

the institute

<http://www.ieee.org/theinstitute>

VOL. 33 NO. 3

SEPTEMBER 2009

CANDIDATES Q&A

Find out where the candidates for 2010 IEEE President-Elect—(from left) J. Roberto Boisson de Marca, Moshe Kam, and Joseph V. Lillie—stand on important IEEE issues. **P. 6**



 **IEEE**
Celebrating 125 Years
of Engineering the Future

INSIDE

3 IEEE Around the World / **4** Calendar
6 Election / **9** Technology
10 Marketplace of Ideas / **11** President's Column / **12** Products & Services
13 Conferences / **14** Standards
14 Continuing Education / **16** Profile
18 Students' Corner / **19** Part-time Passions

TECHNOLOGY



Learn about Intel's vision of sharing technologies wirelessly in the not-so-distant future. **P. 9**

PRODUCTS & SERVICES

When times are tough, the tough get certified. IEEE offers several certification programs in hot tech fields. **P. 12**



STUDENTS' CORNER



Want to start a student branch at your school but don't know how? It's easier than you think. **P. 18**

PART-TIME PASSIONS

One IEEE senior member in Maryland is a fencing champion and another in Virginia swims with sharks. **P. 19**



ONLINE

AVAILABLE 8 SEPTEMBER AT
WWW.IEEE.ORG/THEINSTITUTE

BOARD SERIES WRAP-UP Read highlights from the June IEEE Meeting Series.

IEEE MILESTONES

The ARPANET and the external pacemaker are being honored by IEEE this month.



Accomplish more. IEEE Educational Activities.

Whether you're a working technology professional, professor, teacher or student, IEEE Educational Activities offers you an extraordinary wealth of learning resources.

From technical and soft skills training, to lesson plans, standards education, awards and resources for pre-university and university education, you'll find what you need to achieve more.

Pre-University Education

- TryEngineering.org
- Teacher In-Service Program
- TryNano.org

University Education

- Global Accreditation
- Accreditation.org
- Real World Engineering Project
- Technical English Program
- Standards Education

Continuing Education

- IEEE Expert Now
- Certification
- Continuing Education Units
- IEEE Education Partners Program

Awards

- Ten major awards recognize and honor individuals and companies for major contributions to engineering and technical education.

IEEE Women in Engineering

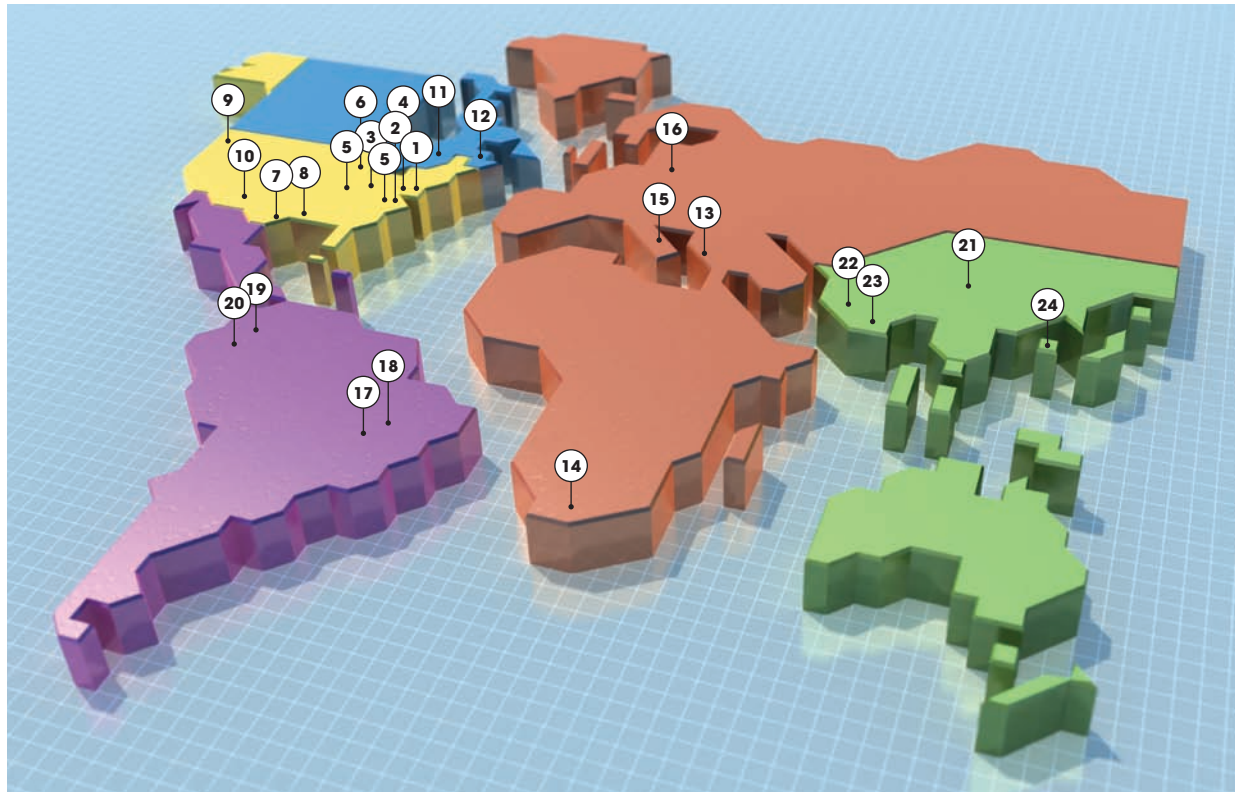
- International professional organization dedicated to promoting women engineers and scientists.



► Accomplish more: www.ieee.org/education

 **IEEE**
Celebrating 125 Years
of Engineering the Future

IEEE AROUND THE WORLD



REGION 1: Northeastern U.S.

1. Long Island (N.Y.) Section establishes chapter of IEEE Product Safety Engineering Society.
2. Princeton/Central Jersey (N.J.) Section establishes chapter of IEEE Solid-State Circuits Society.

REGION 2: Eastern U.S.

3. Pittsburgh Section establishes chapter of IEEE Nanotechnology Council.
4. Lehigh Valley (Pa.) Section forms chapter of IEEE Solid-State Circuits Society.

REGION 3: Southeastern U.S. and Jamaica

5. Hampton Roads (Va.) and Louisville (Ky.) sections form chapters of IEEE Power & Energy Society.

REGION 4: Central U.S.

6. Student branch formed at Central Michigan University, Mount Pleasant.

REGION 5: Southwestern U.S.

7. Central Texas Section forms joint chapter of IEEE Antennas and Propagation and Microwave Theory and

Techniques societies.

8. Student branch established at University of Louisiana at Monroe.

REGION 6: Western U.S.

9. Richland (Wash.) Section establishes Graduates of the Last Decade (GOLD) affinity group.
10. Albuquerque and Los Alamos/Northern New Mexico sections form Life Members affinity groups.

REGION 7: Canada

11. Toronto Section forms joint chapter of IEEE

Communications and Broadcast Technology societies.

12. Canada Atlantic Section forms joint chapter of IEEE Signal Processing and Microwave Theory and Techniques societies and a Women in Engineering (WIE) affinity group.

REGION 8: Europe, Middle East, and Africa

13. Lebanon Section forms joint chapter of IEEE Power & Energy, Circuits and Systems, and Power Electronics societies.
14. South Africa Section forms chapter of IEEE Systems, Man,

and Cybernetics Society.

15. Italy Section forms chapter of IEEE Biometrics Council.
16. Poland Section establishes WIE affinity group.

REGION 9: Latin America

17. South Brazil Section establishes chapter of IEEE Computational Intelligence Society.
18. Student branch at the Federal University of Juiz de Fora, Minas Gerais, Brazil, forms chapter of IEEE Robotics and Automation Society.
19. Colombia Section establishes chapter of IEEE Control Systems Society.
20. WIE student branch affinity groups formed in Colombia at the University of the Andes, Bogotá, and at Corporación Universitaria de la Costa, Barranquilla.

REGION 10: Asia and the Pacific

21. Harbin (China) Section establishes chapter of IEEE Education Society.
22. Gujarat (India) Section establishes chapter of IEEE Communications Society and joint chapter of IEEE Microwave Theory and Techniques and Antennas and Propagation societies.
23. In India, student branches formed at the College of Engineering Karunagappally; the LDRP Institute of Technology and Research, Gandhinagar; the B.H. Gardi College of Engineering and Technology, Rajkot; and the C.U. Shah College of Engineering & Technology, Surendranagar.
24. Student branch formed at National Chung Hsing University, Taichung, Taiwan.

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

2010 Dues Notice

IEEE membership base dues for 2010 will be US \$134, a \$5 increase. This increase is based on the rate of inflation as measured by the U.S. Consumer Price Index. In addition to the base price of membership, regional assessments are charged to members to facilitate local activities.

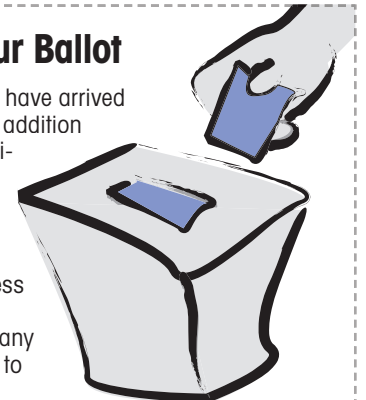
There are no changes to the assessments for 2010. For U.S. members, the additional combined assessment for IEEE-USA and ABET, the accrediting body in the United States for academic programs in applied science, computing, engineering, and technology, will be \$38, an increase of \$1.

Dues for student and graduate student members will rise by





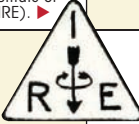
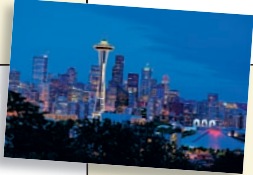
\$2. This is the first time since 2003 that IEEE student dues have been increased. The fee for society affiliates, which is set at half the base IEEE dues, will increase to \$67. Affiliates, who can belong to one or more IEEE societies but are not IEEE members, pay the affiliation fee for each IEEE society they join plus the membership dues charged by that society.



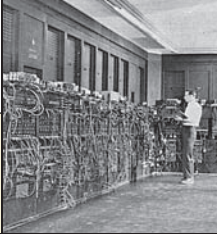


Remember to Return Your Ballot


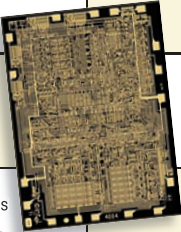



The annual IEEE election ballot should have arrived in members' mailboxes last month. In addition to three candidates for 2010 IEEE President-Elect, there are 34 others running for positions in various IEEE divisions and regions, as well as the IEEE Standards Association, IEEE Technical Activities, and IEEE-USA. You can access and return your ballot electronically at <https://www.directvote.net/ieee>. Send any questions you have about the election to corp-election@ieee.org.



CALENDAR

| SUNDAY | MONDAY | TUESDAY | WEDNESDAY | THURSDAY | FRIDAY | SATURDAY |
|--|--|--|--|---|---|--|
|  | |  | 2 ◀ 1987: Philips introduces CD Video , combining compact disc and laserdisc technologies. | 3 | 4 1995: Computer programmer Pierre Omidyar launches eBay , the online auction Web site. ▼ | 5 |
| | 7 ◀ 1912: Birth date of IEEE Fellow David Packard , cofounder of Hewlett-Packard Co. | 8 | 9 | 10  | | 12 1958: IEEE Fellow Jack Kilby of Texas Instruments makes a germanium IC consisting of phase-shift oscillators. |
| 13 | 14 | 15 1888: Birth date of Alfred Norton Goldsmith , cofounder and 1928 president of the Institute of Radio Engineers (IRE). ▶ | 16 IEEE 125th anniversary celebration in Mountain View, Calif. | 17 | 18 | 19 |
| 20 1954: IBM runs the first Mathematical Formula Translating System computer program, known as Fortran . ▶ |  | 22  | | 24 | 25 25–26 September: Region 6 meeting in Seattle. ▶ |  |
| 27 | | 29 IEEE 125th anniversary celebration in Toronto. | 30 | <h1>September</h1> | | |

| | | | | | | |
|--|----|---|---|---|---|---|
| | |  | | 1 1949: Kimble Glass Co. delivers the first practical television tubes in the United States. | 2 1903: Commonwealth Edison Co., in Chicago, begins operating the first large-capacity steam turbine to generate electricity. |  |
| 4 1854: Birth date of Michael E. Pupin , inventor of the loading coil and president of the IRE and American Institute of Electrical Engineers. | 5 | | 7 ◀ IEEE 125th anniversary celebration in London. |  | 9 | 10 ▲ 10–11 October: Region 8 meeting in Lisbon. |
| <h1>October</h1> | | | 13 | 14 | 16 16–18 October: Region 7 meeting in London, Ont., Canada. |  |
| 18 | 19 | 20  | 21 1925: The first U.S.-made photocell is demonstrated by Westinghouse Electric and Manufacturing Co. in New York City. | 22 ▲ 1955: ENIAC , the first all-electronic computer, ends operation after a decade of service. | 23 IEEE 125th anniversary celebration in Tokyo. ▶ | |
| 25 | 26 | | 28 ◀ 1971: Great Britain's Prospero satellite is launched to test solar cells. | 29 | 30 | 31 |

| | | | | | | |
|---|-------------------|---|--|--|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 1923: Jacob Schick receives a patent for the first electric shaver . ▶ |  |
| 8  | | 10 |  | 12 ◀ 12–15 November: Region 9 IEEE Graduates of the Last Decade and Women in Engineering meeting in Guayaquil, Ecuador. | 13 | |
| 15 1971: Intel releases the C4004 microprocessor , the first commercial single-chip microprocessor. ▲ | | 17 17–23 November: IEEE Meeting Series in New Brunswick, N.J. | | 19 | 20 1923: Garrett A. Morgan Sr. receives a patent for a three-position traffic signal. ▶ |  |
| 22  | | 24 ◀ 1969: Apollo 12 , the second manned mission to the surface of the moon, successfully returns to Earth. | 25 | 26 | 27 | |
| 29 | <h1>November</h1> | | | | | |

Historical events provided by the IEEE History Center

IEEE events indicated in RED

We're still looking for the final frontier.

The sky is never the limit for IEEE members. From yesterday's Mercury missions, to today's satellite constellations, to tomorrow's landing on Mars, we're bringing expertise and innovation where no one has gone before.

In fact, IEEE members have been part of nearly every major technical development of the last 125 years. So when you need to draw on the most advanced technical knowledge on Earth, or anywhere else, you'll see that IEEE members aren't just waiting for the future, they're engineering it—one trek at a time.

Celebrating 125 Years of Engineering the Future

www.ieee125.org

 **IEEE**
Celebrating 125 Years
of Engineering the Future

Candidates Take On the Top Issues

BY ANNA BOGDANOWICZ

AS THE ELECTION nears, it's time to learn where the candidates for 2010 IEEE President-Elect—J. Roberto Boisson de Marca, Moshe Kam, and Joseph V. Lillie—stand on IEEE issues. At the annual Candidates Night on 18 June, at the Sheraton University City Hotel in Philadelphia, the three men answered questions posed by the audience and via e-mail. Here are excerpts from their responses, edited for brevity. To hear the debate in its entirety, visit <http://www.ieee.tv>.

If elected 2011 president, what would be your top two priorities?

DE MARCA We have to improve the volunteer experience. Volunteers are our most important assets, and we need to develop an environment in which volunteers find enjoyment in their work and can balance their expectations with IEEE business requirements. We also have to continue to work hard to develop products that all members perceive as essential to their career growth and daily lives. Our products are very much appreciated by academia, but we need to reach out to industry leaders to work with us to find ways to more effectively meet the needs of practicing engineers and managers.

KAM We need new programs for practicing members and recent graduates. Practicing engineers constitute 60 to 70 percent of membership. They tell us often that many of our publications and conferences do not help them with their job duties. There is an urgent need to provide meaningful services to this key constituency. Moreover, this effort would require a different model of publications and conferences than what we have now.

My second priority is to expand IEEE into new, emerging fields. We will not be at the forefront of science, engineering, technology, and computing if we do not make sure we are leading in new technical disciplines. There is a lot of excitement at the intersection of electrical engineering, computer engineering, computer science, biology, and life sciences. We need to make sure that IEEE is not only a participant but also a leader in these developments.

LILLIE Costs and member engagement. Costwise, we need to take a hard look at everything IEEE is doing that members and customers pay for. If we do



**J. ROBERTO
BOISSON
DE MARCA**

MEMBER GRADE

Fellow

EMPLOYMENT

Professor, Center
for Studies in Tele-
communications,
Catholic University,
Rio de Janeiro

a better job of managing what it costs to deliver these services and products, we can deliver more without having to raise fees or modify our processes. It's been many years since IEEE took an overall look at its cost structure.

We have to do a better job of creating opportunities to bring members together—to engage them face-to-face at the section level, at the regional level, and internationally—through the various technologies IEEE members develop. We have the technology that can bring people together no matter where they reside.

Is IEEE at the forefront of innovative technologies?

KAM We must be, but we are not always there. We lead in several fundamental areas, such as communications and power and energy. However, our leadership in these fields is sometimes tenuous.

For example, while IEEE is recognized as a leader in power and energy, we need to improve our presence in green energy and in environmental considerations of power delivery. We have not yet realized several great opportunities in multimedia, entertainment technology, biomedical engineering, and biomedical instrumentation. We are not focusing enough on the aspects of life sciences and health care technology that are relevant to IEEE; there is much room for growth there.

LILLIE We are doing an excellent job for the benefit of humanity and in areas such as standards. Our standards are second to none. We have standards used worldwide that users don't even know come from IEEE. However, we need to get rid of the "silos" that prevent us from getting involved in new technologies. For example, where does green technology fit in with IEEE's society makeup? It doesn't really fit in any one society. We have to figure out how to make it fit and become a leader in emerging technologies.

DE MARCA I disagree a bit. IEEE *is* in many ways at the forefront of new technologies. We have activities in every new technology, broadly speaking, but we do a poor job of packaging and creating visibility for these efforts. I chair the New Technology Directions Committee, and we are trying to work on that. Right now our focus is on the smart grid and next-generation computing, and, soon, the brain-machine interface. Each of these areas is being led by industry people, so the outside world will have a consistent and comprehensive view of the full set of IEEE publications and services available on that topic. This will also require improved coordination on these topics among societies and councils, and we are working on that as well. If these trials are successful, all the exciting technology developments happening inside IEEE will be more visible to the outside world.

What would you do to ensure IEEE weathers the economic recession?

LILLIE Things we've already done are helping to weather the current economic downturn. A few years ago, we changed the way we put together the operations budget. It used to be somewhat dependent on the stock market, but it depends now on income. That model can help us as we move forward. We also need to better understand members' needs and how we can serve them better. We don't know how many members will have to change careers because of the economy and aren't necessarily ready for a change. How can we help them? We have some successful programs, but we need more. We need to learn from our current situation and come up with ways to handle a downturn in

the future because this is not the last time it's going to happen. It happened seven years ago, and we need to help people make transitions.

DE MARCA We have a different situation now than in the last downturn in 2001. We now have a balanced budget and better control of our investments. Despite what's happening, we still have healthy reserves and are in a reasonably good financial position. Product sales are still good. Conferences are down about 20 percent in net, but I think at the end of the year we'll still be in reasonably good shape. However, I'm concerned about an attitude I sense in IEEE: Some departments seem to think they are exempt from negative impacts—that they will happen somewhere else and not to them—and that's dangerous. To successfully weather this downturn, we have to control our costs better everywhere. I don't like that staff head count is growing every year. The Board of Directors approved what I thought was a freeze on head count, but it turned out to be a frost or a chill, and the head count still kept growing! I think we have to control costs better. IEEE is a little bit like a government organization. People seem to think it operates like a family business, with lifetime employment and special exemptions. That has to stop if we are to be successful now and in the future.



MOSHE KAM

MEMBER GRADE

Fellow

EMPLOYMENT

Department head
and Robert Quinn
Professor,
Electrical and
Computer Engineering
Department,
Drexel University,
Philadelphia

KAM First, we need to have detailed contingency plans. We must not be caught unaware, surprised, and unprepared. Contingency plans will give us an opportunity to look at our priorities, ask what businesses we are willing to fund through our reserves and what activities are unnecessary or redundant—and therefore can be sacrificed. We should also take advantage of unique opportunities offered by the recession. For example, there may be opportunities to hire high-caliber indi-

viduals for our staff who would not be available under other circumstances.

Another important area is employment assistance and networking for our members. We tend to work very hard in these areas in difficult times but abandon them when circumstances get a little better. We should commit to building permanent employment assistance services and not be tempted to dismantle them quickly when the economy appears to be improving.

Has the IEEE Public Visibility Initiative been successful, and will you continue to support it?

KAM I think this new effort has been successful so far. It will be increasingly more successful if we keep working at it. Such efforts take a long time to bear fruit—you cannot expect much after only a year or two. A good example of success is our highly popular preuniversity portal, TryEngineering.org. We built it in 2006, and we keep maintaining and growing it; hundreds of thousands use it now as their primary source of information on engineering and computing education.

We must recognize that it is not enough for IEEE to “do good things.” We need to make sure that the public understands how much good we do. Every time I attend an IEEE awards ceremony, I am awed at the leaders we recognize and at what they have achieved for humanity. In the past, we have not done a very good job of advertising these achievements and letting the public know. I am glad to see that we are getting better at it.

LILLIE Whether to continue will be the decision of the Board of Directors. It has been funded for the last two years. I voted for it and will continue to support it. I think raising visibility is the right thing to do. The funds aren't in the tens of millions. They're in the million-dollar range.

Getting the word out on what IEEE is all about is very difficult. The audience is the world, but we have tremendous assets in our members worldwide and in individuals who contributed to successful technologies that people use daily. We need to get the public to understand that IEEE is a key player in all the technologies we use today. You can't wake up in the morning and operate for 15 minutes without touching something IEEE was involved with.

DE MARCA The project is still in its beginning stages. I voted for it initially, and under my leadership it will continue. In IEEE we say we have done many things, but it is not IEEE that has done those things, it is individuals—and it is so important for us to recognize our members' and volunteers' achievements. The Honors Ceremony is a start, but we need to broadcast that message to a larger audience. Last November during the [Board of Directors] meeting series, my daughter, who is a medical doctor, was talking about some medical equipment, and I said, “You know, this equipment was built with technol-



JOSEPH V. LILLIE

MEMBER GRADE

Senior Member

EMPLOYMENT

Consultant, AT&T

ogy first proposed in IEEE.” She said, “Really? Then you need to do a better job of letting people know that.” And we do need to do a better job of making the public aware of the great contributions to society that our members and volunteers have made over the years and continue to make every day.

How involved would you get IEEE in renewable/sustainable energy and green technology?

LILLIE I think we can come up with a better way to package green technology in our societies by bringing together those that represent some aspect of it. We need to package green technology in a way that people can access it. We have found several better energy sources, which, for the most part, are being developed. We just haven't yet found a way to get them to produce energy we can use on a daily basis. I think IEEE can help tremendously with that. IEEE is also the solution for a lot of the interface issues involved with bringing all those renewable resources onto the electric grid.

DE MARCA The good news is that we are involved in this topic already. The *Transactions of Sustainable Energy* journal has been approved by the Technical Activities Board Periodicals Committee and will be published next year. We now have conferences addressing this topic, including one I participated in last March in Budapest [the IEEE Wireless Communications & Networking Conference 2009].

Again, it's about packaging and creating visibility for our activities in these areas of emerging technology. And I think the way to address these is to identify champions. We need individuals—

lead technologists—who can coordinate across different societies and break down silos. We must all team up to offer an environment for our community to develop new products and services that allow IEEE to lead in these emerging fields.

KAM If we continue to address this emerging field as we are doing now—holding conferences and publishing *Transactions*—we will certainly do some good. However, this approach is hardly adequate. We have to be much bolder and work closely with industry to develop more comprehensive and practical solutions. We need an IEEE unit that would be responsible for working on renewable and sustainable energy and the smart grid across organizational units—with our technical societies as well as our local sections. We need to maintain close relations and work hand in hand with CTOs and CEOs of companies advancing this field.

What improvements should IEEE strive for in the next five years?

KAM First, I would like to reverse the trend of decreased participation of practicing engineers in our membership. We ought not to become solely a learned society of academics. IEEE is the professional home for individuals who work in all aspects of computing and engineering, not just for those who work in the most abstract and advanced

mathematics of science and engineering.

The second issue is to make sure emerging areas such as multimedia and entertainment technologies as well as advanced health care become part of IEEE's portfolio. We should address these areas in a way that engages practitioners and makes them enthusiastic about working on these areas within IEEE.

More daunting, but no less important and critical to our future, is to bring advances and relevant aspects of life sciences into IEEE. It is entirely possible that the most exciting and important advances in technology, engineering, and computing will occur in the next few decades in areas related to life sciences. IEEE must be at the forefront of these developments.

LILLIE We need to use technology to better serve the communities we operate in. We need to look at delivering products in a lot of different ways and see how we can better serve members. We still mail print copies to areas where it takes several weeks to arrive. Why are we doing this? Technology gives us a better way. I'm not saying we should give up access to print, but we can provide the electronic version immediately.

We need to look at becoming a truly global organization. We talk, take strides, and have had some success in this. Almost 70 percent of our students are outside the United States, and 50 percent of conferences are held in Regions 7, 8, 9, and 10. We need to make other parts of IEEE as global.

DE MARCA First, I'd like IEEE to continue working in emerging technologies. We have industry people leading very new and exciting areas. We should coordinate activities so they meet market timing, and we should make sure our efforts are visible. I would also like to continue reaching out to industry to encourage its involvement in defining our products and services. Last year, the Technical Activities Board had a very good advisory committee, with members from different industries, even venture capitalists, and people from different parts of the world, and that effort has helped to shape our technical activities.

We also need to better understand the needs of all members, all over the world, so we can provide better service to them. This is something I don't think we do well today. We have to continue to strive to be a model global organization. We talk a lot about it, but maybe we haven't defined yet what it means to be more global. I say, instead of people in the United States and the IEEE Board of Directors trying to define this, how about asking people outside the United States what it means for them? Do they feel properly represented? Is their work recognized and valued? Do they have the proper channels to participate? If we ask ourselves alone, we may reach the wrong conclusions. And we cannot afford to be wrong in this area. Members outside Regions 1 through 6 are the fastest-growing IEEE population. We need to become truly transnational in the future, and we need to start now to break the barriers to doing so. ■

Your Colleagues Recommend...

IEEE Member Group Insurance Program



"Every year, I shopped for home and auto insurance. Then I learned about the group discount available to IEEE members from Travelers. Even with a young driver on the policy, Travelers rates were unbeatable. Plus, Travelers applied a good student discount. My savings more than paid for my IEEE dues."

— Pankaj G.

Get the Advantage. Visit www.ieee.org/fap

Request your free, no-obligation rate quote from Travelers today!
+1 800 842 0629

 **IEEE**
Celebrating 125 Years
of Engineering the Future

Dynamic Sharing

BY ANNA BOGDANOWICZ

IN TODAY'S WEB 2.0 world, sharing is paramount. On Facebook and other social networking sites, you can post and check out others' photos, opinions, and music. And with the ever more popular Twitter, you can send mass messages about everything from the cereal you ate this morning to your politics. But what if you want to share even more—and on the go?

Picture this: You're just back from vacation with a smartphone full of photos, and you run into a friend at a local coffee shop. You want to show her your photos, but your phone's screen is just too small to really see anything. Not to worry: There's a computer monitor in the shop, so you wirelessly connect your phone to it. Just like that, your photos appear on the larger screen.

Wirelessly linking the monitor to your phone is part of the future, according to Intel Corp. And it's being made possible thanks to dynamic composable computing (DCC), a technology being developed by IEEE Fellow Roy Want and his Intel colleagues in Santa Clara, Calif.

A senior principal engineer at Intel Labs, Want described DCC at the March media event in New York City celebrating IEEE's 125th anniversary, where IEEE members working on breakthrough technologies discussed their work with the press.

BORROW A HI-FI

With DCC, you will be able to play the music stored on your laptop on your friend's stereo system, wirelessly. Or, from your laptop, you'll be able to put together a polished video of your recent vacation from the clips still in your camcorder and then show it at a friend's house on his TV—again, wirelessly.

"Basically, DCC allows you to build your own computer system on the fly," Want says. The technology lets people use their mobile Internet devices (MIDs) such as smartphones and notebook computers to connect wirelessly to nearby monitors, speakers, keyboards, and other components—even USB devices. Intel, which has a prototype, says DCC could be commercially available in about five years.

"DCC was developed to overcome the limitations of MIDs," Want says. "We wondered if we could wirelessly borrow a larger display, keyboard, or other peripheral from the nearby infrastructure."

Key to DCC technology is the composition manager, a component that will have to be built into everything or be downloadable as software. Want says DCC will work a bit like Bluetooth discovery, querying its immediate area for computers and devices to connect to. However, unlike Bluetooth, it will actually tell you what types of components are shareable on each computer. Normally, you make a wireless connection first

GOOD TIMING

Several key factors make DCC appealing, Want notes, especially in an increasingly mobile world. MIDs such as the iPhone have limitations, including small screens. These problems can be solved with DCC. "I've always been excited about smartphones' capabilities," Want says. "Our technology allows us to make better use of them."

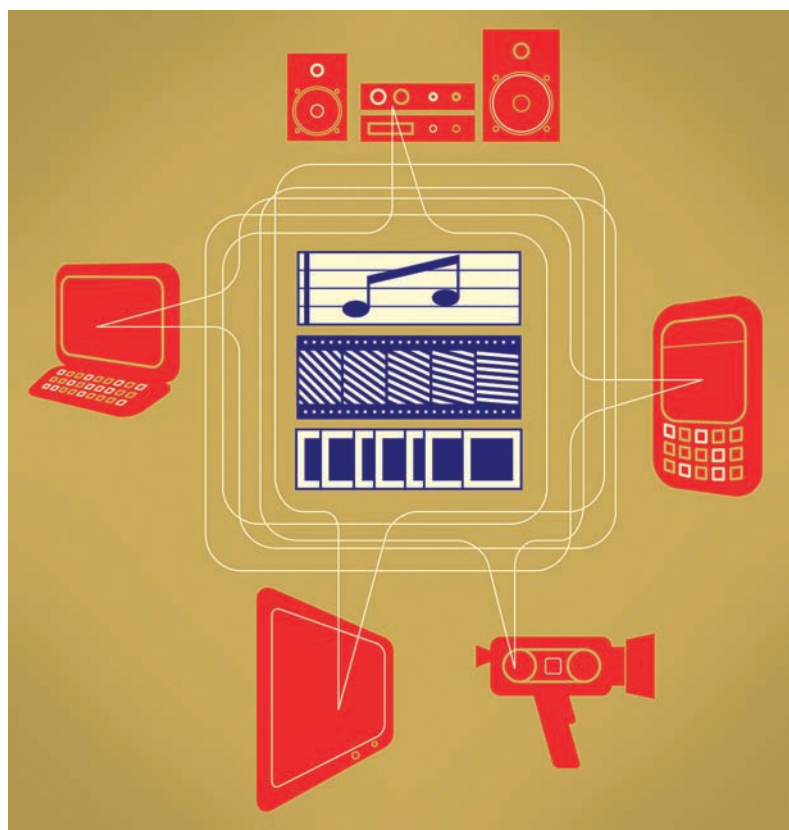
Advances in processor technology are enabling greater interoperability between mobile devices and desktop computers. Also, high-bandwidth wireless communications have improved. According to Want, the wireless standards being developed for many of today's MIDs make it easy to create the connections DCC needs to link to different components. In particular, two short-range wireless standards—ultrawideband and IEEE 802.11n—boast data rates of about 500 megabits per second, comparable to those of a wired connection. "For the first time, we can consider connecting the major system components of a computer architecture wirelessly," Want says.

CHALLENGES

Intel's developers face great obstacles. If it's so easy to connect to surrounding hardware, what's to stop a stranger from accessing your information? Want says the likely solution will be to have users type in passwords for the components they want to use. This would make the connection just as secure as the one an employee uses to connect to the company server when telecommuting.

That approach might be further improved through technologies such as near-field communications, in which a device is brought within 1 centimeter of another to initially make the connection, using physical proximity to enforce the right to connect.

But the number-one challenge, as with most new technology, is adoption. For companies to build their devices with DCC, wireless standards must be developed. "Work on standards for layer-2 discovery is already taking place, and so is work around wireless display," Want says. Once standards are in place, it will be time to win over consumers. For that, Want goes by the saying, "If you build it, they will come. People will realize that a device that can share is much more valuable than one that can't." ■



and then discover services on that computer using universal plug and play. The composition manager compresses several of these steps. It scans for devices—similar to the way your computer looks for Wi-Fi—as well as shareable resources.

At one level, the composition manager presents the resources to a user with a join-the-dots metaphor. In other words, you can share a resource simply by drawing a line to the device you wish to share. "At a higher level, you can save a set of these connections as a composition name, and in the future, to save time, just select that name from a pull-down menu," Want explains. "To keep it simple, default configurations of several common compositions might be preconfigured in a device at the time of purchase."



THIS MONTH'S QUESTION:

A Patent "Strike" for Engineers

A recent editorial on *EE Times's* UK Web site called for engineers to band together and stage a patent "strike" to gain control of their inventions. The editorial says engineers should refuse to sign employment contracts giving their employers sole rights to their inventions. Engineers should also refuse to file patent applications for every idea, a practice that companies have used to spawn "a business of litigation and licensing that charges for portfolios by the pound." Although engineers shouldn't stop working during a recession, the editorial adds that it's about time engineers stood up for themselves.

Do you agree? Would you take part in such a patent strike?

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 December issue of The Institute and may be edited for space. Suggestions for questions are welcome.

MAIL: The Institute, IEEE Operations Center, 445 Hoes Lane, Piscataway, NJ 08854-4141 USA **FAX:** +1 732 562 1746 **E-MAIL:** institute@ieee.org

RESPONSES TO JUNE'S QUESTION

Are You Secure in Your Job?

In recent months, news outlets have reported that HP, IBM, Microsoft, Nokia, Panasonic, and other high-tech companies have laid off thousands of employees. But some observers call those reports exaggerated. One tech news publication wrote that layoff figures are deceptive because most refer to the elimination of already vacant positions or ones that are new and

as yet unfilled. What's more, some engineers are in demand, such as those needed for smart power grids, alternative energy, and new-technology projects.

Just how secure do you feel in your job?

It's in the Numbers

I was part of a 10 percent layoff of U.S. employees at IBM. Part of my package included a 62-page list of employees laid off, by title and age. It was a really deep layoff.

BILL MASEK
Bedford, Mass.

Don't Be Too Sure

If you think your job is secure, you need to rethink your position. If you work for a publicly owned company, your job is not secure—period.

I worked for Analogic for more than 20 years and was directly involved in the design of every major product the company produced. All my designs work well and continue to provide substantial income for the company. I solved technical problems for the company's foreign subsidiaries, have had my inventions assigned to the company, and always got good reviews and bonuses. But on 28 January 2009, at 10:50 a.m., my supervisor walked into my office and handed me a blue file folder containing my termination information. I was escorted out of the building as if I were a part-time janitor.

Public ownership means that bankers, insurance company executives, and people playing the stock market as if they were in a casino are in charge of the company and your career. There will never again be security unless these conditions change.

RICHARD B. JOHNSON
Groveland, Mass.

A Bleak Future

Unless you own a company and maybe a few congressmen, your job isn't secure—and it never will be. No engineer has ever had a secure job. Since the late 1950s, engineers have been treated as disposable resources. While employers claim shortages of engineers, they import greater numbers of foreign, less-expensive H-1B visa holders and fire older U.S. workers. It's been 60 years of the same thing, with nothing new in sight. The government wants businesses to use cheaper labor, but who makes wealth for the country—engineers or Wall Street crooks? You do the math.

If any job is secure at all, it's one with the government. Government workers are the new middle class. Everyone else is headed for poverty, part-time work, underemployment, or no job at all. The dirty little truth is that the population is expanding at a fast pace while jobs are disappearing. The future is bleak, especially for older engineers. Younger ones will last maybe 40 years before discovering the old-timers were right all along.

WILLIAM ADAMS
Springfield, Va.

A Word of Advice

I am fortunate because I work for a company that tries to avoid layoffs. I am also fortunate because I switched from electronics to electrical power engineering 37 years ago. I worked for electric utilities for six years, and I have been a staff electrical engineer for Hallmark Cards for more than 30 years. Despite its best efforts, Hallmark had layoffs this year. I was fortunate to survive, and I plan to retire in three years.

For younger electrical engineers, here's my advice: Don't give up on electrical engineering as a profession. It can be very rewarding. But if you want job security, steer clear of electronics and specialize in electrical power engineering. While the technical challenges are not as great, much of the work is very interesting, and the pay is just as good as—if not better than—in electronics.

More important, the job market for power engineers promises to be excellent for decades to come, and most of the work cannot be outsourced to a foreign country. You can also enhance your job security if you get your professional engineering license as soon as you have enough experience to take the exam.

JAMES M. COOK
Olathe, Kan.

Power Prerequisite

Realistically speaking, I don't feel very secure at all. Some people like to cherry-pick different aspects, such as an increased need for engineers to design smart power grids. But the truth is that the application-specific IC designer laid off by Intel is not well suited to design the power grid. Not to mention that he probably isn't a power engineer, which is usually a prerequisite for working in the energy field. So he's still out of work.

Worse, the world economy continues to tank, and no amount of glad-speak is going to reignite it any time soon. When people have to choose between buying their next meal or buying the next great electronic gadget, guess which one they buy?

What this economy needs is cheap and abundant energy—and I'm not talking about the piddling amounts that come from so-called alternative energy sources.

DONALD McCALLUM
Greenwood, Calif.

Editor Kathy Kowalenko
Assistant Editor Anna Bogdanowicz
Editorial Consultant Alfred Rosenblatt
Copy Editors Joseph N. Levine
 Michele Kogon
 Mark Yawdoszyn
 Peter Borten
Editorial Intern Cassie Bobotas
Senior Art Director Mark Montgomery
Art Director Brandon Palacio
Photo Editor Randi Silberman Klett
Graphic Designer Bonnie Nani
Director of Periodical Production Services
 Peter Tuohy
Editorial & Web Production Manager
 Roy Carubia
Web Production Coordinator
 Jacqueline L. Parker
Multimedia Production Specialist
 Michael Spector
Editorial Offices
 IEEE Operations Center
 445 Hoes Lane, Piscataway, NJ
 08854-4141 USA
Telephone: +1 732 562 6825
Fax: +1 732 562 1746
E-mail: institute@ieee.org
Web: <http://www.ieee.org/theinstitute>

Editorial Advisory Board
 Ziauddin Ahmed, James Anderson,
 Anthony Durniak (IEEE Staff Executive,
 Publications), Abhi Gupta,
 Brian Harrington, Susan Hassler
 (Editor in Chief, *IEEE Spectrum*),
 Eric Holdrinet, Phillip Laplante,
 Nita Patel, Sandra Robinson,
 Jon Rokne (Vice President, IEEE
 Publication Services & Products),
 and Karl Varian

IEEE MEDIA

Publisher James A. Vick
Associate Publisher
Sales & Advertising Director
 Marion Delaney
Business Manager Robert T. Ross
Marketing & Promotion Manager
 Blanche McGurr
Advertising Sales +1 212 419 7760
Advertising Production Manager
 Felicia Spagnoli
Advertising Production
 +1 732 562 6334

THE INSTITUTE (ISSN 1050-1797) is published quarterly by The Institute of Electrical and Electronics Engineers Inc., 3 Park Ave., 17th Floor, New York, NY 10016-5997; tel. +1 212 419 7900. Periodicals postage paid at New York, NY, and at additional mailing offices. Canadian GST# 125634188. Annual subscription rate: US \$26.00. The editorial policies for IEEE's major publications are determined by the IEEE Board of Directors. Unless otherwise specified, IEEE neither endorses nor sanctions any positions or actions espoused in THE INSTITUTE. Major IEEE boards review items within their purview prior to publication. When published in THE INSTITUTE, individual viewpoints of elected IEEE officers are labeled as such. They are reviewed by the individuals to whom they are attributed, unless they are a matter of record. The editorial staff is responsible for selection of subject matter and its placement within the issue. Copyright © 2009 by The Institute of Electrical and Electronics Engineers Inc. THE INSTITUTE is a registered trademark owned by The Institute of Electrical and Electronics Engineers Inc. POSTMASTER: Send address changes to THE INSTITUTE, IEEE Operations Center, Coding Department, Box 1331, Piscataway, NJ 08854-4141, USA.



IEEE Is Also a Business

IEEE'S REVENUES last year topped US \$340 million. So, in addition to being a not-for-profit membership organization, the publisher of journals and standards, and the organizer of conferences, IEEE is also a large business.

As are all other not-for-profits, IEEE is a business even though it exists solely to provide scientific and educational programs, and services of benefit to the public. And like for-profits, it has revenues, expenses, and budgets designed to result in a profit at the end of the year.

The difference between a for-profit and not-for-profit organization is not in the ability to make a profit but in how the surplus revenue is used. In a tax-exempt not-for-profit organization like ours, profits, by law, may not be used to benefit private individuals. The profits must be reinvested in the organization to further its mission or be added to reserves. Our financial statement can be found in the *IEEE Annual Report* at <http://www.ieee.org>, under About Us.

What are the sources of IEEE's revenues? Basic membership dues bring in only 9 percent of the total; conference events and proceedings, 38 percent; periodicals, 36 percent; society dues and assessments, 5 percent; standards, 7 percent; and investments and other sources, 5 percent. All told, IEEE depends on conferences and publications for three-quarters of its revenues. Both face serious competition. For the future health of IEEE, we must diversify our revenue sources. But that is a topic for another column.

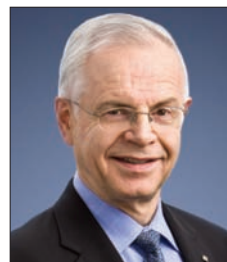
What are the costs of operating IEEE? The annual report shows that our many programs account for 97 percent of our expenses. That includes costs associated with serving members, publishing *IEEE Spectrum* and other periodicals (including maintaining the IEEE digital library platform, IEEE Xplore), organizing conferences, producing standards, and conducting educational activities. The remaining expenses are the general and administrative costs to keep IEEE up and running every day.

We do try to make a profit. Except for a few that have large endowments, not-for-profit organizations couldn't survive long without producing a

profit. And like families saving for a "rainy day," we save some of our profits for IEEE's long-term protection and preservation. For example, reserves may be used to cover deficits that could result from a pandemic or a severe economic recession such as the one we have been experiencing this year. Either situation could drastically reduce conference attendance, for example. The reserves also can be used to fund strategic programs such as large-scale improvements to our IT infrastructure and major upgrades to

The winner of the 2009 competition, a team from Stanford University, was one of 200 entries. The Stanford team designed a handheld device to test bodily proteins for diagnosing illnesses. The tool promises to be especially useful in home diagnostic kits and in remote areas of developing countries.

Another entry was the energy kiosk from a UK team. It is a solar-powered charging station that offers a source of electricity in remote areas. Batteries charged at the kiosk can be



Except for a few that have large endowments, not-for-profit organizations couldn't survive long without producing a profit

IEEE Xplore, and to help us weather the economic impact of a legal judgment against us.

What is the "right" level of reserves? That's decided by the Board of Directors based on a data-driven risk assessment of IEEE operations. The proper level of reserves for this year has been determined to be between \$178 million and \$254 million. Reserves are now \$159 million, below the target due to the faltering investment markets of 2008–2009.

Revenues, expenses, and profits are basic metrics for any business. But for IEEE, our success also is measured by how well we adhere to our core values (http://www.ieee.org/web/aboutus/strategy/envisioned_future.html). The most important of the values is service to humanity—which has been imbued in IEEE since the inception 125 years ago of the American Institute of Electrical Engineers, one of IEEE's predecessor societies. That's why in this 125th anniversary year, I initiated the IEEE Presidents' Change the World Competition (<http://www.ieee125.org/change-the-world>) to recognize students who develop unique solutions to humanitarian or community problems.

used at home for such things as lighting, phones, and powering a radio.

The Agrobot entry from India is a solar-powered robot that can sow crops, spray fields, weed, and control pests—agricultural jobs normally done by several costly machines or with less efficient manual labor.

Each day, IEEE members help create prosperity in business, industry, government, and education. Our efforts are supported by the profits produced by IEEE publications, standards, conferences, continuing education, and other activities. We are strong in every measure, and we shall continue to be the world's leading professional association for the advancement of technology. But for IEEE to truly achieve its vision, IEEE needs you, its members, to apply your skills and education to provide solutions to the most pressing humanitarian challenges. There is no higher calling.

John R. Vig
 IEEE President and CEO



Boost Your Skills and Get Certified

BY KATHY KOWALENKO

IN THESE DIFFICULT times, when competition for jobs is fierce and hanging on to the job you have is getting even tougher, holding certifications may provide the edge you need. Technologies change rapidly, yet many companies expect their employees to keep on top of the latest concepts and demand that new hires prove they are up to speed. Gaining certification in a particular area is one way you can demonstrate your skill, and IEEE can help. It offers three certification programs in two important areas: software development and wireless communications.

The IEEE Computer Society offers certifications for associate-level and professional-level software developers: Certified Software Development Associate (CSDA) and Certified Software Development Professional (CSDP).

The third program, offered by the IEEE Communications Society, leads to certification as a Wireless Communications Professional.

"I feel managers should develop adaptable technical professionals, not narrowly defined specialists whose specialty might become obsolete," says Susan Land, 2009 president of the IEEE Computer Society. "Certifications help members stay current."

VOTES OF CONFIDENCE

Three organizations recently adopted the Computer Society's certification programs. Two groups in India, Siemens Information Systems Ltd., in Bangalore, and the Vellore Institute of Technology, in Tamil Nadu, are using the certifications to raise software development standards in their organizations. And in the United States, Rose-Hulman

Institute of Technology, in Terre Haute, Ind., hopes to help engineering students bridge the gap between the academic curriculum and industry requirements.

"We selected the CSDA and CSDP as the benchmarks for software certification to raise the level of competence in our organization," says Raghu Nambiar, Siemens Information Systems' general manager for software practices and technical competences.

Here's an overview of the IEEE programs, which are geared to either a seasoned professional or to those taking their first steps toward a career in software or wireless.

SOFTWARE SKILLS

The CSDA and CSDP certifications are based on the knowledge areas contained in *The Guide to Software Engineering Body of Knowledge* [IEEE Computer Society, 2004]. The guide summarizes the knowledge needed for certification, with references to more detailed explanations of 10 individual topics, including software engineering principles in areas such as software construction, design, testing, requirements, and methods. It also describes disciplines related to software engineering, such as mathematics, quality management, and systems engineering.

The CSDA certification is targeted at students in their final year of study for a bachelor's or equivalent degree in a computing-related field and entry-level software developers with two years or less of experience. The CSDA tests for knowledge of established software development practices and is the first step toward becoming a CSDP. The CSDP certification is meant for midcareer software professionals and covers topics that demonstrate the mastery of a body of knowledge and skills necessary to perform the job of software engineering.

IEEE senior members and licensed software engineers are automatically eligible to take the CSDP examination. Educational requirements include having a bachelor's degree or CSDA credentials or being an educator. Having an advanced degree in software engineering and at least two years (about 3500 hours) of experience in software engineering or development or hav-

ing at least four years (about 7000 hours) of experience in software engineering or development is also required. Both programs comply with ISO/IEC 24773:2008, Software Engineering—Certification of Software Engineering Professionals—Comparison Framework. The standard provides guidelines to ensure that software engineering certifications are portable, or recognized, from one geographic region to another.

WIRELESS TECHNOLOGIES

The IEEE Communications Society Wireless Communication Engineering Technologies (WCET) certification program is aimed at engineers who already hold a bachelor's degree and have at least three years of experience in the workplace.

Areas the WCET exam covers include radio-frequency engineering, propagation, and antennas; network and service architecture; security; licensing agreements; industry standards; and government regulations. The society has developed a handbook to help candidates understand eligibility requirements, as well as how to apply for the exam and what to study for. In addition, *A Guide to the Wireless Engineering Body of Knowledge* [Wiley, 2009] provides insight into commonly accepted best practices and references for WCET study.

IEEE Member Jeff Smith, who earned his WCET credentials in 2008, is a consulting systems engineer with Cisco Systems, in Englewood, Colo. He works with the sales force to build wireless systems, as well as to field questions that run the gamut from security issues to interference from cell towers.

"I deal with a lot of people who don't know me, so having this certification says that I'm a recognized expert in my field and that I have a wide variety of wireless engineering knowledge," he says. "Because the WCET certification focuses on such a wide area, it helps me with my job." ■

To learn more about the WCET certification, visit <http://www.ieee-wcet.org>. For more about the software certifications, visit <http://www.computer.org/getcertified>.



International Test Conference Austin, Texas; 3–5 November

Celebrating its 40th anniversary, the conference focuses on the electronic test and design-for-test of devices, boards, and systems.

Topics include board and system testing, defect-based testing, innovative industrial testing practices, and testing and design for manufacturability. Cooperative efforts on the part of academic groups, design tool and equipment suppliers, and test engineers to solve challenges facing the industry will be discussed. So will volume diagnosis, yield-learning adaptive testing, high-speed digital testing, and online testing.

SPONSORS: IEEE Computer Society and IEEE Philadelphia Section
VISIT: <http://www.itctestweek.org>



35th Annual Conference of the IEEE Industrial Electronics Society Porto, Portugal 3–5 November

Held in conjunction with the annual IEEE International Conference on E-Learning in Industrial Electronics, IECON-2009 focuses on applications for electronics, instrumentation, control, computational intelligence, and industrial and manufacturing systems and processes. Topics include power electronics, drives, sensors, actuators, signal processing, motion control, robotics, mechatronics, building automation, and informatics. Emerging

technologies and applications such as renewable energy and the reuse of electronics will also be discussed.

SPONSORS: IEEE Industrial Electronics Society, the Society of Instrument and Control Engineers, University of Minho, and Faculty of Engineering of the University of Porto
VISIT: <http://paginas.fe.up.pt/~iecon09>

International Microwave and Optoelectronics Conference Belém, Brazil 3–6 November

The theme of this year's conference is "Towards the Future."



Topics include microstrip and printed antennas, reflector antennas and feeds, antenna measurements, power amplifiers, ICs, mobile and indoor propagation, and nonlinear optics. Radio and radar meteorology, military applications, sensor systems, electromagnetic wave theories, and numerical methods are also in the program.

SPONSORS: IEEE Microwave Theory and Techniques Society, Brazilian Microwave and Optoelectronics Society, Universidade Federal do Pará
VISIT: <http://www.prodepa.gov.br/imoc2009>

IEEE International Workshop on Computational Advances in Multi-Sensor Adaptive Processing Palm Beach, Aruba 13–16 December

This workshop brings together researchers from such areas as array signal processing, opti-



mization, sensor networks, and communication systems. Topics include convex optimization algorithms, relaxation methods, and computational linear algebra. Other topics include sampling methods, distributed computing, estimation, detection algorithms, and emerging techniques.

SPONSOR: IEEE Signal Processing Society
VISIT: <http://www.conference.iet.unipi.it/camsap09>

IEEE Radio and Wireless Symposium New Orleans 10–14 January

The symposium is part of Radio Wireless Week 2010, which also includes the 10th Topical Meeting on Silicon Monolithic Integrated Circuits in RF Systems. It focuses on various aspects of wireless communication systems

in the radio and wireless fields by exploring the relation between hardware design and system performance. Topics include 3G and 4G wireless communication services, satellite network sys-



tems, power-line communication technologies, microwave energy transmission, heterogeneous mobile networks, mobile network convergence, multicasting, and broadcasting. There are also three tracks of two-day sessions highlighting RF power amplifiers, biomedical applications of microwave systems, and sensors and sensor networks.

SPONSORS: IEEE Antennas and Propagation Society, Communications Society, Microwave Theory and Techniques Society, and Vehicular Technology Society
VISIT: <http://www.rawcon.org>

Joint Magnetism and Magnetic Materials- Intermag Conference Washington, D.C. 18–22 January

The focus is on recent developments in fundamental and applied magnetism. Topics



include experimental and theoretical research, the properties and synthesis of new magnetic materials, and advances in magnetism technology. The proceedings will be published in *IEEE Transactions on Magnetism* and the *Journal of Applied Physics*.

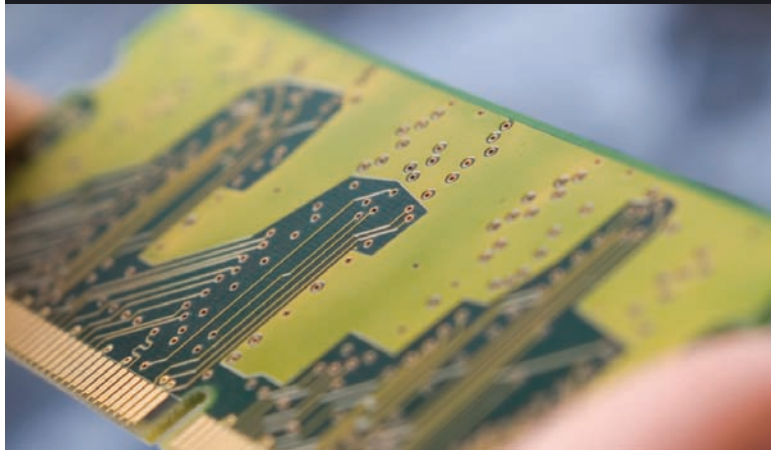
SPONSORS: IEEE Magnetism Society and the American Institute of Physics
VISIT: <http://www.magnetism.org>

Up-to-date, Relevant Information

- Driving the Bottom Line
Fueling Imagination

“Saving time in any way you can is critical. Access to IEEE articles and papers is key in this regard.”

– Jon Candelaria, Project Manager, Motorola



From Imagination to Market

Access the cutting-edge IEEE journals and conference proceedings shaping industry today.

- Periodicals and conference proceedings that define the future of innovation
- Over 2 million documents in the IEEE Xplore® digital library
- Top cited journals in the field

Free Trial!

Experience IEEE information—request a trial for your company.

www.ieee.org/innovate

IEEE Information Driving Innovation



STANDARDS

Spotlight on Products

IEEE Std. 1662-2009, released April 2009

The IEEE Guide for the Design and Application of Power Electronics in Electrical Power Systems on Ships summarizes electrical engineering practices for applying power electronics in shipboard power systems. It describes analytical methods, parameters, and performance characteristics for reliable integrated marine electrical power.

IEEE Std. 802.15.5-2009, released May 2009

The IEEE Recommended Practice for IT-Telecommunications and Information Exchange Between Systems-LAN/MAN-Specific Requirements-Part 15.5: Mesh Topology Capability in Wireless Personal Area Networks (WPANs) is a recommended practice for implementing the architectural framework that enables WPAN devices to promote interoperable, stable, and scalable wireless mesh topologies. The new document also includes an amendment to current WPAN standards that's required to implement the practice applied to wireless mesh topologies optimized for IEEE 802.15 WPANs.

IEEE Std. 11073-10417-2008, released May 2009

The Health Informatics-Personal Health Device Communication-

Part 10417: Device Specialization-Glucose Meter standard defines the communication between personal glucose meters and compute “engines”—such as cell-phones, personal computers, and personal health appliances—so as to enable plug-and-play interoperability. The standard specifies term codes, formats, and behaviors in telehealth environments and defines a common core of communication functionality for personal glucose meters.

IEEE Std. 802.16-2009, released June 2009

The IEEE Standard for Local and Metropolitan Area Networks, Part 16: Air Interface for Fixed and Mobile Broadband Wireless Access Systems specifies the air interface, including the medium access control layer and physical layer, of combined fixed and mobile point-to-multipoint broadband wireless-access systems that provide multiple services. The standard, a revision of IEEE Std. 802.16-2004, aims to enable rapid worldwide deployment of innovative, cost-effective, and interoperable multivendor broadband wireless-access products.

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

CONTINUING EDUCATION

IEEE “Expert Now” Courses

A series of three IEEE Expert Now courses on clustering is being presented by IEEE Fellow James C. Bezdek, past president of the IEEE Computational Intelligence Society. The courses are aimed at those interested in research on or the application of clustering to real-world problems such as data mining, image analysis, and bioinformatics.

A Primer on Cluster Analysis: I. Models and Algorithms

The first course in the series provides a foundation for understanding the field.

A Primer on Clustering: II. Tendency Assessment and Cluster Validity

The second course discusses approaches to preclustering tendency assessment and post-clustering validation and reviews papers on the subject.

A Primer on Clustering: III. Fuzzy Cluster Analysis in Very Large Scale Data Sets

The final course explores one important approach to the challenge of clustering in very large data: progressing sampling followed by extension.

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

www.ieee.org/theinstitute

IEEE Quick Guide

THE IEEE CONTACT CENTER

Visit <http://www.ieee.org/contactcenter> for assistance with membership and nonmembership products and services and help with publication delivery.

For e-mail inquiries, the Contact Center is open from 4:30 p.m. ET (20:30 GMT) Sunday to 4:30 p.m. Friday.

To speak to a Contact Center representative, call:

Tel: +1 800 678 4333 (U.S. and Canada)
Tel: +1 732 981 0060 (worldwide)
Fax: +1 732 562 6380

Business hours: 8 a.m. to 5 p.m. ET (12:00 to 21:00 GMT), Monday through Friday

To renew membership:

<http://www.ieee.org/contactcenter>

To update your profile:

http://www.ieee.org/web/membership/join/update_profile.html

CONTACT POINTS

IEEE Operations Center

445 Hoes Lane
Piscataway, NJ 08854-4141 USA
Tel: +1 732 981 0060

IEEE Corporate Office (New York)

Tel: +1 212 419 7900

IEEE—USA (Washington, D.C.)

Tel: +1 202 785 0017
Fax: +1 202 785 0835
E-mail: ieeusa@ieee.org

Ask*IEEE Document Delivery

Tel: +1 800 949 4333
Fax: +1 303 758 1138
E-mail: askieee@ieee.org

Conference Information

Tel: +1 732 562 3878
Fax: +1 732 981 1769

Elevation Forms

- Associate to Member:
<http://www.ieee.org/organizations/rab/md/memelv.htm>
- Member to Senior Member:
<http://www.ieee.org/organizations/rab/md/smforms.htm>

IEEE Financial Advantage Program

Tel: +1 800 438 4333
Fax: +1 732 981 0538
E-mail: fap-benefits@ieee.org

Ombudsman

Tel: +1 800 678 4333
E-mail: ombudsman@ieee.org

Section and Chapter Information

Tel: +1 732 562 5511
Fax: +1 732 463 9359
E-mail: sec-chap-support@ieee.org

Student Activities Information

Tel: +1 732 562 5527
Fax: +1 732 463 3657
E-mail: student-services@ieee.org

Technical Societies Information

Tel: +1 732 562 3900
E-mail: society-info@ieee.org



FEATURED AUTHORS

Taking on Risk Communication

A critical part of any engineering job is to make sure the technologies being applied are safe for the public and won't harm the environment.

To do that, an engineer must know not only how to identify safety risks but also how to explain them to others. That's where Regina Lundgren (left) and Andrea McMakin come in. Their book *Risk Communication: A Handbook for Communicating Environmental, Safety, and Health Risks*, now in its fourth edition, deals with how to communicate risks to your managers and the public. The book covers topics such as laws that mandate risk communication and how to develop a communication plan to address public perceptions and opinions.

"Risk communication has never been more important," says Lundgren, a consultant and trainer in the field. "It seems no matter how much we safeguard our workplaces, homes, and personal lives, new risks continually crop up."

McMakin is a communication specialist at the U.S. Department of Energy's Pacific Northwest National Laboratory, in Richland, Wash. The two wrote the book in response to requests from engineers, scientists, and managers asking for a text that explains the science and practice of risk communication.

Other books on the subject focus either on one particular scientific aspect or on one person's experience, according to Lundgren. "Ours does both: provides scientific underpinnings to the discipline of risk communication and shares specific, practical advice from our own experience working in the field," she says.

—Anna Bogdanowicz

Here's a selection of newly published books from Wiley-IEEE Press. You can save 15 percent by using promo code INST9 when ordering from <http://www.wiley.com/IEEE>.

Risk Communication: A Handbook for Communicating Environmental, Safety, and Health Risks, 4th Ed.

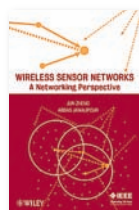
By Regina Lundgren and Andrea McMakin (July 2009, US \$79.95, 384 pp.)



Updated edition discusses risk communication principles, planning, actions, and evaluation; expands coverage of the Internet and social media; and offers new insight on international risk communication.

Wireless Sensor Networks: A Networking Perspective

By Jun Zheng and Abbas Jamalipour (July 2009, \$94.95, 512 pp.)



Networking aspects of wireless sensors take center stage, with sections on network architecture, routing and data dissemination, node clustering, time synchronization, node localization, and fault tolerance.

Parallel Solution of Integral Equation-Based EM Problems in the Frequency Domain

By Yu Zhang and Tapan K. Sarkar (June 2009, \$99.95, 364 pp.)



Focusing on the method-of-moments technique, the authors explore efficient parallel electromagnetic simulation techniques for multicore chips. Appendices provide details on a number of computer platforms used for computation. One demo shows how to compile scalable linear algebra package (LAPACK) and parallel LAPACK on Windows, and another demo

shows how parallel source code can solve two-dimensional electromagnetic scattering problems.

A Guide to the Wireless Engineering Body of Knowledge

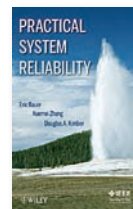
By the IEEE Communications Society (April 2009, \$69.95, 253 pp.)



Meant for those preparing to take IEEE's Wireless Communication Engineering Technologies certification exam (see p. 12), this guide summarizes the knowledge required to pass and provides references to detailed information. It was written by industry professionals and deals with the eight WCET certification areas.

Practical System Reliability

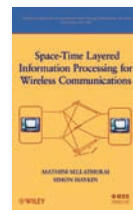
By Eric Bauer, Xuemei Zhang, and Douglas A. Kimber (April 2009, \$79.95, 287 pp.)



Explains how system availability and software reliability relate to telecommunications systems and how to understand, model, predict, and manage system availability through the development cycle. Practical methods and concepts are presented. The modeling, prediction techniques, and tools follow industry standards.

Space-Time Layered Information Processing for Wireless Communications

By Mathini Sellathurai and Simon Haykin (April 2009, \$95.95, 204 pp.)



This textbook presents current research in space-time communications, with an emphasis on multiple-input, multiple-output wireless systems. Examples illustrate theory, and end-of-chapter problems challenge readers to reinforce their understanding of the subject.

PROFILE

Katie Hall

Unplugging the World

Hall wants you to cut the cord—charging is going wireless

BY SUSAN KARLIN

FOR IEEE Senior Member Katie Hall, the future means never having to say, “My battery is dying.” Recently, the chief technology officer of WiTricity, in Watertown, Mass., spoke at the media event celebrating IEEE’s 125th anniversary in New York City. She envisions a world in which mobile phones, laptops, and even electric vehicles—just about anything battery-operated—could be recharged without ever changing batteries or being plugged into an electric socket. WiTricity was founded two years ago to commercialize a technology for wireless energy transfer developed at Hall’s alma mater, MIT. The technique relies on resonant magnetic coupling to power electronic devices over distances from several centimeters to a few meters.

A high-frequency coupling field is set up by a WiTricity device plugged into an ac outlet, a USB port, or a car’s power outlet. This magnetic field is picked up by a receiver—basically a coil tuned to the very same frequency as the power source. That receiver converts the magnetic field into a current and stores it in a rechargeable battery or uses it to power the equipment, such as a laptop, directly.

The magnetic field does no harm to people or animals, says Hall, and can be used safely in a variety of applications. Several can be powered from a single source, with the capture coils built into the devices’ hardware or available as an accessory. Further out, Hall envisions charging ports installed around a city so that devices can charge automatically whenever a source is within range.

WiTricity’s goal is to make such wireless electricity as commonplace as batteries and extension cords. With experience as both an entrepreneur and engineer, Hall scouts out potential commercial applications for such technology.

WAKE-UP CALL

MIT assistant professor of physics Marin Soljacic was inspired to invent WiTricity’s cordless, self-charging technology when his cellphone, which beeped on low power, kept waking him in the middle of the night. He and his team focused on new magnetic resonance techniques because the wireless technology used to transmit data is too inefficient for transmitting enough energy to power

or charge anything. The power tends to radiate in all directions, with most of it wasted.

WiTricity is now in the process of building prototypes. It has garnered interest from leading manufacturers of mobile and consumer electronics, medical device manufacturers, and military contractors.

“The explosion of mobile devices over the last few years has really driven the need for this kind of technology,” says Hall, adding that she expects it to reach the marketplace in the next year or two.

SWITCHING SCIENCES

Hall wasn’t always set on a career in technology. As an undergraduate at Wellesley College in Massachusetts, she was interested in a totally different type of science—political science. It wasn’t until she took a physics course that she changed her major. “I like to figure out how things work, especially something that doesn’t seem possible,” she says.

Graduating with a bachelor’s degree in physics in 1984, Hall spent three years at AT&T Bell Laboratories, in Holmdel, N.J., in the lightwave systems research department, where she worked on optical transmission research. “It was an incredible place to work,” she says. “There were people from many different disciplines, and they were so smart that you could walk down the hallway to find the right expert to answer any question. Innovative ideas were supported, and I couldn’t wait to get up in the morning. It was there that I really decided to make science my life’s work.”

In 1987, Hall returned to the Boston area, this time to MIT, for her master’s and Ph.D. in electrical engineering, which she earned in 1990 and 1993. Hall joined IEEE and went on to serve on the Board of Governors of the IEEE Lasers and Electro-Optics Society (now the IEEE Photonics Society) and as associate editor of *Photonics Technology Letters*. She



Katie Hall in WiTricity’s lab.

holds 11 U.S. patents and has published more than 100 journal articles and conference papers.

Hall next spent six years at MIT Lincoln Laboratory, in Lexington, Mass., researching optical communications and high-speed optical switching, eventually becoming assistant leader of the Optical Networks Group. In 1999 she launched the first of two Massachusetts-based start-ups, PhotonEx Corp. (now located in Maynard), which built cutting-edge optical transport equipment. In 2003 she helped set up Wide Net Technologies, in Acton, which develops optical communications and sensing systems by applying quantum cryptography and photonic crystal sensors. She joined WiTricity in 2007.

In the end, it was engineering that enabled her to accomplish what first attracted her to political science. “I’m most excited about the opportunity to impact people’s lives for the better,” she says. “Engineering is a kind of trail blazing—doing things that haven’t been done before. It’s a fertile atmosphere for coming up with ideas, implementing them, and changing the way people think and do things.” ■

Save money on the services you need most. Now more than ever.

If you're like most IEEE members in the U.S. and Canada, you already know many of the exclusive benefits of the IEEE Financial Advantage Program. It's how smart members save year after year when they buy insurance. Now the program offers new discounts on computers, office equipment, moving services and more.

Look at these NEW members-only benefits

Discounts on FedEx® shipping!

IEEE members can now save up to 26% on select FedEx® shipping services for any size shipment originating in the U.S.

Discounts on Dell computers!

With Dell's Employee Purchase Program, Canadian and U.S. members can save on Dell products.

Auto and home insurance for Canadian residents!

Get the essential coverage you need at attractive "members only" rates, direct from The Personal Insurance Company, one of the largest, most respected group insurers in Canada.

More moving and relocation services!

Exclusively for IEEE members, you get a one-stop resource for everything you need to move your home—faster, easier and more affordably than ever before.

So why wait? There's no better time than right now to check out all the IEEE Financial Advantage Program has to offer—at the savings you want, now more than ever.

Get the Advantage

Visit www.ieee.org/fap • Call +1 800 438 4333



Starting a Student Branch: Easier Than You Think

BY ANNA BOGDANOWICZ

THERE'S MORE TO belonging to an IEEE student branch than getting a membership card. Much more. You get to meet other members who share your technical interests, network with professionals, participate in conferences and competitions, and enjoy social events.

No student branch at your school? Not to worry. IEEE has made it easier to start one of your own. You now need only 12 student members to form a student branch, not the 20 previously required.

Here's what to do once you've rounded up your dozen:

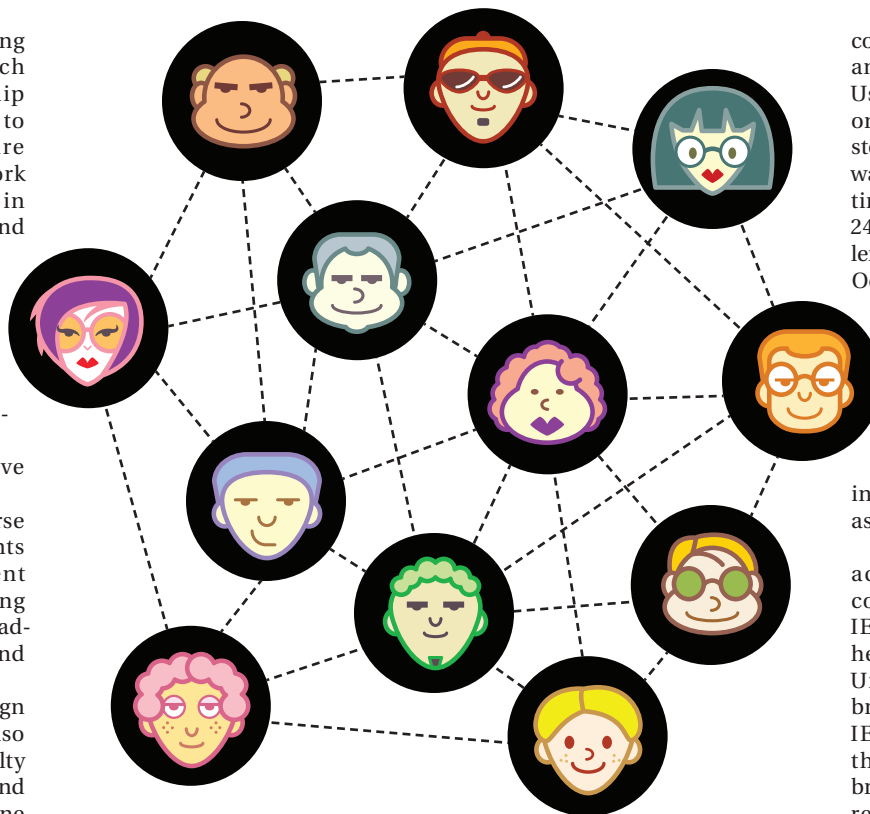
1 Visit the IEEE Student Concourse at <http://www.ieee.org/students> and click on the IEEE Student Branch Resources and Reporting link. That brings you to a downloadable packet of forms to fill out and return to IEEE.

2 Each of your members must sign the branch petition form. You also need the signatures of three faculty members who are IEEE members and teach in IEEE's fields of interest. One must be your department head, and another must be willing to serve as your branch counselor.

3 Choose one of your fellow students as your interim chair. You can choose a permanent chair once IEEE approves your application.

4 Fill out the form that asks about your university's educational programs. Be sure to specify whether your university is accredited and if so, which authority—such as ABET or a government agency—authorized the accreditation, when the accreditation or permission to award degrees was granted, and when it is scheduled to expire. If you need help tracking down the required information, ask the professors who signed the petition.

5 Include all the degrees your university offers in IEEE's fields of study. The form lists the fields for you, including engineering, computer science, information technology, and biological and medical sciences. Also note the date your school graduated its first students. It must have graduated at least one class before you can form an IEEE student branch.



6 Adopt a constitution. You can find a sample constitution with the other forms. Write in the name of your new branch, and give it a purpose. The constitution must include bylaws, also available in the sample documents.

After you submit your application, IEEE Member and Geographic Activities staff, in Piscataway, N.J., will ensure it's filled out properly and send it for approval to the director of your IEEE region and the region's student activities committee chair. You'll be notified when the approval process is complete.

Once your application is approved, rev things up by organizing meetings and fun events. Here are several ways to make your branch successful, according to student branch leaders who have gone through the process.

TECH SEMINARS

One of the top reasons for joining an IEEE student branch is to network with working engineers and gain a competitive edge when entering the

workforce. A great way to arrange that is by organizing technical seminars, according to Amr el-Deeb, 2008 chair of the student branch at Alexandria University, in Egypt. Invite speakers from local companies to discuss breakthrough technologies they're working on as well as to offer advice on landing a job.

"Technical courses and workshops have always succeeded in attracting the largest number of students to our branch," el-Deeb wrote in the September/October 2008 issue of *IEEE Potentials*, the publication for IEEE student members. That issue featured a profile of his branch, which boasts more than 750 members.

You can find speakers simply by calling local companies as well as by asking your professors if they know of good candidates.

BE ACTIVE

Don't allow your branch to fade from sight. It's important to hold regular meetings, at least once a month, to keep members engaged. Organize a

committee to plan interesting events—and don't forget those guest speakers. Use the meetings to update everyone on upcoming events and brainstorm new activities. There are many ways to engage members, such as getting them involved in IEEEExtreme, a 24-hour online programming challenge. The next one takes place on 24 October; more details are available at <http://www.ieee.org/xtreme>.

Every branch needs a place to hold its meetings. Talk to your professors about using a room. The student branch at the University of Victoria, B.C., Canada, for example, got a room in its engineering building simply by asking the dean for space.

After you've secured a space, accumulate equipment such as computers and supplies. Your local IEEE group or your school might help with funds. For example, the University of Victoria's student branch wrote a grant proposal; the IEEE Canadian Foundation and the Victoria Section each gave the branch CDN \$3000. The branch also received equipment from the university's electrical and computer engineering department.

PLAY DATES

A great way to recruit members and retain those you have is to hold barbecues, sporting events, video-game nights, pizza parties, and other gatherings.

"We make ourselves visible by organizing large social events," said Chuan-Zheng Lee, 2009 chair of the student branch at the University of Auckland, in New Zealand, in the branch profile that appeared in the May/June 2009 issue of *IEEE Potentials*. "Each year we gain 80 or more new members at these events."

The most important factor in recruiting members is to get the word out, according to Manfred Sampl, 2008 chair of the student branch at Graz University of Technology, in Austria.

"Our marketing methods include hanging posters, handing out our branded mugs, and sending e-mail," he said in the *IEEE Potentials* profile of his student branch [November/December 2008]. ■



Don Davis En Garde!

IT WAS THE sword-fighting scenes in the 1987 film *The Princess Bride* that lured IEEE Senior Member Don Davis into fencing. It looked like a cool thing to try, so he signed up for a class during his junior year at the University of Maryland. Three weeks into it, he entered a local tournament and came in second.

It might have been a case of beginner's luck, but by the mid-1990s he was nationally ranked in the top 30 to 40 competitors, with a drawer full of medals. He was also a new father by then, however, which didn't mesh too well with constant traveling on the fencing circuit, so he stopped. In 2006, when three of his daughters entered middle school and his youngest was in elementary school, he rejoined the fencing fray, this time in the 40-plus age category. He went on to win the 2007 and 2008 men's foil U.S. national championships.

Davis's weapon of choice is the relatively thin foil. In foil fencing, points are earned by striking the opponent's torso. The other fencing weapons are the larger épée and saber; the latter can score points by slashing as well as thrusting.

The fencing season lasts about 10 months, dur-

ing which Davis competes in 15 to 20 tournaments. He trains six days a week. His equipment includes a protective jacket and breeches, mask, gloves, shoes, and the foil, which has an electric push button that registers hits of at least 500 grams of force. A body cord connects the sword through the back of the jacket to a plug connected to a scoring machine by a reel-tensioned spring, which keeps the cord taut as the fencer moves. "It's state-of-the-art from 1950, but it works," Davis laughs. "You need the sensor because it happens so fast.

Judges can't always see the hits."

Davis likens fencing to chess. "It involves moves and countermoves, but at superhigh speeds," says Davis, who works for Alloy Computing, the Clarksville, Md., engineering consulting firm he co-owns, as an embedded systems and field-programmable gate array designer. And it seems that with age he's gotten better at fencing. "This year I had my highest placement—in the top 20—and that was for the open age category," says Davis, 42. "I think age has given me a perspective on my opponents. I better understand how to read them."

Davis finds fencing and engineering a complementary combination. "It's not like you use calculus to fence better," he says. "But it does require a kind of real-time analysis. After you get beyond the basic lunges, attacks, and retreats, fencing is about how to trick the other person." —Susan Karlin

PASSION
Fencing
PROFESSION
Embedded systems designer
HOMETOWN
Clarksville, Md.

Deborah Cooper Swimming With Sharks

WHEN DEBORAH COOPER found herself surrounded by hammerhead sharks while scuba diving off the Galapagos Islands, she didn't panic.

"Some of the sharks started moving toward me, but I think it was mostly out of curiosity," says Cooper, an IEEE senior member. "I don't expect to get attacked by a shark, but if I did, it would happen so quickly, it's not something I can get nervous about." In fact, Cooper recalls her time with the hammerheads as "one of the most awesome and beautiful experiences I've had while diving."

"Although," she adds, "I did have a really cute experience in the Caribbean when a barracuda followed me around."

Since getting her diving certification in 1998, Cooper has made more than 200 dives in places like Belize (her deepest dive, at 42 meters), Fiji, Hawaii, and many islands in the Caribbean. She hopes to dive in Indonesia next year.

But her favorite has been the Galapagos.

"Everything in the Galapagos is amazing," she says. "I could not believe how unspoiled and unafraid the marine life was. There were wild dolphins swimming around us, and a turtle even bumped into a diver. This was a rare experience for a scuba diver."

Cooper recalls watching broadcasts of Jacques Cousteau and finding herself "glued to the television, captivated." Her interest was also piqued when she accompanied some scuba-diving friends in California's Channel Islands, as a snorkeler only. But it wasn't until she moved across the country and met a colleague who was a scuba instructor that she decided to take a certification course.

Cooper dives mostly from live-aboard boats in open water. While her friends in Virginia frequently dive for fun in a local water-filled quarry, she uses it to check out her equipment and skills. "For me, scuba diving is underwater tourism," she says. "I'm there to watch the marine life and to learn, including how to protect marine life. Being a certified scuba diver allows me to dive safely and to see things at depths unavailable to snorkelers."

On land, Cooper is a computer security expert who has run her own Reston, Va.-based consultancy, DC Associates, for the past 14 years. She is a certified nitrox diver—nitrox is a gas mixture that lets divers stay underwater longer—and intends to take more courses to improve her skills. —S.K.

PASSION
Scuba diving
PROFESSION
Computer security expert
HOMETOWN
Reston, Va.



If you have an interesting hobby you'd like to share, e-mail the editors: institute@ieee.org.

You prepare the world for tomorrow.

We work to help secure it.

You provide the innovations that shape our future, but what if you were suddenly unable to provide for your own future?

According to the Social Security Administration's Disability Benefits Brochure, "studies show that a 20-year-old has a 3-in-10 chance of becoming disabled before reaching retirement age.¹" That's not the kind of future you like to envision, but a possibility you should be ready for.

If you rely on your income to pay the bills, make sure you are prepared for an unexpected illness or accident that could leave you unable to earn a paycheck. The IEEE Group Disability Income Insurance Plan could help you pay those bills by replacing a portion of your income to protect you and your family's future from significant debt.

The IEEE Group Disability Income Insurance Plan. Designed to help protect the future of the professionals who design our future.



The Company You Keep®

The IEEE Group Disability Income Insurance Plan

To learn more about plan features, costs, eligibility, renewability, limitations and exclusions, call 1.800.493.IEEE (4333) or visit www.ieeeinsurance.com/disability.

IEEE Member Group Insurance Program:
For peace of mind beyond calculation.



Celebrating 125 Years
of Engineering the Future

Call 1.800.493.IEEE (4333) or visit www.ieeeinsurance.com/disability

¹SSA publication No. 05-10029: www.ssa.gov/dibplan/index.htm

This plan may vary or may not be available in all states. This program is administered by Marsh Affinity Group Services, a service of Seabury & Smith, Inc. d/b/a in CA Seabury & Smith Insurance Program Management. The Group Disability Income Insurance Plan is underwritten by New York Life Insurance Company, 51 Madison Ave., New York, NY 10010 on Policy Form GMR-FACE/G-12150-0.