE Conference Proceedings Order Plans.

Demand for the digital library continued to grow, and with it came the need for IEEE to build its own data center to house all the servers it took to support IEEE Xplore. The center went into operation in December 2003 in Piscataway.

"Since then, we've been growing by leaps and bounds," Lange says. "The most significant accomplishment is that people around the world are using IEEE Xplore 24/7," she adds, noting that IEEE now reaches far more people online than it ever did with its print publishing program.

She says the IEEE conference proceedings in particular now receive greater exposure because the material is online and linked with related content. Close to 800 conference proceedings have been uploaded this year to IEEE Xplore.

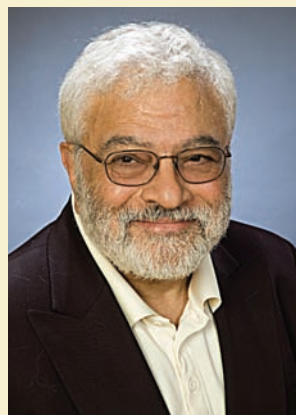
GROWING With so many people using the digital library, IEEE has to make sure it remains stable, with little to no downtime. "It's now a pretty sophisticated system, with the processes and infrastructure constantly being evaluated to ensure it is operating under industry best practices," Lange says.

Hosting its own data required IEEE to think like a software developer to manage the software updates and system upgrades that keep the library operating so reliably.

One way the library has grown is through its links to outside resources. "It's important to us to get users to content no matter where it's located," Lange says. She points to the CrossRef partnership in which participating publishers work together to link their content to each other. "If someone using IEEE Xplore finds a reference to a non-IEEE article, we make it easy for them to get to it," she says.

Keeping up with other, large online publishers is a challenge, but it is one that IEEE has met. "If you look at the other big technical publishers, we're on equal footing in terms of services and reliability," Lange says.

But it's the quality of IEEE publications that keeps people coming back, she notes. On average, 6 million to 7 million PDF documents are downloaded from IEEE Xplore every month. ■



FEATURED AUTHOR

El-Hawary Presents A Power Primer

Need to bone up on the basics of power engineering? Then take a look at Mohamed E. El-Hawary's latest book, *Introduction to Electrical Power Systems*.

After spending the last 40 years teaching all aspects of power systems at companies and universities around the world, El-Hawary decided it was time to write a book for newcomers to the field.

"This book is based on previous ones I've written, but I've simplified the complex topics—something I love to do," says the IEEE Life Fellow, who has authored or edited more than a dozen textbooks on power engineering.

There's no time like the present to get into power engineering, El-Hawary adds, because "there's going to be a large demand for electric-power engineers due to an aging workforce that will be retiring soon in huge numbers."

The illustrated text details the essentials of electric-power systems. It covers how electric power is generated, transmitted, and used. Other topics include the operational characteristics of power systems; system control, protection, and stability; the interconnection of the devices used in the systems; and the challenges system operators face.

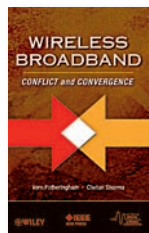
El-Hawary, a consultant to utilities and government organizations, is editor of the Wiley-IEEE Press series of power-engineering books.

—Anna Bogdanowicz

Here is a selection of books from Wiley-IEEE Press. Members receive a 15 percent discount by using the promotional code INSA2 when ordering from <http://www.wiley.com/IEEE>.

Wireless Broadband: Conflict and Convergence

By Vern Fotheringham and Chetan Sharma (November 2008, US \$85, 254 pp.)



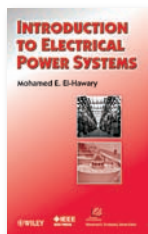
This resource for telecommunication industry decision makers and investors covers issues likely to affect the future market for wireless services.

The authors discuss emerging technologies, service delivery options, applications, and digital content that will shape the next phase of the wireless revolution. They provide a historical perspective for current and upcoming developments and analyze the state of wireless and broadband technology.

TO ORDER: <http://www.wiley.com/remtitle.cgi?0470227621>

Introduction to Electrical Power Systems

By Mohamed E. El-Hawary (October 2008, \$110, 394 pp.)



This comprehensive text discusses the modern electric power system, centering on the technical aspects of power generation, transmission, distribution, and utilization.

After an overview of electric power and machine theory fundamentals, El-Hawary describes various applications, including synchronous machines, transformers, and electric motors. A look at the present and future direction of the electrical power field rounds out the book.

TO ORDER: <http://www.wiley.com/remtitle.cgi?0470408634>

Handbook of Large Turbo-Generator Operation and Maintenance, 2nd Edition

By Geoff Klempner and Isidor Kerszenbaum (September 2008, \$140, 856 pp.)



For operators and inspectors of large utility and industrial generating facilities, this handbook deals with how to maintain and operate turbine-

driven generators of varying sizes, origins, and vintages. Also described are operational problems and failure modes that occur in generating stations and other power facilities.

TO ORDER: <http://www.wiley.com/remtitle.cgi?047016767X>

Mobile WiMax

Edited by Kwang-Cheng Chen and J. Roberto B. de Marca (April 2008, \$140, 400 pp.)



The first book to cover one of the hottest topics in wireless communications today, *Mobile WiMax* summarizes the technology's

fundamental theory and practice. The authors explain topics at an introductory level and then move on to advanced subjects including standards, physical layer transmission, and multimedia networking. **TO ORDER:** <http://www.wiley.com/remtitle.cgi?047051941X>

IP Multicast With Applications to IPTV and Mobile DVB-H

By Daniel Minoli (April 2008, \$89.95, 376 pp.)



This guide to Internet Protocol multicast technology and its applications focuses on IP-based television (IPTV) and digital video broadcast-handheld (DVB-H) applications. The authors explain how traditional phone companies apply IP multicast technology to deliver video services, how

cellphone companies can use it to stream video to handheld phones and PDAs, and how cable TV companies can upgrade to IP technology. The book is meant for engineers in communications or Internet design, content providers, and researchers. It can also be used as a college textbook.

TO ORDER: <http://www.wiley.com/remtitle.cgi?0470258152>

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Spotlight On Three Standards

IEEE Std. 1588-2008, released in August

The IEEE Standard for a Precision Clock Synchronization Protocol for Networked Measurement and Control Systems defines how to synchronize clocks in systems using techniques such as network communication, local computing, and distributed objects. The protocol supports system-wide synchronization accuracy in the submicrosecond range with minimal network and local clock computing resources. The standard includes mappings to UDP/IP, DeviceNet, and a layer-2 Ethernet implementation.

IEEE Std. 1631-2008, released in August

The IEEE Recommended Practice for Measurement of 8-VSB Digital Television Transmission Mask Compliance for the USA covers the theory, techniques, and procedures for measuring the spectral characteristics of 8-VSB transmitters used for terrestrial transmission of digital television in frequencies near

assigned channels. The standard explains the characteristics and measurement procedures that ensure all users get comparable results.

Update to 2007 National Electrical Safety Code, released in October

The NESC is considered to be the most important document for safeguarding people from the hazards of installing, operating, or maintaining conductors and equipment in electric power stations and overhead and underground electric supply and communication lines. This update comprises five amendments, including requirements for the enclosure of equipment, load factors for structures, and the use of insulators. The code also has guidelines for electrical wiring and equipment used in all types of buildings.

FOR MORE INFORMATION on these and other standards, visit the IEEE Standards Association Web site, at <http://www.standards.ieee.org>.

IEEE Expert Now Courses

Four new IEEE Expert Now courses dealing with technical skills are available. The interactive online courses are based on educational tutorials and workshops held at IEEE conferences around the world.

Space-Time Adaptive Processing for Radar

By Michael L. Picciolo and Scott Goldstein

Deals with systems for space-time adaptive processing, an advanced signal processing method used to mitigate motion-induced spread-Doppler-radar clutter that interferes with the echo from ground targets.

IEEE 802.11N Physical Layer

By Eldad Perahia Provides a comprehensive overview of the physical layer technology in the IEEE 802.11n draft standard. Topics include applications, environments, channel models, reduced guard intervals, and high-rate coding.

Design of Electrically Small Antennas

By Steven Best As wireless devices decrease in size, the demand for smaller antennae increases. This course covers the theory, challenges, and performance trade-offs associated with designing small antennae.

Biometrics: Solutions for Security and Authentication

By Kostas Plataniotis Provides an overview of biometrics, the study of methods for recognizing individual humans based on one or more intrinsic physical or behavioral traits.

FOR MORE INFORMATION on these and other IEEE Expert Now courses, visit <http://www.ieee.org/expertnowieee>.

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FEATURED CONFERENCE

IEEE International Systems Conference

Vancouver
23-26 March

The Systems Conference offers a forum for the presentation of papers dealing with the advancement of system design, development, and management. The program is geared to systems-engineering practitioners, managers, researchers, and educators.

Topics include applications of large-scale systems, research opportunities relating to system of systems, and processes for the system-of-systems environment.

SPONSOR: IEEE Systems Council
VISIT: <http://sysconf09.ieee-systemscouncil.org>



IEEE International Solid-State Circuits Conference

San Francisco
8-12 February

A forum for the presentation of advances in solid-state circuits and systems on a chip, the conference offers an opportunity for engineers working on the cutting edge of IC design and application to maintain technical currency and to network with leading experts.

One session during the conference, "Green Electronics: Environmental Impacts, Power and E-Waste," brings green manufacturing issues to the fore. Also, Intel is expected to unveil its new Itanium processor for mobile devices, the first processor to hold more than 2 billion transistors.

SPONSOR: IEEE Solid-State Circuits Society
VISIT: <http://www.isscc.org>

International Microwave Workshop Series On Signal Integrity And High-Speed Interconnects

Guadalajara, Mexico
19 and 20 February

The first in this series of workshops to take place in IEEE Region 9 sets out to explore industrially relevant problems in the microwave field and to contribute



to the education and training of engineers working in the field in Latin America.

Topics include high-speed and state-of-the-art interconnects, electromagnetic compatibility and EMC measurement techniques, crosstalk and coupling effects, signal integrity, and high-speed digital techniques.

SPONSOR: IEEE Microwave Theory and Techniques Society
VISIT: <http://www.imws2009-R9.org>

IEEE PES Power Systems Conference And Exposition

Seattle
15-18 March

The conference covers issues vital to electric power systems. Exhibitors at the exposition showcase state-of-the-art software and hardware systems as well as consulting services.



Topics include system-wide events and analysis methods, the integration of wind energy, emerging software needs for restructured grids, control-system robustness, and the smart grid and the Internet.
SPONSOR: IEEE Power & Energy Society
VISIT: <http://www.pscexpo.com>

IEEE International Conference On Mechatronics

Málaga, Spain
14-17 April

This conference is designed to spark discussion about the latest

in mechatronics, to present research results and prospects for their development, and to stimulate cross-fertilization among different fields.

Other issues include modeling and design, motion control, system integration, vibration and noise control, robotics, and intelligent control.



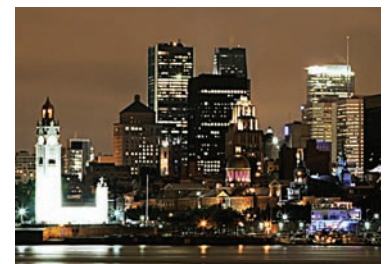
SPONSOR: IEEE Industrial Electronics Society
VISIT: <http://www.icm2009.net>

IEEE International Reliability Physics Symposium

Montreal
26-30 April

For more than 40 years, this symposium has been the world's premier conference for engineers and scientists who are presenting original work in the field of microelectronic device reliability.

The three-day meeting addresses reliability concerns associated not only with silicon, including microelectromechanical systems, but also gallium arsenide, LEDs and diode lasers, optical fiber, flat-panel displays, and organic electronics and nanotechnology.



The conference includes two days of tutorials, evening session workshops, and equipment demonstrations.

SPONSORS: IEEE Electron Devices Society, IEEE Reliability Society
VISIT: <http://www.irps.org>

PROFILE

KAREN PANETTA

Bringing Geek Chic Into Style

Dispelling the myth of the nerdy female engineer

BY SUSAN KARLIN

When IEEE Fellow Karen Panetta and a group of her engineering students, dubbed the Nerd Girls, appeared on NBC's "The Today Show" in July, the idea was to promote the fact that female engineers can be attractive and hip.

So what viewer feedback does Panetta remember reading on the network's Web site? "You only picked the pretty girls!" viewers chastised. Panetta—who chose the young women for the segment to represent the varied careers and successes of her Nerd Girl alumni—was more amused by the students' reaction. "They wondered, 'People think we're pretty?'" she says with a laugh.

"The stereotype of what people think female engineers should look like always stuck with me," says Panetta, a professor of electrical engineering at Tufts University in Medford, Mass. "The girls I knew who were studying engineering didn't just sit in a basement with pizza boxes focusing on work, work, work. They were also musicians, ballet dancers, and cheerleaders." To help dispel the myth of the geeky "engineeress," Panetta began working on the Nerd Girls program in 1996.

The Nerd Girls—about 14 Tufts engineering undergrads each year—work on socially conscious projects such as environmental cleanup, green energy, and improving mobility for the disabled. For example, the group rewired a historic lighthouse to run on renewable energy. Another undertaking involved a voice-activated system that let a quadriplegic dispense treats to a monkey helper assisting with simple ambulatory tasks.

Panetta says she hoped to foster camaraderie among and support for aspiring female engineers and to retain them in engineering, though the program is open to men as well.

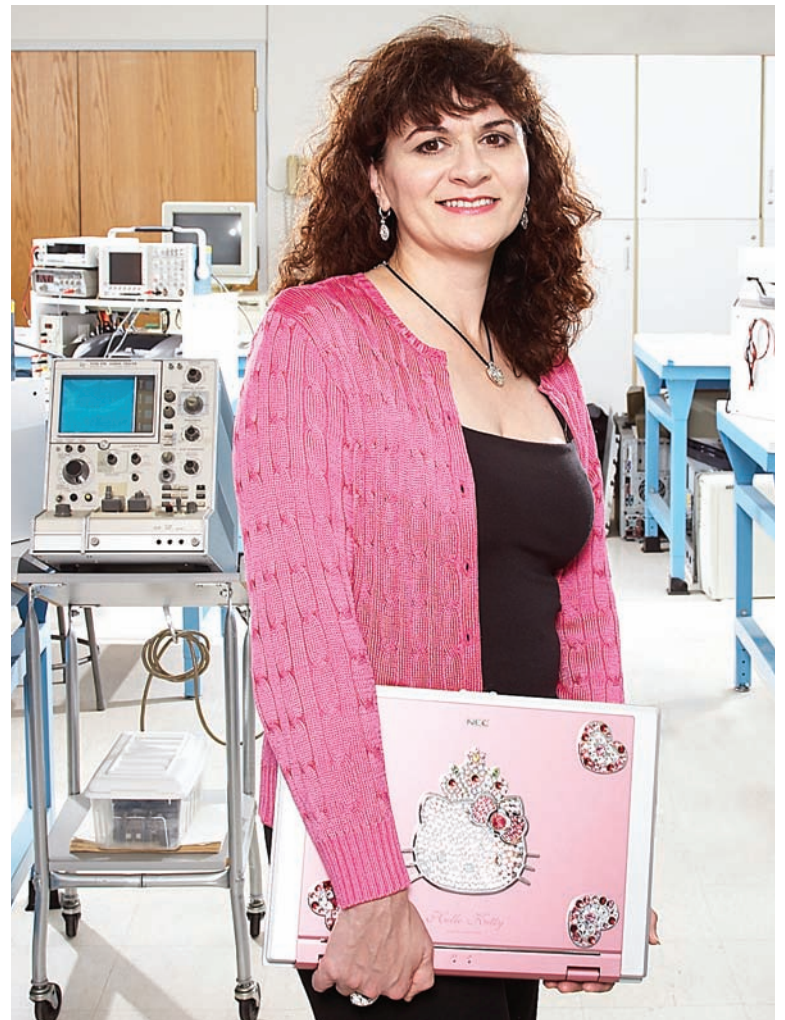
She says the program tries to offer real-world experience, practice working on a team with students from other engineering disciplines, and a support system for female-oriented styles of collaboration.

The group has attracted media attention from *Newsweek* and other news outlets, plus corporate sponsorships and grants totaling more than US \$100 000. The donations will be used to cover expenses for the next eight years, Panetta says.

And the group might soon have its own TV show. Panetta is meeting with a number of networks to discuss a Nerd Girls reality series that would follow the undergrads as they work on projects.

Panetta didn't set out to be a mentor. After earning a bachelor's degree in computer engineering from Boston University in 1986, she worked for Digital Equipment Corp. (DEC, now a part of Intel), in Hudson, Mass. She earned a master's in 1988 and a Ph.D. in electrical engineering in 1994 from Northeastern University, Boston. Her IEEE involvement began as a student member. "It helped me get my first job," she says. "I'd go to IEEE conferences and work the registration booth. People got to know me and asked for my résumé."

In 1995, she was accepted into DEC's Engineers Into Education, a program for employees wanting to teach that placed them in academic institutions for two-year stints to help students navigate between



classroom theory and real-world problem solving. She chose Tufts because of its focus on undergraduates. After her first year there, she left her job at DEC and joined the university as its first female electrical engineering professor. At the time, the department had only one female undergraduate EE student.

Panetta formed the precursor to the Nerd Girls in 1996 during a summer gig consulting for NASA in Langley, Va. She worked at the data visualization and animation lab translating complex information into a user-friendly animated form. The programs visualized the Earth's atmosphere and identified pollutants, their origins, and how they affected lives and the environment.

"I didn't have stipend money to pay grad students to help with the research, so I asked undergraduates, both male and female," Panetta

says. "Female students flocked to me because they could relate to the work I was doing, loved how their skills could benefit humanity, and didn't see me as the classic nerd professor with no life. Eventually, the girls outnumbered the boys."

"The project ended up winning awards," she continues. "Tufts couldn't believe that undergrads had a hand in the research. That's when things really turned around." Nerd Girls officially launched in 2000.

Nerd Girls has morphed into as much of a social group as an engineering organization. "How many engineering groups will spend 13 hours straight putting together a solar-powered car and then go shopping?" asks Panetta, who continues to attract women to engineering. Last year she founded IEEE's electronic *Women in Engineering Magazine* and became its editor. ■

Why You Should Stay With IEEE

BY ANNA BOGDANOWICZ

Each year about half the IEEE student members who graduate don't renew and sign up as full members—they just drop out. By not joining, those graduates are missing out on a load of benefits that come in handy when they enter the workforce. There are many advantages to becoming a member after you graduate, including help with finding a job, mentoring and continuing-education programs, and discounts on conferences, books, and insurance.

Here are 11 reasons why you should keep your membership after you finish school.

1. Dues are discounted for your first year

Sure, the leap from US \$30 (in the United States and Canada, \$25 everywhere else) a year for student membership to \$129 for basic IEEE dues can seem steep, but IEEE eases the load with a 50 percent discount for your first year after graduating.



2. You get help finding a job

The IEEE Job Site (<http://careers.ieee.org>) features postings from the world's top tech employers. The site lets you create an online profile that includes your qualifications and the type of job you're looking for, and IEEE will even e-mail you when positions matching your criteria are posted.



3. IEEE Xplore digital library is at your fingertips

In your new job, you'll need to stay on top of the latest work in your field. The IEEE Xplore digital library provides access to more than 1.5 million documents from IEEE journals, transactions, letters, magazines, conference proceedings, and standards. You pay two-thirds less per article than a nonmember would. You can also download articles for free from those journals you get as part of your society membership. In addition, a \$35 subscription to the IEEE Member Digital Library lets you download up to 25 articles per month from any IEEE publication or conference proceeding.



4. Advice comes free with the IEEE Mentoring Connection

Need to learn how to prioritize your job tasks?

Want advice on how to approach your first performance review? You can get the answers to these and other questions through the IEEE Mentoring Connection (http://www.ieee.org/web/membership/benefits/products/prod_mentoring.html?cprod=67099). The online program connects recent grads and young professionals with IEEE members willing to devote time to guide them in their professional development.

5. There's continuing education, at a discount

Need extra training to stay current in your field? That's where the IEEE Education Partners Program (<http://www.ieee.org/partners>) comes in. It offers IEEE members a 10 percent discount on more than 6000 online continuing-education, certificate, and graduate degree courses from universities and organizations partnered with IEEE.

Want to bone up on the latest technologies but don't have time to make it to an IEEE conference? You can purchase conference tutorials online through the IEEE Expert Now Web site (http://www.ieee.org/web/education/ExpertNow_IEEE). The site contains one- to two-hour courses on more than 50 topics in aerospace, lasers, optics, signal processing, vehicular technology, and other fields.

6. You get discounts on books and conferences, too

Get a 15 percent discount on Wiley-IEEE Press books (<http://www.wiley.com/IEEE>), which cover a diverse range of electrical and computer engineering topics.

You also can get up to 20 percent off the registration fee on IEEE conferences (<http://www.ieee.org/conferences>). Each year IEEE sponsors or cosponsors more than 800 conferences in more than 60 countries on the latest engineering breakthroughs in many technical fields.



7. Networking opportunities

Taking the step from student to professional is much easier if you have a network of like-minded colleagues to help you. MemberNet (<http://www.ieee.org/memberNet>) is an online community that lets you find others who share your technical interests, educational background, and more.



There are also plenty of opportunities to network in person. IEEE sections, societies, and regions hold numerous meetings each year that bring together members from your local and regional IEEE community as well as business leaders from local companies.

8. IEEE Spectrum and The Institute

One of the benefits most often cited as a favorite in member surveys is IEEE's flagship publication, *IEEE Spectrum*. The monthly magazine for technology insiders features the latest in science, engineering, and technology.

And, of course, you get the monthly IEEE member newsletter, *The Institute*, to keep you posted on what's happening at IEEE.



9. You can gain soft skills for free

Volunteering for IEEE—whether for your section, society, or region—offers many benefits. Not only are you contributing to your profession, but you also gain valuable soft skills that you might not learn at your job, such as effective ways to lead meetings and make presentations. Learn more about volunteering at <http://www.ieee.org/web/volunteers/home>.



10. The IEEE Financial Advantage Program

Members receive discounts on products and services from the Financial Advantage Program (<http://www.ieee.org/web/membership/financial-advantage>). IEEE has negotiated with insurance and other companies to lower the cost of services for you and your family, including great deals on health care, life insurance, auto and home insurance, loan consolidation, and college savings plans, as well as discounts on office supplies.



11. IEEE is fun, too!

IEEE members don't just hold technical meetings. They also organize fun get-togethers that you can participate in. IEEE sections regularly host barbecues, tours of tech sites, dinners featuring interesting speakers, and other events. Check out your local section's newsletter to find what's happening in your area.





Tom Silliman

Home on the Range

Broadcast engineer Tom Silliman spends his days maintaining transmission antennas high above the United States' tallest buildings. But his real passion keeps him more grounded.

After a week in the air, you can't get much more down and dirty than being a cowboy. Come Saturdays, Silliman is on his Indiana ranch, herding, branding, and roping cattle.

"It's a nasty business being a cowhand—you're covered in cow manure every day," he says, laughing. "My business partner and I basically buy cows so we can play with them and then sell them."

Cattle ranching involves acclimating cattle to being handled—roping, medicating, corralling, guiding to better grazing areas—in order to raise a healthy herd of beef to bring to market. "It's different from what you see in the movies—cowboys shouting and whooping and driving the cattle to near-stampedes," he says. "We keep the cows very quiet. We don't want them to run, because it takes off weight."

Silliman, an IEEE senior member, trains the cattle a half dozen at a time, getting them used to ropes

thrown around their heads and hoofs, and treating them for worms and ticks. "We move a large herd of cattle several miles over an open range, rounding them into circles to calm them down," he says.

It takes almost three days to round up, castrate, brand, and medicate a herd of four dozen cattle.

Silliman's day job is chief executive officer of Electronics Research, in Chandler, Ind., which builds commercial broadcast antennas and towers for radio, TV, and cellphone transmission.

A friend got him involved in working with cattle three years ago when Silliman took a class on horsemanship to learn how to handle the animals with horses. They bought seven horses, 54 cattle, and 93 hectares of property in Lynnville—which they're turning into a ranch. Now in their second year of cattle ranching, they buy the animals in February at a svelte 160 kilograms each, train and feed them through August, and then sell them at roughly 365 kilograms.

"After all that, we only make about US \$5000 in profit," he says. "It's an expensive hobby. The more you get into it, the more you realize you must be out of your mind."

—Susan Karlin

PASSION
Cattle ranching
PROFESSION
Broadcast engineer
HOMETOWN
Newburgh, Ind.

Cecilia Aragon

Stunts in the Sky

As a child, Cecilia Aragon was a shy, play-it-safe, nerdy science geek—hardly the foundation for a world-champion aerobatic flyer. But she had big dreams. Despite a chronic fear of flying, "on every birthday, I'd close my eyes, blow out the candles, and make a wish that I could fly," says Aragon, an IEEE member.

In 1985 Aragon was working as a three-dimensional-graphics programmer at Digital Equipment Corp. in Palo Alto, Calif., when a co-worker who was an amateur pilot invited her to go flying with him. She enjoyed it so much that she decided to tackle her demons once and for all. As soon as they landed, she stunned her friend by signing up for flying lessons.

Within a year she had conquered her fear and then some, working her way up to flight instructor, specializing in helping students overcome their fears. To learn how to control a plane in case of an emergency, she took a class in aerobatics—essentially airborne acrobatics involving spins, loops, and upside-down flying—and loved it. After learning to fly a Cessna 150, she would eventually handle up to 50 other types of aircraft, including a number of aerobatic planes. "Aerobatics is what

finally connected me to that childhood dream," she says.

A year later she entered and won her first competition, and by 1990 she had traded engineering for a full-time career as an air-show pilot and owner of her own flying school. She thought the school would allow her time to fly. Instead it saddled her with paperwork.

In 1994, tiring of 100-hour work weeks and missing engineering's intellectual challenges, she sold the school and parlayed her flight experience into a job working on airflow hazard visualization software at the NASA

Ames Research Center, in Mountain View, Calif. In 2004, after earning a Ph.D. in computer science/information and scientific visualization from UC Berkeley, she went to work for the Lawrence Berkeley National Laboratory. Now she's developing visualization software that translates complex scientific data into understandable visuals.

Today Aragon flies in a Super Decathlon plane and teaches every other weekend. "Aerobatics is a three-dimensional dance," she says. "When I fly, I don't notice the boundary between myself and the airplane. It becomes a part of me the way ballet shoes become part of the ballerina."

—S.K.

PASSION
Aerobatic flying
PROFESSION
Computer scientist
HOMETOWN
Berkeley, Calif.



If you have an interesting hobby you'd like to share—such as sculpting, mountain climbing, or playing in a band or orchestra—e-mail the editors: institute@ieee.org.

RECOGNITIONS



FELLOW NIM CHEUNG

has been named CEO of the Hong Kong Applied Science and Technology Research Institute Co., which performs research in communication and information technology.

Prior to the appointment, Cheung had been vice president since 1990 at the Applied Research Government Program at Telcordia Technologies, a company in Piscataway, N.J., that provides software, services, and research to communications companies. He joined Telcordia in 1976 and in 1984 became district manager of the Advance Lightwave Technology Group, where he created three research programs in high-speed, coherent, and subcarrier-multiplexed light-wave systems. Since 2004 he has also been a consulting professor of electrical engineering at Stanford University.

Cheung served as the 2006 president of the IEEE Communications Society. He was the society's 1998 vice president of technical affairs, and in 2000 he served as its director of related societies. He earned a bachelor's degree in electrical engineering in 1970 from the University of Hong Kong and master's and doctoral degrees in physics from Caltech in 1972 and 1976.



FELLOW AART DE GEUS

received the 2008 Phil Kaufman Award for Distinguished Contributions to the Electronic Design Automation (EDA) Consortium. The consortium represents 100 companies in the EDA industry. De Geus was recognized for his "demonstrable impact on the field of EDA."

De Geus is cofounder and CEO of Synopsys, one of the world's largest suppliers of semiconductor design and manufacturing software, located in Mountain View, Calif. He started the company in 1986 with five of his former colleagues from General Electric. He is credited with building Synopsys into a leader in electronic design.

Electronic Business magazine named him CEO of the Year in 2002 and one of the 10 Most Influential Executives in 2005.

He holds a master's degree in electrical engineering from the Swiss Federal Institute of Technology, in Lausanne. He immigrated to the United States in 1979 and earned a Ph.D. in electrical engineering from Southern Methodist University, in Dallas.



MEMBER RAMZI NASSIF

has been appointed to lead Leviton's expansion into the Middle East. The company, which manufactures electrical and electronic products, is headquartered in Little Neck, N.Y.

As the managing director for the expansion, he is based in Dubai and is overseeing sales of the company's industrial and residential products throughout the Middle East, as well as in Turkey and India.

Before joining Leviton, Nassif worked for 3M of Maplewood, Minn., for a decade. He was 3M Gulf's manager for the Middle East, and he helped incorporate a new fiber-installation process within the region. Previously, he had been a sales engineer, a marketing executive, and a regional sales manager for the company.

He earned a bachelor's degree in electrical engineering in 1995 from Georgia Tech.

IN MEMORIAM

HUGO MARÍA FERNÁNDEZ VERSTEGEN

Region 9 Director

MEMBER GRADE: SENIOR MEMBER

AGE: 65

DIED: 27 August



Hugo María Fernández Versteegen held a number of volunteer positions for IEEE, including chair of the Argentina Section's board of directors from 1987 to 1989 and again in 1997. He served as Region 9 director in 1994 and was the IEEE secretary in 2001.

He was CEO and managing director of Latin America in Buenos Aires at Landis & Gyr, an energy and technology company based in Switzerland.

He was a member of the Rotary Club in Buenos Aires. He received the 2003 Larry K. Wilson Transnational Award from the IEEE Regional Activities Board, now IEEE Member and Geographic Activities, for "his significant contributions to making IEEE a truly global society."

He earned a bachelor's degree in electrical engineering in 1966 from the University of Buenos Aires.

ELISE H. TURNER

Artificial-Intelligence Researcher

MEMBER GRADE: Member

AGE: 49

DIED: 14 August



Elise H. Turner was an expert in artificial intelligence who specialized in natural-language processing and discourse processing. She died after a seven-year battle with biliary tract cancer.

Turner began her career in 1989 as an assistant professor of computer science at the University of New Hampshire, in Durham. She left in 1995 to become a professor of computer science at the University of Maine, in Orono. She became chair of the department in 2004. She served as codirector of the Maine Software Agents and

Artificial Intelligence Laboratory, located at the university.

She was a member of the Association for Computing Machinery and the Association for the Advancement of Artificial Intelligence.

She earned bachelor's and master's degrees in computer science from Columbia University in 1984 and 1986. She also earned a Ph.D. in computer science in 1989 from Georgia Tech.

HARRY B. SMITH

Pulse-Doppler Radar Expert

MEMBER GRADE: Life Member

AGE: 86

DIED: 8 August



Harry B. Smith was known as the father of pulse-Doppler radar, and he helped develop the radar system for high-altitude surveillance aircraft.

Smith began his engineering career at the Naval Research Laboratory in Washington, D.C., in

1942 as a consultant for its radio division. Shortly afterward he enlisted in the U.S. Army, which assigned him to an elite intelligence unit at Harvard University and MIT in 1943. There he helped lead a group of engineers developing decryption machines to let U.S. allies analyze and break German codes. After being discharged with the rank of lieutenant, he joined the Baltimore division of Westinghouse Electric Co. in 1952. Within a year, he was promoted to manager of advanced development and was responsible for building analog and digital computers. With the help of two other Westinghouse engineers, he developed a pulse-Doppler radar system, which became the foundation of the U.S. Airborne Warning and Control System. The system uses a special type of radar to track all aircraft within a battle zone.

Smith earned a bachelor's degree in electrical engineering in 1942 from the University of Missouri School of Mines, in Rolla. He also received a master's degree in electrical engineering in 1949 from the University of Maryland at College Park.

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DEADLINES & REMINDERS

Call for IEEE Award Nominations

Nominees are being sought for 2010 IEEE medals, awards, recognitions, and prize papers. The deadline for the IEEE Board of Directors to receive nominations is 1 July 2009.

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and technology.

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IEEE JACK S. KILBY SIGNAL PROCESSING MEDAL

For outstanding achievements in signal processing.

SPONSOR: Texas Instruments Inc.

IEEE JUN-ICHI NISHIZAWA MEDAL

For outstanding contributions to material and device science and technology, including practical application.

SPONSORS: The Federation of Electric Power Companies, Japan, and the Semiconductor Research Foundation

IEEE ROBERT N. NOYCE MEDAL

For exceptional contributions to the microelectronics industry.

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IEEE JOURNALS TOP THE CHARTS

Four IEEE journals were the most frequently cited in their fields, according to the 2007 Journal Citation Reports.

Produced by Thomson Scientific, the JCRs survey more than 7500 peer-reviewed journals in about 200 disciplines, including categories relevant to IEEE. The reports assess the influence of academic journals within their disciplines by recording the average number of times articles published in the last two years were cited in the most recent year.

Nearly a century old, *Proceedings of the IEEE* was rated No. 1 in the field of electricity and electronics. *IEEE Transactions on Medical Imaging* was the most frequently cited journal in the

field of imaging science and photographic technology. *IEEE Transactions on Automatic Control* came in on top in the field of automation and control systems.

The annual study also revealed that a number of other publications sit near the top in their categories. Thus IEEE has:

- Eighteen of the top 20 journals in electrical and electronic engineering
- Nine of the top 10 in telecommunications
- Six of the top 10 in computer science, hardware, and architecture
- Five of the top 20 in computer science and information systems
- Eight of the top 20 in computer science and software engineering

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