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REGION NEWS



REGION 1 NORTHEASTERN UNITED STATES

- Student branch formed at **Benjamin Franklin Institute of Technology, Boston**.
- Student branch formed at **Long Island University, Brooklyn, N.Y.** Branch also forms joint chapter of the IEEE Systems, Man, and Cybernetics Society and the IEEE Computer Society.
- **Schenectady (N.Y.) Section** forms IEEE Dielectrics and Electrical Insulation Society chapter.
- **Princeton/Central New Jersey Section** forms IEEE Life Members (LM) affinity group.

REGION 2 EASTERN UNITED STATES

- **Cleveland Section** forms IEEE Graduates of the Last Decade (GOLD) affinity group.
- Student branch formed at **Northern Kentucky University, Highland Heights**.

REGION 3 SOUTHEASTERN UNITED STATES

- **Eastern North Carolina Section** forms GOLD affinity group.
- Student branch at **Florida International University, Miami**, forms IEEE Power & Energy Society chapter.

REGION 4 CENTRAL UNITED STATES

- **Central Illinois Section** forms joint chapter of IEEE Geoscience and Remote Sensing and IEEE Photonics societies.
- **Rock River Valley (Ill.) Section** forms LM affinity group.
- Student branch formed at **Eastern Michigan University, Ypsilanti**.

REGION 6 WESTERN UNITED STATES

- Student branch at **University of Hawaii at Manoa, Honolulu**, forms IEEE Microwave Theory and Techniques Society chapter.
- **University of California, Davis**, forms IEEE Microwave Theory and Techniques Society chapter.
- Student branch at **University of California, Santa Barbara**, forms IEEE Photonics Society chapter.
- **Orange County (Calif.) Section** forms IEEE Consumer Electronics and IEEE Aerospace and Electronic Systems society chapters.

REGION 7 CANADA

- **Kitchener-Waterloo (Ont.) Section** forms joint chapter of IEEE Electromagnetic Compatibility and IEEE Magnetics societies.

REGION 8 EUROPE, MIDDLE EAST, AND AFRICA

- Student branch at **Université Mentouri, Constantine, Algeria**, forms IEEE Industry Applications Society chapter.
- **Algeria Section** forms joint chapter of IEEE Industrial Electronics and IEEE Industry Applications societies.
- Student branch formed at **AGH University of Science and Technology, Kraków, Poland**.
- Student branch at **Sharjah Higher College of Technology, United Arab Emirates**, forms IEEE Women in Engineering (WIE) affinity group.
- Student branch formed at **Zayed University, Dubai**.
- Student branch formed at **Kirikkale University, Turkey**.
- **Spain Section** forms IEEE Intelligent Transportation Systems Society chapter.
- Student branch at **National Research University of Information Technology, Mechanics, and Optics, St. Petersburg, Russia**, forms IEEE Computer Society chapter.
- **Northwest Russia Section** forms GOLD affinity group.
- Student branch formed at **All Nations University College, Koforidua, Ghana**.
- **Ghana Section** forms joint chapter of IEEE Communications and IEEE Computer societies.

REGION 9 LATIN AMERICA

- Student branch at **Universidad Nacional del Callao, Peru**, forms IEEE Communications and IEEE Industry Applications society chapters.
- **Colombia Section** forms joint chapter of IEEE Electron Devices and IEEE Robotics and Automation societies and WIE affinity group.
- Student branches formed in Colombia at **Universidad Francisco de Paula Santander, Universidad Santo Tomás, and Unipanamericana**.
- Student branches formed in Brazil at **University of São Paulo, Universidade Estadual de Feira de Santana, and Universidade Estadual de Londrina**.
- Student branch at **Universidade Federal do ABC, Santo André, Brazil**, forms WIE affinity group.
- **Centro Occidente (Mexico) Section** forms joint chapter of IEEE Computational Intelligence and IEEE Robotics and Automation societies.

REGION 10 ASIA AND PACIFIC

- Student branches formed in India at **Pandit Deendayal Petroleum University, Thejus Engineering College, Amity University, Ajay Kumar Garg Engineering College, Nalla Narasimha Reddy Education Society's Group of Institutions, Laxmi Devi Institute of Engineering and Technology, Jeppiaar Institute of Technology, TKM College of Engineering, Al-Ameen Engineering College, MRK Institute of Technology, and Thangavelu Engineering College**.
- Student branches in India at **KL University, Padmasri Dr. BV Raju Institute of Technology, Maulana Azad National Institute of Technology, Sree Narayana Gurukulam College of Engineering, Vignan Institute of Technology and Science, and Prathyusha Institute of Technology and Management** form WIE affinity groups.
- Student branch at **Amrita Vishwa Vidyapeetham University, Coimbatore, India**, forms IEEE Robotics and Automation and IEEE Education society chapters.
- Student branch formed at **Swinburne University of Technology, Melbourne, Australia**.
- **Nanjing (China) Section** forms IEEE Systems, Man, and Cybernetics Society chapter.

SEND US YOUR NEWS

We publish announcements of new groups once they've been approved by IEEE Member and Geographic Activities. To send us local news, like student branch events and competitions, WIE or preuniversity outreach efforts, or other IEEE group activities, use our form on the Region News page at <http://theinstitute.ieee.org/region-news>.



NEWS

Herz Award Goes to Gorman

JUDITH L. GORMAN, former managing director of the IEEE Standards Association (IEEE-SA), has been chosen to receive the 2012 IEEE Eric Herz Outstanding Staff Member Award. Gorman, who retired in April, was cited for "leadership in development of the IEEE Standards Association as a recognized global and world-class organization." She will be given the award at the IEEE Meeting Series, to be held in New Brunswick, N.J., in November.

Gorman began her career with IEEE in 1984, responsible for helping to publish a backlog of approved IEEE standards. She went on to become managing director of IEEE-SA in 1998 and helped to create its new structure, which included a board of governors.

Gorman also helped establish the IEEE-SA Corporate Advisory Group in 2004. The group, composed of representatives from industry, helps develop standards and advises the IEEE-SA board of governors on financial matters and new projects worth pursuing.

She also helped establish IEEE-SA's presence worldwide, spearheading several standards development and educational programs with international standards organizations in Asia and Europe.

The IEEE Board of Directors created the award in 2005 to honor the longtime IEEE volunteer Eric Herz, who became IEEE general manager and executive director before retiring in 1992. The award recognizes a past or present staff member who has had a substantial impact on the goals and objectives of IEEE, contributed to the success of a number of IEEE initiatives, and led several staff activities.

The nomination deadline for the 2013 Herz Award is 31 January. For more information, visit http://www.ieee.org/about/awards/recognitions_herz.html.

—Amanda Davis

Time to Vote

THE ANNUAL election ballot should have arrived in members' postal mailboxes in August. Members can vote for 2013 IEEE president-elect and for officers of various IEEE divisions and regions, as well as the IEEE Standards Association, IEEE Technical Activities, and IEEE-USA. To access and return your ballot electronically, visit <http://www.ieee.org/elections>. All ballots must be received by noon CDT USA (17:00 UTC) by 1 October.

—Carrie Loh

Dues for 2013

THE BASE IEEE membership dues for next year will be US \$139, an inflation-adjusted \$1 increase. For the sixth straight year, regional assessments charged to members for local activities conducted by their regions will not change. For U.S. members, an additional 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 \$44, an increase of \$1.

Dues for student and graduate student members will not change, but those members will begin receiving digital, rather than print, issues of *IEEE Spectrum* and *The Institute*. They can switch from the digital to the print version of the publications for an extra \$5 per year, or they can subscribe to both digital and print versions for an extra \$14.95 per year.

The fee for society affiliates, set at half the base IEEE dues, increases to \$69.50. Affiliates, who can belong to one or more IEEE societies but are not IEEE members, pay that fee for each IEEE society they join plus the membership dues charged by the society.

—Amanda Davis

Online

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theinstitute.ieee.org

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BOOKS OF INTEREST

A sample of e-books
available for free to members

CALENDAR

September



5 1879: Birth date of **Frank Baldwin Jewett**, 1922 AIEE president and the first president of Bell Laboratories.

10 1960: **Color television** transmission begins in Japan.

13 1845: Michael Faraday discovers that a magnetic field could alter the polarization of light: a phenomenon known today as the **Faraday effect**.



21–22 **Region 6 meeting in Portland, Ore.**



24 1960: USS *Enterprise*, the **first nuclear-powered aircraft carrier**, is launched. It travels more than 330 000 kilometers without refueling.

25 1956: TAT-1, the **first telephone cable running across the Atlantic Ocean**, begins operation.

October

1 1971: Godfrey N. Hounsfield produces the **first computer-aided tomography image**, of a patient's cerebral cyst, at Atkinson Morley Hospital, in London.



5–7 **Region 8 meeting in Tallinn, Estonia.**

12–14 **Region 7 meeting in London, Ont., Canada.**

17 1919: **Radio Corporation of America** is formed.

23 1873: Birth date of **William David Coolidge**, developer of X-ray tubes and recipient of the 1927 IEEE Edison Medal.



28 1955: Birth date of **Bill Gates**, personal computer software pioneer and cofounder of Microsoft.

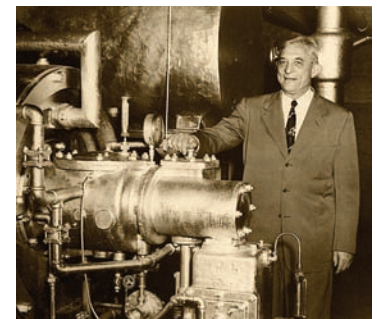
November

3 1926: Birth date of **Nick Holonyak Jr.**, developer of the LED and recipient of the 2002 IEEE Medal of Honor.

7–12 **IEEE Meeting Series in New Brunswick, N.J.**

13 1851: The **first successful undersea telegraph cable**, between Dover, England, and Calais, France, goes into service.

19 1954: The **first automatic toll collection machine** goes into service, on the Garden State Parkway, in New Jersey.



26 1876: Birth date of **Willis Haviland Carrier**, inventor of air-conditioning.

CORRECTION

An item in the Calendar [March] incorrectly stated that Alessandro Volta was born 5 March 1827. That was the date he died. He was born 18 February 1745.

Historical events provided by the IEEE History Center. IEEE events indicated in red.

CLOCKWISE FROM LEFT: BRUCE ZOLOT; BETTMAN/CORBIS/AP PHOTO; PHOTO RESEARCHERS/GETTY IMAGES; VOLODYMYR VYSHNEVSKYI/ISTOCKPHOTO; U.S. NAVY/GETTY IMAGES; SCIENCE SOURCE/GETTY IMAGES; IEEE

TECH TOPIC

Working With Sketchy Images

A new forensics computer application overcomes image-matching hurdles

BY KATHY PRETZ

I F YOU'RE A fan of TV shows like “CSI: Crime Scene Investigation,” you’ve probably been impressed with the technology used to identify a suspect from poor photographs. After all, the show’s forensics staff can take a surveillance camera’s grainy image, run it through databases holding millions of mug shots, and find a match in seconds.

But the face-matching systems of real-life law enforcement agencies are not that sophisticated, at least not yet. For example, there is no way they can accurately compare a forensic artist’s sketch of a suspect with mug shots in a database.

“With sketches, police still look for suspects the same way sheriffs in the Wild West did: with ‘Wanted’ posters distributed in public places,” IEEE Fellow Anil Jain says. But that could change, thanks to a computerized forensics system being developed by Jain and other IEEE members at Michigan State University, in East Lansing. Simply put, the system matches artists’ sketches with mug shots. Jain is a university distinguished professor in the department of computer science and engineering.

FACE MATCHING

Technology has provided law enforcement with many tools, including DNA and biometric ID systems, but plenty of criminals never leave such clues behind. Instead, police often depend on a forensic artist and the recollections of eyewitnesses. The artist works with witnesses to draw a sketch of the culprit’s face; a detective uses software to build a composite drawing from “canned” facial features like eyes, noses, and ears. The ren-

dering is distributed to police officers and the news media in the hopes that someone will recognize the suspect and make a report.

“Technically, a photo and a sketch are two different modalities,” Jain explains. “They both depict a face, but they are sensed differently by

a computer. It’s like comparing an image taken by your digital camera with an infrared image of the same face. They’re just too different in appearance. And it’s too time-consuming to manually compare a sketch to thousands of mug shots, unless there’s something unusual about the suspect’s facial features, such as a scar.”

Beyond dealing with the different textures of drawings and mug shots, those trying to match the two types of images must also consider that sketches can be imprecise and perhaps inaccurate because of fuzzy witness recollections.

Jain and IEEE members Brendan Klare and Zhifeng Li tried to get around such problems with their face-recognition system, which they describe in “Matching Forensic Sketches to Mug Shot Photos,” *IEEE Transactions on Pattern Analysis and Machine Intelligence* (March 2011). Jain and his team recently received funding from the U.S. National Insti-

tute of Justice to build a prototype.

Automated systems that match digital photos typically find key landmarks for alignment such as the center of the eyes, then measure a set of facial features. These systems are accurate when photos are captured under controlled conditions, such as well-lit environments while the subject is holding his head upright, looking at the camera, and displaying a neutral expression, according to Jain. “However,” he says, “they do not work well at all when trying to match a photo to a sketch.”

The new system developed by Jain and his colleagues—known as local feature-based discriminant analysis (LFDA)—bridges the gap between sketches and photos. The researchers scanned and digitized nearly 200 forensic sketches and entered them into a database that already held photos of the same people. The Michigan State Police and other forensic sketch artists provided the images.

“We examined the kind of changes taking place in the sketch in terms of how dark a line was or the direction in which it was going,” Jain says. “Based on our descriptors, the system attempts to find the corresponding photos. Basically, we trained the system to look for a photo in the database that matches the sketch. No one has done this before with sketches in a law enforcement setting.”

Algorithms initially found in research papers for matching laboratory-generated sketches relied on generating a synthetic photograph from a sketch, but Jain’s team realized that would not work when matching real-world forensic sketches. Instead, the LFDA system represents both sketches and photographs with scale-invariant feature transformation and multi-scale local binary pattern feature descriptors, which display the structure and shape of local regions within a facial image.

The LFDA framework was tested on those 200 forensic sketches and matched against a database with more than 10 000 mug shots. The LFDA algorithm achieved recognition accuracies nearly an order of magnitude greater than did one of the leading commercial automated face-recognition systems.

Jain says he hopes to install prototypes at two different law enforcement agencies by year’s end. ■



After scanning a database of more than 10 000 mug shots, the face-recognition system designed by researchers at Michigan State University correctly matched all three sketches above (drawn by forensic sketch artist Lois Gibson) to their corresponding photographs.

LOIS GIBSON

IEEE Members: an In-depth Look

A survey gauges satisfaction with IEEE and explores member demographics

BY ANIA MONACO

WHY DO PEOPLE join and remain members of IEEE? The most common reasons are to stay current technically and to get access to IEEE's well-regarded and highly cited publications. That's according to recently released results from the IEEE Member Segmentation Survey, conducted every four years to gauge members' satisfaction with IEEE's products and services.

Almost 8000 members and student members responded to the online survey, conducted in October and November 2011. The results were released this January. The survey asks members to rate the importance of and their satisfaction with IEEE's offerings, such as online career resources, continuing-education programs, professional networking opportunities, and discounts on products and services. It also asks about other aspects of membership, including information about members' careers and educational backgrounds.

WHAT YOU VALUE

How satisfied are members with IEEE, and which benefits matter the most?

About two-thirds of all respondents say they are very or somewhat satisfied with IEEE, a level that's almost identical to that defined by the results of the 2008 survey.

The top five "most valued" and "highly rated" IEEE benefits are its online publications; conferences; printed transactions, journals, and magazines; printed books; and member discounts.

Areas of high importance to members but in which they rated their satisfaction lower are professional networking, continuing education, and career resources.

Students had a similar list but added that they'd like more awards and scholarship opportunities, the chance to get involved with humanitarian projects, and videos of conference highlights.

All respondents were asked to rate IEEE's services from a list, but they could also write in their own responses.

After analyzing the results, IEEE Member and Geographic Activities (MGA) chose five areas to focus on: access to publications,

career tools, professional networks, continuing-education programs, and member discounts.

"These areas of concern continue to be of high importance to members since the last survey," says Jamie Moesch, senior director of member experience in IEEE MGA, in Piscataway, N.J., the group that oversaw the survey. "This time around, we will work to improve our focus and begin working towards a world-class satisfaction level in these most important areas." IEEE has already made strides since the 2008 survey results, Moesch adds, particularly in improving its career tools, continuing-education programs, and access to publications.

IMPROVEMENTS SHOWN

Recently, IEEE-USA has been offering all members free access to an e-book each month on career-related topics such as launching a start-up, polishing writing skills, and finding a job. And IEEE is dedicating increased staff attention to improving its career products and services globally.

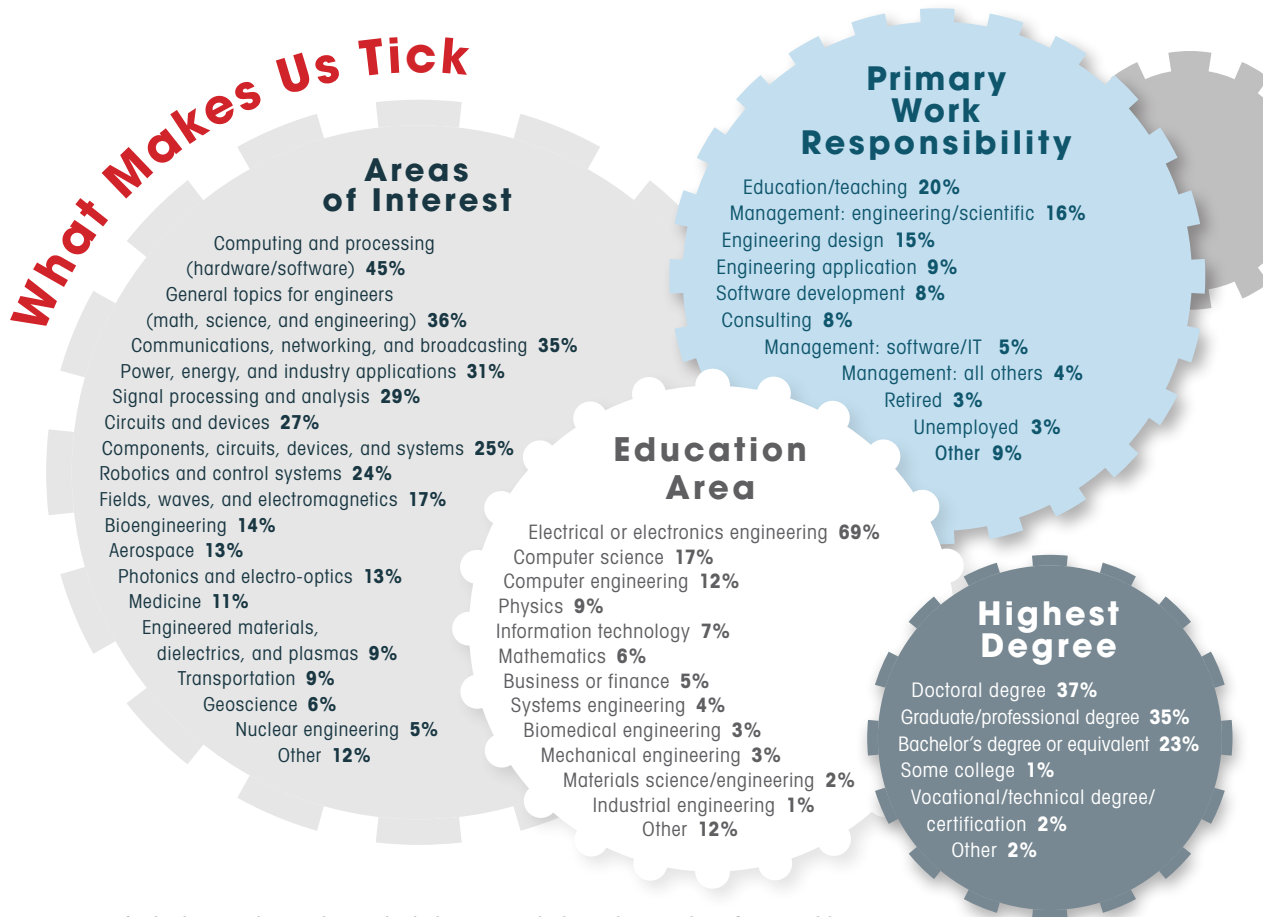
IEEE is also working to help members network with each other. It recently began setting up members-

only areas at some conferences where members can gather before and after presentations. MemberNet, IEEE's online community, was also recently enhanced to make it a more effective tool for networking with other members. And if an in-person IEEE section meeting is not possible, volunteers can now hold meetings via WebEx, an online conference tool that is free for section volunteers.

Several changes have been made to the continuing-education offerings, with more on the way. The website that houses IEEE's collection of online courses was overhauled last year. The IEEE eLearning Library (formerly known as IEEE Expert Now), now includes more than 200 courses and webinars from universities, training organizations, and IEEE units, in addition to tutorials from IEEE workshops and conferences.

As for the students' request for more videos from IEEE conferences, they're already available on IEEE.tv, which has been airing highlights of events for the past few years.

Although members say they are happy with access to IEEE publications, the organization continues to look for ways to improve. For



Figures are for higher-grade members, which does not include students. Where figures add up to more than 100 percent, members could choose more than one category.

example, since the last survey, IEEE has rolled out a large collection of free e-books, called IEEE eBook Classics, with more being added each year.

A less expensive option for members' IEEE Xplore subscriptions was unveiled in 2010. The Member Digital Library Basic plan offers three full-text article downloads for US \$15 per month. Many more enhancements are in the works, Moesch says.

ALL ABOUT YOU

To better understand IEEE's membership, the study asked about members' technical interests, careers, education levels, ages, and more.

Some 45 percent of respondents say they are involved with computing and processing. Other top technical areas include math; communications, networking, and broadcasting; power; and robotics and control systems. As for employment, 44 percent work in private industry, 24 percent at educational institutions, and 11 percent in government. The remainder work for nonprofits or are self-employed, retired, unemployed, or full-time students.

A majority of the respondents (69 percent) have degrees in electrical or electronics engineering. Almost two-thirds hold a degree or an additional degree in areas like computer science, computer engineering, physics, information technology, or business.

Almost half of the survey respondents are 50 or older, and 36 percent are 35 to 49. Women total about 10 percent of respondents, a number that has remained relatively stable among IEEE members over the years.

About two-thirds of respondents say IEEE plays a very important role in their professional lives but that work or personal demands prevent them from being more actively involved.

About a third of members and 60 percent of students say they expect to be more involved with IEEE in the future. This is especially true of young professional members, including Graduates of the Last Decade. They look to IEEE to help them engage in their profession but want a simpler and more welcoming experience, both online and from their local sections and chapters.

"IEEE will continue to use information from studies like these to create a more welcoming place for members to find world-class satisfaction with their professional association," Moesch says. ■



TECH HISTORY

First IEEE Milestones in India

The work of J.C. Bose and C.V. Raman to be recognized

BY IVAN BERGER

TECHNOLOGICAL ACHIEVEMENTS in India are being honored with IEEE Milestones in Electrical and Computer Engineering. The first millimeter-wave communications experiments, by J.C. Bose [left], and the molecular scattering of light, discovered by C.V. Raman [right], are to be recognized in Kolkata, West Bengal, on 14 and 15 September.

RADIO WAVES

Two years before Guglielmo Marconi's long-wave radio demonstration in England, Sir Jagadish Chandra "J.C." Bose demonstrated millimeter-wave radio in Calcutta (now known as Kolkata). Bose (1858–1937), born in what is now Bangladesh, was a versatile scientist, working in physics, biology, botany, and archeology. After graduating from St. Xavier's

College, in Calcutta, he studied medicine for a year at London University, left because of poor health, and in 1881 entered Christ's College, Cambridge, in England, to study physics under Lord Rayleigh.

After graduating in 1884 with a natural science tripos (an honors baccalaureate), Bose returned to India. A year later, a recommendation from Rayleigh got him the post of professor

at Presidency College, in Calcutta, the first Indian to hold that title there. The college's British administrators offered him only one-third the salary of its European professors. Bose protested by taking no salary at all for several years until the college recognized his value and raised his salary to match his European peers, retroactive to the start of his professorship.

During his 30 years at the college, Bose conducted research and engaged his students' interest through extensive scientific demonstrations. It wasn't easy, because the school had no lab facilities. Bose was, however, given the use of a 2.2-square-meter room, and he devised his own equipment with the aid of a tinsmith.

Between 1894 and 1900, Bose performed pioneering research on radio waves and generated waves as short as 5 millimeters. His work predates that of Marconi, who is most often associated with the development of radio. Unlike Marconi, who sought to commercialize his work with radio waves, Bose was interested in radio purely as a scientific endeavor.

Bose also developed equipment for generating, transmitting, and receiving radio waves and used it to demonstrate the waves' properties.

He also experimented with galena, a form of lead sulfide, to make an early type of semiconductor diode, using it as a detector of radio waves. Galena detectors were at the heart of the reliable and inexpensive "crystal sets" that helped make radio popular until tube radios began supplanting them in the 1920s.

In the early 1900s, Bose did further pioneering work, this time in animal and plant physiology, another longtime interest. His contributions included his invention of the chrestograph for recording plant growth in increments as small as 1/100 000 of an inch. Another device he developed demonstrated the effects of electromagnetic waves on living and nonliving matter.

Bose, who believed strongly in the free exchange of scientific knowledge, lectured frequently in Europe and the United States on plant physiology and the effects of electromagnetic waves on living and nonliving matter.

In 1917 he founded the Bose Research Institute, in Calcutta, one of India's first scientific research institutes.

Bose was the first Indian scientist to make a name for himself in the western scientific world, and he received many honors. He was the first Indian to lecture before London's Royal Institution (1897). He was knighted by the British Empire in 1917 and became the first Indian member of the prestigious Royal Society of London in 1920.

On 14 September, his experimental work on millimeter-band radio is to be recognized when a plaque is placed in the corridor of the A.J.C. Bose Auditorium in Presidency College's main building.

RAMAN EFFECT

Unlike Bose, Chandrasekhara Venkata "C.V." Raman (1888–1970) was already well known among physi-

cists when he first visited England in 1921, thanks mainly to his work in acoustics, especially in the sounds and vibrations of Western and Indian stringed instruments. But it was his interest in optics, and his curiosity on his trip home to Calcutta about the sea's deep blue color, that led to the IEEE Milestone.

Realizing that the sea's color resulted from light scattering, Raman turned his mind to that phenomenon when he reached home. "It seemed, indeed, that the study of light scattering might carry one into the deepest problems of physics and chemistry," he later wrote.

While supporting himself as a civil servant in the Indian Finance Department, he used the laboratories of the Indian Association for the Cultivation of Sciences (IACS), where he and his protégé K.S. Krishnan exhaustively explored the scattering of light as it passed through various substances. In 1928, they discovered that when monochromatic light passed through a substance, a fraction of the scattered light that emerged was of a different color than the original

beam, and that the color varied with the substance.

The experimental results, published in the *Indian Journal of Physics* (which Raman had founded two years earlier), touched on the phenomenon's quantum implications and stated, "We are obviously only at the fringe of a fascinating new region of experimental research which promises to throw light on diverse problems relating to radiation and wave theory, X-ray optics, atomic and molecular spectra, fluorescence and scattering, thermodynamics, and chemistry."

Widespread recognition followed immediately. Raman's results were published in *Nature* in 1928, he was made a knight of the British Empire in 1929, and he was awarded the 1930 Nobel Prize in Physics. In his acceptance speech, he said his discovery had "practically unrestricted scope in the study of problems relating to the structure of matter."

"We may also hope," he said, "that it will lead us to a fuller understanding of the nature of light and of the interactions between matter and light."

He was right. Spectroscopy, based on what was called the Raman effect, soon became chemists' principal tool for nondestructive chemical analysis, applicable to liquids, gases, and transparent solids. It can be used to analyze not only stable substances but also the spectra of the most transient chemicals. For those reasons, Raman's discovery was named an International Chemical Historic Landmark by the American Chemical Society and IACS in 1998.

But the Raman effect is also applied to electronics and communications, used in lidar (the optical analog of radar), in frequency conversion, in long-distance quasi-lossless transmissions schemes, nonlinear optics, and Raman amplification for optical communications. The phenomenon is of interest in engineering, nonlinear physics, and applied mathematics. IEEE plans to honor Raman's discovery as a Milestone in Electrical Engineering and Computing on 15 September. The commemorative plaque will be placed at the entrance of the IACS. ■



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QUESTION OF THE MONTH

Do Layoffs Target Older Workers?

Hewlett-Packard recently announced it will eliminate 27 000 jobs, layoffs that the company's chief executive, Meg Whitman, claims are "absolutely critical for the long-term health of the company." This year Yahoo laid off 2000 employees, and BlackBerry maker Research In Motion announced that it would make "significant spending reductions and head-count reductions."

A recent opinion piece on CNN.com by Norman Matloff, a professor of computer science at the University of California, Davis, said engineers over 35 will have a hard time finding new jobs. He noted that a lot of HP's current job listings include the terms "intern," "recent graduate," or "postdoc."

Are companies using layoffs to get rid of older engineers? Do you think older engineers now have a harder time finding jobs than recent graduates?

Respond to this question by commenting online at <http://theinstitute.ieee.org/opinions/question>. A selection of responses will appear in the December issue of The Institute and may be edited for space. Suggestions for questions can be sent to institute@ieee.org.

RESPONSES TO JUNE'S QUESTION

Are You in the Cloud Yet?

If cloud computing is not exploding, then how do you describe a technology expected to generate 14 million jobs globally by 2015, according to a recent study by market researcher IDC? That number reflects myriad cloud services involving music, video, photo, and document storage offered by Amazon, Google, and many others. And then there are the business services, such as data analysis, like those Hewlett-Packard announced in March. Cloud computing fans say they like being able to access their content from any Internet-connected device and never running out of storage. But some hesitate to get into the cloud because of security and accessibility issues.

Are you using a cloud computing service? Why or why not? Will cloud computing take over as the main form of data storage?

The following responses were selected from comments that appear at <http://theinstitute.ieee.org/opinions/question/are-you-in-the-cloud-yet>

TOO COSTLY FOR MOST

I suspect the massive growth projections have ignored the lack of spectrum space needed to accommodate truly wide-scale wireless computing. Bandwidth is already at a choke point for private companies, and mobile providers are raising the cost of high-volume use.

I think that widespread use of the cloud will be limited to those who can justify the costs by business needs or to those who can make do with low bandwidth. I see no incentive for carriers to invest in the massive architecture needed to support the widespread adoption of cloud computing when they can squeeze profits out of a much slower growth option.

Drossba

SKY'S THE LIMIT

I have used the cloud for my business activities and for launching a new product. Many cloud systems have security features and large-storage capabilities. Businesses can save a ton of money by using the cloud.

Vpsampath

The following responses are from readers who chose to remain anonymous.

MY DATA, MY RULES

I don't plan on moving to the cloud. Maybe I'm old-fashioned, but data storage is so cheap now that I'd rather keep my files local and physically secure. Then I can be sure I can access them when I need to, as fast as I need to—not when some third-party vendor makes them available to me.

CLOSE THE TECH GAP

I am from a developing country where more than 60 percent of the people have no access to the bandwidth needed to use cloud computing effectively. I personally like to use cloud computing services such as SkyDrive and Google. But such services are not going to have much of an impact in developing countries where Internet speeds cannot keep up with the technology.

WAIT AND SEE

Cloud computing looks tempting, but I have two issues. First, it's too expensive for private use. Photos and videos can take a lot of space, and downloading and uploading to the cloud can take a long time. Second, I wonder if my information could be compromised by cyberattacks. I will wait a year or two to see how cloud computing services mature.

HANDS OFF MY DATA

My issue with the cloud is not with the technology but with current business models and the lack of strong privacy laws in the United States. I want my private data to be just that: private. I don't trust cloud vendors with my data, nor do I want to have to access it over a limited connection that possibly also costs money per megabit.

Most public-use cloud vendors are funded with advertising dollars, which means they're paid to harvest my information, track my Internet habits, and show me targeted ads. Often they can share my information with whomever they deem to be a business partner. Once I store my data on their servers, I will lose control and ownership of it. I will not sell my soul for the convenience of accessing my data from anywhere.

Global Voices

DURING A RECENT visit to Brussels, an IEEE member told me, "Farmers come to Brussels all the time; technologists don't."

We in the IEEE community understand that the path to a better quality of life and greater prosperity is through technology and innovation. But how often do we explain it to those who make public policy decisions?

How often do we point out that access to technology is one of the strongest differentiators between rich countries and poor? That technology defines quality of life today and innovation now will define it for tomorrow? How often do we offer ideas for expanding access and stimulating innovation?

The man I spoke with in Brussels is both a technologist and a policy expert. He does not need to be convinced. But policymaking is a political process—a process of building consensus—and his efforts could be enhanced through the advice and support of some of the nearly 60 000 IEEE members who live in European Union countries.

I believe we have a responsibility, as individuals and as an organization, to share our expertise and knowledge with those who make or influence decisions about how technology affects people's lives.

For about 40 years, IEEE has helped its members in the United States examine current technology policy issues and explain their conclusions to leaders in government. Each year, our office in Washington, D.C., facilitates about 300 individual visits by IEEE members to congressional offices. We also provide policy briefings, and our staff reaches out to policymakers on our behalf. Through events and publicity, we share our views with the public. Over time, it makes a difference.

But we have little experience in doing these kinds of things elsewhere, even though there are many issues that transcend borders, issues on which we can speak with a global voice. I'll suggest a few.

INNOVATION

As much as we may agree on the importance of innovation, there's less agreement on how to stimulate it. I believe that one answer lies in recognizing that innovation comes from people, not institutions. Every country that wants to advance must develop and maintain a talented, well-educated, high-tech workforce. And this suggests that investments in engineering, science, and mathematics education should be the first piece of any innovation strategy.



We have a responsibility to share our expertise and knowledge with those who influence decisions about how technology affects people's lives

RESEARCH INVESTMENTS

A friend recently shared this thought: "Without science, engineering would have no roots. Without engineering, science would bear no fruit." As incomplete and oversimplified as that may be, it helps us understand that research investments are needed across the full spectrum of science and engineering and not, as is often argued, just in "basic" research.

DIGITAL COMMUNICATIONS

Broadband access is still a major quality-of-life and opportunity differentiator. For many of the same reasons that telephones, radio, and television became essential as they became ubiquitous, high-speed data communications must be extended to every part of the world. And there should be no lingering doubt about whether to focus on fixed or mobile solutions. The answer is both.

ENERGY SUPPLIES

Per capita energy usage in India and sub-Saharan Africa is about one-third of the worldwide average and about one-twelfth of U.S. usage. Increasing per capita usage just to today's worldwide average, in just those two areas, would require new energy supplies equal

to more than the total presently used in the United States. We need to lead a discussion about how to provide developing countries with the energy they need to advance.

ENERGY AND THE ENVIRONMENT

Global warming is measurable, and its effects are visible. While others study and debate the future impact, it is time for our community to explain how greenhouse gas emissions can be reduced, the benefits of improving efficiency, the value of expanding renewable and nuclear generation of electricity, the future role of fossil fuels, and why it is important to electrify transportation.

Those are global issues, but many other technology policy issues are national or regional, and advice must be tailored accordingly. What is wise advice in Washington, D.C., may not be so wise in Brussels, New Delhi, or Rio de Janeiro. We must empower our members to be advocates where they live and work. We need to find our global voices.

I believe that the most promising approach is to build partnerships with our peers around the world, with national and regional engineering societies, especially in places where there are many IEEE members. There is evidence that engineering societies want to work together where they have common interests. Recently, more than 40 engineering societies headquartered in 20 countries joined us in expressing support for the United Nations' designation of 2012 as the International Year of Sustainable Energy for All.

I believe that, working with the broader engineering community, IEEE can become a greater force for change, and we can do it globally.

Gordon W. Day
IEEE President and CEO

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"IEEE is the umbrella that allows us all to stay current with technology trends."

Dr. Mathukumalli Vidyasagar
Head, Bioengineering Dept.
University of Texas, Dallas



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PRODUCTS AND SERVICES

Enhancements Make IEEE Xplore Easier to Use

Articles in HTML format are due by year's end

BY KATHY PRETZ

IEEE THIS YEAR launched its new business platform, IBP, which includes enhancements to IEEE Xplore. Here's a look at its new features, as well as what to expect in the future.

USER ACCOUNTS

Creating a new account now takes just a few simple steps: Key in your first and last names, your e-mail

address, and a password, then select and answer two security questions. The process takes place within the digital library—unlike the old way, which brought you to another IEEE site where you also had to answer questions about your job and technical interests. And the new account can be used to access other IEEE services, eliminating the need to set up yet another user name and password.

PERSONALIZED EXPERIENCE

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BROWSING

Instead of being limited to browsing by type of content only, such as books, conference publications, or standards, you can now look for material about any of 16 broad topics, including aerospace, nuclear engineering, and robotics and control systems.

“Categorizing the information into these topics allows users to

discover the rich content of the library,” says Prakash Bellur, senior director of IEEE Platform Design, the group in Piscataway, N.J., that oversees the digital library.

ABSTRACTS

Article abstracts also received a makeover. New, easier-to-use tabs have been added that contain an article's index terms, references, and information such as the ISBN, the publication date, and the date it was uploaded to the library.

MAKING A PURCHASE

Buying an article is easier as well. A click on its title or the PDF icon brings you to a page showing prices. Just click on the Add to Cart button, and up pops a menu confirming what you want to buy. That screen also has another new feature: related articles that may be of interest. You can either keep shopping or go ahead and check out.

In the Works

For the past year, IEEE has been converting articles published between 2002 and 2012 from PDF into an XML format that will be offered in IEEE Xplore as interactive HTML files, in addition to PDFs. Journal articles, conference proceedings, and standards published this year and last will be available in HTML versions within the next few months.

Every piece of information, including each abstract, reference, math formula, and image—is being converted to XML.

“As PDFs, the content is constrained to bits and bytes,” says IEEE's Prakash Bellur. “With this conversion, we'll build a relationship with the content, making it more interactive and providing a much better user experience.”

From the Quick Preview feature atop each article, users will be able to read its abstract, keywords, multimedia files, authors' names, references, and citations or see the figures.

Other time-saving features include skipping from one section



With the upcoming full-text HTML design, users can scan articles using the “At-a-Glance” feature [above] and move among sections of long articles using intuitive floating navigation [right].

of an article to another by hitting the jump key. Also, hovering your cursor over individual footnotes displays their details on the screen. Click on a keyword, and you'll find other articles that use that same term.

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IEEE Xplore also tries to enhance users' knowledge with reading recommendations, called “articles of influence.”

“We are redefining the researcher's experience,” Bellur says. “It will no longer be bound by the limits of a PDF.”

For more information, visit <http://ieeexplore.ieee.org/Xplore/guesthome.jsp>.

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ANAHEIM, CALIF.; 29 OCTOBER-3 NOVEMBER

TOPICS: Emission tomography instrumentation, multimodality systems, high-resolution imaging instrumentation, image reconstruction methods, data-correction and quantitative-imaging techniques, beam instrumentation and diagnostics, analog and digital circuits, high-density detector processing, photodetectors, and instrumentation for biomedical research.

SPONSOR: IEEE Nuclear and Plasma Sciences Society

VISIT: <http://www.nss-mic.org/2012>

IEEE International Conference on Power Systems Technology

AUCKLAND, NEW ZEALAND;
30 OCTOBER-2 NOVEMBER

TOPICS: Design, application, construction, installation, and operation of power distribution systems; technology for safe, reliable, and economic power generation; power conversion;

measurement and control; and transmission of electric energy.
SPONSOR: IEEE Power & Energy Society
VISIT: <http://www.powercon2012.com>

IEEE Region 10 Conference

CEBU, PHILIPPINES; 19-22 NOVEMBER

TOPICS: Power electronics, signal processing, circuits and systems,

computer architectures and systems, computational intelligence, networks and communications, robotics and mechatronics, software and database systems, and humanitarian technology.

SPONSOR: IEEE Region 10

VISIT: <http://www.tencon2012.org>

IEEE International Workshop on Information Forensics and Security

TENERIFE, SPAIN; 2-5 DECEMBER

TOPICS: Forensic analysis, watermarking and data encryption, security and privacy analysis, digital rights management, cryptography for multimedia, signal encryption, biometric forensics, system architectures, channel identification, and video surveillance.

SPONSORS: IEEE Signal Processing Society, IEEE Biometrics Council

VISIT: <http://www.wifs12.org>

IEEE International Nanoelectronics Conference

SINGAPORE; 2-4 JANUARY

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SPONSOR: IEEE Electron Devices Society
VISIT: <http://www.inec2013.org>

IEEE Engineering in Medicine and Biology Society Special Topic Conference on Point-of-Care Healthcare Technologies

BANGALORE, INDIA; 16-18 JANUARY

TOPICS: Smart sensors for health monitoring, wearable sensors, biomarkers, sensor reliability, body sensor networks, wireless computing and communications, wireless sensor and medical-device control, personalized medicine, multi-sensor data fusion and analysis, patient monitoring and care, and affordable global health care.

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PROFILE

Jacquelyn Nagel: Natural Engineering

She is one of this year's New Faces of Engineering

BY SUSAN KARLIN

IN THE COURSE of her short academic career, IEEE Member Jacquelyn Nagel has drawn inspiration from a slew of technical areas including electrical and mechanical engineering, industrial robotics, and laser-aided manufacturing. Recently, nature has been her muse: Her current research in chemical sensors uses biomimicry, which involves adapting biological design to engineering.

Nagel's research focuses on translating natural sensors to engineering. In other words, she tries to appropriate the mechanisms in plants and animals that react to stimuli for an engineered device that accomplishes similar tasks. Her main sources of inspiration are the functions performed by plant guard cells, which regulate gas transfer, and the spiral shapes of troponin and tropomyosin, proteins that regulate animal muscle contraction depending on calcium levels. She has crafted a conceptual design for a device that would use an array of chemical sensors to pick up indicators of illnesses including colds, diabetes, liver disease, and cancer.

The research earned her a spot among this year's New Faces of Engineering. She is among 12 nominees chosen in February by the National Engineers Week Foundation, a coalition of more than a dozen engineering societies, including IEEE, as well as major companies and U.S. government agencies. Each society chooses a candidate under 30 who has worked on projects that could significantly affect public welfare or further professional development and growth.

"I was totally shocked when I found out, and happy and grateful," says Nagel, now 30 and an assistant professor of engineering at James

Madison University, in Harrisonburg, Va. "It helped validate my direction in research and made me feel really good that I had identified something that others also thought was significant."

Nagel learned that biological sensing systems reacted only when chemicals were at a certain level—a concept she used for her design, which involves a patient breathing into a mechanism that responds to a certain level of signature chemicals. "I got that idea from plants," she says. "Chemical sensors often process all levels of a stimulus, resulting in huge data streams. A lot of it is noise," she says. Since her device reacts only after a critical threshold is met, the noise reduction happens up front.

Each spiral-shaped sensor in her device is coated with a chemomechanical polymer that responds to a critical level of a target chemical by expanding and changing its shape, thus altering the sensor's resistance to electric current. The resistance change correlates with chemical concentrations, which can be processed by a computer and displayed on a screen. Nagel's device also consists of redundant sensors—another lesson gleaned from nature—to speed up processing and protect against individual sensor failure.

She's now working on an analytical model to mathematically define how the device will work. From there, she plans to build a prototype.

But none of her progress would have happened without some happy accidents that led her in a variety of engineering directions.

HOOKED ON TINKERING

Growing up in Kansas City, Kan., Nagel became interested in engineering when her high school drafting teacher described an engineer's



job as solving problems. "I was into puzzles, brainteasers, and tinkering around to figure out how things worked," she says. "To hear there was a whole career dedicated to solving problems—that hooked me right there. I decided to major in electrical engineering because I was interested in understanding circuits and electronics."

While she was at the University of Missouri-Rolla (now the Missouri University of Science and Technology), her plans veered into a multidisciplinary path. "I simply followed my curiosities," she says.

While pursuing a bachelor's degree in EE in 2005, she worked as an electrical engineer at care products conglomerate Kimberly-Clark, in Paris, Texas, and Neenah, Wis., which introduced her to industrial robotics. That led her to pursue a master's degree in manufacturing engineering in 2007, also from the university. Her graduate program involved working in the laser-aided manufacturing processes lab in Rolla, and she interned in the Dayton, Ohio, office of Motoman, a Japanese automated systems supplier. Those experiences piqued her interest in sensor design.

When she began pursuing a Ph.D. in EE at the university, one of her research advisors told her he had funding only for projects in biomimicry, which she knew nothing

about. She spent her first year getting up to speed, researching the design of biological sensors in animals, plants, and single-cell organisms. She began integrating that new understanding into the design of electro-optical sensors. But when she transferred to Oregon State University, in Corvallis, following her advisor in biomimicry, she switched to mechanical engineering and focused on chemical sensors.

After graduating in 2010, she spent a year with Mission Critical Technologies of El Segundo, Calif.—she worked remotely from Virginia—contributing to the Defense Advanced Research Projects Agency's Meta-II program to reduce design and verification times of new research. Last year, she joined the James Madison faculty and resumed her bio-inspired sensor research.

"I never thought about getting into biomimicry as an engineer," she says, "but it's really helped me creatively, because it requires me to figure out how to connect concepts and ideas from one domain to another.

"It's like a research project that's been going on for the last 3 billion years, and the natural designs we see today in plants and animals are the optimized ones," she continues. "The tricky part is replicating the natural design to where it can become a piece of functional engineering." ■



PART-TIME PASSIONS

Ian Smith *Smooth Sailing*

PASSION
Dinghy sailing

OCCUPATION
Electronics and software project manager

HOMETOWN
Wokingham, England

YOU MIGHT THINK the last thing an engineer wants to do in his free time is tax his mind trying to solve problems. But that's exactly what IEEE Member Ian Smith says he loves about sailing dinghies, small boats ranging from 1 by 1.5 meters to 2 by 5 meters.

"I'm a physicist by training, and there's lots of science and meteorology behind sailing," says Smith, who runs his own software project management consultancy in Wokingham, about 50 kilometers west of central London. "I use that understanding to maneuver the boat better and make it go faster. The concentration involved in keeping track of everything—navigation, speed, and wind direc-

tion and force—prevents me from thinking about all the other things niggling on my mind."

Smith also teaches others to sail. For the past three years, he has been volunteering with Sailability, a Royal Yachting Association-sponsored initiative that brings people with disabilities out in dinghies. Smith teaches at the Sailability branch operating from the Burghfield Sailing Club.

He often uses his problem-solving skills to get a point across to his students. Once, trying to teach a group to sail in a straight line by focusing on a tree on shore, he found the students couldn't do it until he gave the tree a person's name.

In his youth, Smith dabbled in canoeing, waterskiing, windsurfing, and sailing. He took a sailing course as a child and, as a teenager, he and his brother made their own canoe. Eventually, they were spending most summer vacations on the water. But the incident that got him seriously involved with boating was winning a dinghy through a newspaper contest 15 years ago.

He soon realized he had a passion not just for sailing but also for teaching others. Within two years, Smith received his instructor's license and was soon teaching sailing at local boating clubs. That eventually led to Sailability and his efforts to teach the disabled.

"The biggest reward is seeing the happiness it brings them," he says.

"We took out one wheelchair-bound man who was unable to communicate verbally. But when it came time to wheel him off the boat, he deliberately took his foot off the footrest and kicked off his shoe so as not to leave. Another, an adult male with the mental capacity of a 4-year-old, loves to shout like a pirate when he's on board."

—Susan Karlin

Adam Fargher *Hail the Ale*

PASSION
Craft beer brewing

OCCUPATION
Undergraduate EE student

HOMETOWN
Corvallis, Ore.

OREGON RANKS second in microbreweries per capita out of all the U.S. states (after Vermont). For a beer connoisseur like IEEE Student Member Adam Fargher, who attends Oregon State University, it was only a matter of time before he plunged into his own beer making.

"We're surrounded by microbreweries—there's one in every town," says Fargher, 29, a junior electrical

engineering major. "People here love the natural, non-mass-produced stuff. Homebrewed beer tastes so much better, and there are so many more flavors. Drinking a craft beer makes your palate go crazy!"

A year ago, he stopped by the local home-brew supply store to pick up a beginner's kit, and he has been making beer ever since. The process involves boiling water, sugar (usually the malt extract from grain), and hops (flower clusters that enhance flavoring) for an hour; cooling the resulting "wort"; then adding yeast and letting the mixture ferment for 7 to 10 days. The liquid is separated from the yeast into another container and allowed to sit for four to five days. From there, it's consumed or bottled.

Fargher spends about US \$40 and seven hours—excluding fermenting time—per batch, which yields five gallons of beer. "At the beginning, you're following a recipe," says Fargher, whose preferred style is India pale ale.

"But as you advance, you start tailoring the brew to your palate, and it becomes a science as you experiment with different sugar sources, types of hops and yeasts, and fermenting time," he adds. "Advanced beer makers will grind the grain and extract the sugar themselves—which requires a lot of specialty equipment." It's not unheard of for serious hobbyists to spend \$20 000 on advanced home-brewing equipment.

That precision, attention to detail, and creative experimentation is probably what appeals to Fargher's engineering side. "It's also meditative and therapeutic for me," he says. "I love sharing my beer and seeing the look on people's faces when they try it." —S.K.



TOP: IAY DEAR; BOTTOM: RACHEL FARGHER

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STUDENTS

IEEEEXtreme: Six Years and Growing

The annual coding competition has seen a lot of changes over the years

BY ANIA MONACO

STUDENT MEMBERS: Does spending a sleepless night programming with your friends while competing against peers from around the world sound like fun? Then get your coding fingers ready, because this year's IEEEEXtreme competition is right around the corner. The 24-hour event kicks off at 0:00 GMT on 20 October.

This year's IEEEEXtreme is the sixth annual global challenge in which teams of IEEE student members—each squad supported by an IEEE student branch and advised and proctored by an IEEE member—compete during a 24-hour span to solve a set of programming problems. This

year's competition features more problems than ever before.

Much about the competition has changed over the years, including the number of participants, the way their answers are submitted and graded, and how students interact with each other.

READY, SET, PROGRAM!

Teams of two or three students receive sets of problems every six hours, starting at 0:00 GMT on the competition date. All teams receive the same problems to solve. They don't need to tackle every problem, but the more they solve, the more points they score. Students submit their solutions using an online tool. Points are awarded based on how

the problem was solved, the time it took, and its difficulty. Points are deducted for each wrong answer. Higher-grade IEEE members serve as judges.

First prize is an all-expenses-paid trip to an IEEE conference of the team's choice. All participants receive T-shirts featuring the IEEEEXtreme logo.

ON THE RISE

Since it was launched in 2006, IEEEEXtreme has grown each year. The first competition attracted 47 teams with 150 participants. The numbers more than tripled the second time it was held, in 2008, to 130 teams with 500 participants. Last year there were 3183 students on 1515 teams.

Not only has participation risen, but more and more countries are being represented. In 2006, for example, participants came from eight of IEEE's regions. Last year, teams from 65 countries—and all 10 IEEE regions—competed.

The competition's organizers—who include dozens of IEEE volunteers and staff members working on devising the programming problems, promoting the event, answering student questions submitted online during the competition, and other tasks—expect participation to rise this year as well.

Undoubtedly adding to the numbers is the visibility given the competition by IEEE Women in Engineering. The group has promoted this year's event in its newsletter.

As participation has increased, organizers have worked harder, says IEEE Member Gowtham Prasad, project lead for IEEEEXtreme. "The growth we've had is a double-edged sword," Prasad says. "We have had to keep up with the expectations from ever more students, including how the problems are to be released during the competition, recruiting quality judges from all the time zones, and even figuring out how to ship prizes to more than 3000 unique addresses around the world."

The competition's organizing committee was especially active this year in recruiting more programming-oriented volunteers, running announcements in IEEE newsletters, and creating a training video to show would-be judges how simple it is to be involved.

BETTER TOOLS

Nowadays, participants can find out who won within a day, but a lot more patience was required in the competition's infancy. The first year, it took volunteers several months to grade all the answers. Things weren't much better for the next competition, when it took about a month to learn who the winners were.

Slowing things down in the early years was the fact that participants e-mailed their responses. That was relatively time-consuming for both students and judges. It was the students who suggested building a Web interface, which now lets teams submit answers directly. By the third year, IEEEEXtreme organizers began using Mooshak, the contest-management tool. Its greatest value is that it can automatically grade responses.

Nonetheless, the increase in participation has put a strain on Mooshak, which last year had difficulty handling the number of students using it at the same time. "We pushed Mooshak to its limits," Prasad says. "To accommodate the growth expected this year, we evaluated five new platforms. For IEEEEXtreme 6.0, we will use Interview Street, a cloud-based program that promises an online code checker and a better user experience."

Another improvement along the way was the addition in 2010 of a Facebook page for the competition. The page allows students to chat with each other during the competition and share their experiences, although they're not allowed to ask for help with a problem. IEEE staff and volunteers log on to Facebook during the event to monitor the conversations, provide technical support, and cheer on the competitors. The page also has become a place for participants to post funny photos—often of sleep-deprived teammates.

"The pure thrill of 24 sleepless hours while monitoring more than 50 000 posts on Facebook and still being hungry for more is just the icing on the cake," Prasad says. "Every bit of IEEEEXtreme is enjoyable."

To learn more and to register, visit <http://www.ieee.org/xtreme>.

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