IEEE

Writing an Engineering Code of Ethics

The Institute

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Do-it-Yourself E-Publishing

BY KATHY KOWALENKO

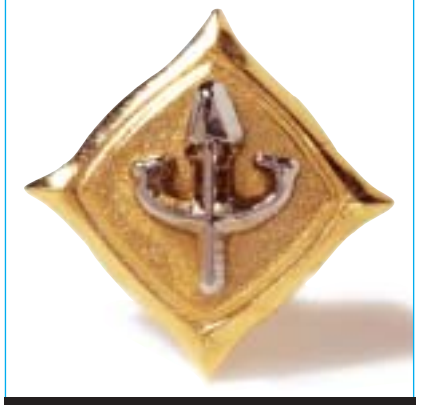
THE IEEE HAS HAD A VISION of an electronic publishing process that authors anywhere in the world could use. With the recent introduction of a new Web-based toolkit, known as IEEE Tools for Authors, this vision is nearing reality.

The new e-publishing process will not only markedly reduce the time from submission of an article to its publication in print or online—it will overall be far easier to use than anything that preceded it. IEEE Publishing Operations and Publishing Technology staff developed the system.

"When we first went to online peer review, we were concerned about authors who did not have Web access," says Dawn Melley, director of IEEE Periodicals Editorial Services, who manages the project. "But it didn't prove to be an issue. Most authors now have access to the Internet, they are familiar with it, and have no problems using these Web-based tools."

Journal and transaction authors now can create their articles, format them using templates, proofread their work, and submit annotations—all online. Those who use the [*Continued on page 19*]

IEEE AWARDS



Meet the 2003 class of IEEE Fellows page 7

State of the Heart

Artificial hearts hold out hope for desperately ill patients, thanks in part to members of the IEEE

Artificial hearts like the AbioCor™ being examined by O. H. Frazier, can help the growing number of patients who are not eligible for a traditional heart transplant.

BY ERICA VONDERHEID

Be near me when my light is low,
when the blood creeps, and the nerves prick
and tingle; and the heart is sick,
and all the wheels of Being slow.
ALFRED LORD TENNYSON

EVERY YEAR, millions of people face the same bleak future described in Tennyson's poem—according to the World Health Organization, 7.2 million died from heart disease in 2001. But over the last 40 years, technology is helping patients whose hearts are failing with artificial hearts, which replace most of the heart, and ventricular assist devices (VAD), which help a diseased heart circulate blood.

"No disease is as desperate as terminal heart failure when a patient has no realistic hope for [a] transplant," says IEEE Life Fellow Robert Arzbaecher, professor emeritus at the Pritzker Institute of Biomedical Science and Engineering at the Illinois Institute of Technology, Chicago, USA. Arzbaecher was part of a panel discussion on the history of the artificial heart at the Second Joint IEEE Engineering in Medicine and Biology Society/Biomedical Engineering Society Conference held last October in Houston, Texas, USA.

In recent years, the death rate from cardiovascular disease has gone down, but the incidence of arteriosclerosis—or hardened arteries—has gone up. Medical science can save many heart attack victims, but more and more patients need treatment for long-term heart disease, says O. H. Frazier, a [*Continued on page 10*]

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THE INSTITUTE ONLINE

Find information on these topics and more at www.ieee.org/theinstitute

Web Sites for Volunteers

Navigate the IEEE maze with our list of great online resources for volunteers.

Measures of Success Results

Members report high satisfaction with IEEE Section activities and online product delivery, according to an annual survey.

PLUS

News IEEE-USA's Consultants' Survey reveals independent consultants' average income and hourly fees.

Conference IEEE International Conference on Software Engineering, Portland, Ore., USA, 3 to 10 May, 2003.

Education Deans Summit II brings together engineers and educators to increase the public's technological literacy.

Products & Services IEEE introduces three new technical journals and the new *Power and Energy Magazine*.

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NEWS

From Around the IEEE & the World

Winston is 2003 President-Elect, Candidates for 2004 Announced

ARTHUR W. WINSTON, Life Fellow and director of the Gordon Institute of Tufts University in Medford, Mass., USA, was elected 2003 President-Elect. His term as President will begin on 1 Jan. 2004 following the term of 2003 IEEE President Michael S. Adler.

Of the members who voted, 17,949 chose Winston, 11,122 chose Vijay K. Bhargava and 8,884 chose Luis T. Gandia.

A member since 1955, Winston served on the IEEE Board of Directors from 1996 through 1999, holding positions as Vice President of Educational Activities and Region 1 director.

Out of 249,352 ballots mailed, 39,059 valid ballots were returned for a turnout of 15.66 percent, down from 19.80 percent in 2001.

In other election news, the IEEE Board of Directors nominated three candidates for 2004 President-Elect: Cleon Anderson of Salt Lake City, Utah, USA; Vijay Bhargava of Victoria, British Columbia, Canada; and Michael Lightner of Boulder, Colo., USA. *—Kathy Kowalenko*

Standards Association Acquires Voice in Choosing U.S. Voting Gear

THE IEEE STANDARDS ASSOCIATION has been invited to help set technical guidelines for new voting systems in the United States. A representative of the association's Voting Equipment (P1583) Committee will sit on the U.S. Technical Guidelines Advisory Committee of the Federal Elections Commission (FEC).

IEEE-USA supported the successful effort to get representation on the national committee, which was mandated by the Help America Vote Act of 2002. Passed by the U.S. Congress last October, the Act calls for improving the voting technology used by state election officials for federal elections.

The Technical Advisory Committee will make recommendations to the FEC, which will then provide guidelines to the states. The committee will look at equipment used in all aspects of elections such as voter registration, software for tallying results, financing, and the devices citizens use to cast their votes.

Meanwhile, the IEEE P1583 Committee is developing a standard for voting equipment for manufacturers and those buying the equipment. The specs will consider accessibility for voters with physical disabilities, accuracy, confidentiality, and reliability.

—Helen Horwitz

IEEE Technical Journals Score High In Citations

OTHER PUBLICATIONS in electrical engineering cited IEEE journals more often than ever before in 2001, according to the Institute for Scientific Information's "2001 Journal Citation Report," released late last year.

Citations, or how frequently articles are quoted or cited by other scientific journals, are considered a measure by many of a technical journal's impact. The study counted citations within a year of an article's publication. Of the 25 most often cited journals, IEEE publishes 21—the IEEE's highest number yet for any one year.

IEEE Transactions on Medical Imaging ranked first in the biomedical engineering category and second overall among electrical and electronics engineering publications with 3748 citations. In first place overall was *Progress in Quantum Electronics* published by Elsevier Science. Also according to the citations study, the IEEE publishes the top five telecommunications journals. *—Helen Horwitz*

Topping the List in Citations

Category	Top-ranked IEEE Journals
Automation and control systems	*IEEE Control Systems Magazine*
Biomedical engineering	*IEEE Transactions on Medical Imaging*
Hardware and architecture	*IEEE-ACM Transactions on Networking*
Imaging science and photographic technology	*IEEE Transactions on Medical Imaging*
Robotics	*IEEE Transactions on Robotics and Automation*
Software engineering	*IEEE Transactions on Visualization and Computer Graphics*
Telecommunications	*IEEE Network*
Transportation science and technology	*IEEE Transactions on Vehicular Technology*

Semiconductor Laser Pioneer Receives 2003 IEEE Medal of Honor

LIFE FELLOW NICK HOLONYAK JR. is to be the recipient of the 2003 IEEE Medal of Honor, sponsored by the IEEE Foundation. He will receive his medal at the annual Honors Ceremony to be held on 21 June 2003 in Nashville, Tenn., USA.

A professor and John Bardeen Chair of Electrical and Computer Engineering and Physics at the University of Illinois at Urbana-Champaign, USA, Holonyak is recognized for his pioneering contributions to semiconductors, specifically semiconductor alloys, heterojunctions, visible–light-emitting diodes, and injection lasers. Light sources based on his work dominate the optical communications and home entertainment industries and are used in applications ranging from CD and DVD players to medical diagnostic and surgical lasers.

In addition, 46 others will receive IEEE medals, service awards, honorary memberships, corporate recognitions, prize papers, technical field awards, and teaching awards.

For more details about the individual awards, visit www.ieee.org/awards.

—Kathy Kowalenko

Agreement Strengthens Standards Development

THE IEEE and the International Electrotechnical Commission (IEC) have formally agreed to foster more cooperation in their development of global technical standards and to make IEEE standards more available. The agreement, signed at the IEC general meeting last October in Beijing, also includes an arrangement for both organizations' logos to appear on IEEE standards approved by the IEC.

Based in Geneva, Switzerland, the IEC has 122 member countries and is the leading global organization for preparing and publishing international standards for electrical, electronics, and related technologies.

Initially, both groups will identify IEEE standards that are candidates for the IEC's standardization process. Then, the IEC board will select those that best complement its program. In particular, the IEC will look at new IEEE standards for electronics, telecommunications, and power generation. *—Helen Horwitz*

LETTERS

Complaints About E-formats

Along with *The Institute*, it appears that the *IEEE Canadian Review* is considering reducing or eliminating its paper publication in favor of an electronic format. I will probably stop reading it because I do not have Internet access at home and have no time to read electronic publications at work. I do most of my reading by carrying the publications with me and looking at them when I get a chance.

I have no argument with providing electronic versions, but I prefer to see the paper mailings continue. I pay more than $200 Canadian a year for IEEE membership and all I get for that is the *Canadian Review*, *The Institute*, and *IEEE Spectrum*. If these three publications are only available electronically, my membership will no longer be valuable and I will cancel it.

David M. LeBlanc
Fredericton, New Brunswick, Canada

With respect to all electronic newsletters from the IEEE and its Societies, not just *The Institute* and *Spectrum*: I use time away from my desk and computer to keep abreast of technology and the electrical engineering industry. To me, electronic newsletters are worthless.

I have no objection to electronic newsletters for those who prefer them, but please make any important information available to all members in a timely manner by the postal service, as part of the normal dues structure. Members not wishing to receive printed copies of publications by mail might receive a reduction in their dues reflecting the elimination of printing and mailing costs.

One reason I belong to the IEEE and to several of its Societies is to receive the best information in the world, and to have the opportunity to scan the publications at my leisure—without having to decide when each issue appears whether it is worthwhile.

John E. Harder
Bloomington, Ind., USA

I am sorry to say I don't like *The Institute* online. Call me a dinosaur, but there is more value in a paper publication. Reading a paper document enables me to find interesting things that I wasn't looking for, which is called a "parallel input" phenomenon. So often in engineering and research, we find what we expect to find, and ignore unforeseen data. It's like connecting a digital voltmeter to a non-sinusoidal source. You get a reading, but do you understand all that is happening?

While looking at *The Institute* online a section at a time, I have to ask myself: "Do I really want to read the obituaries?" While scanning the paper version, I was often surprised to find that a colleague, friend, or innovator had passed away.

I know moving *The Institute* online is a cost-saving move, but I question its efficacy.

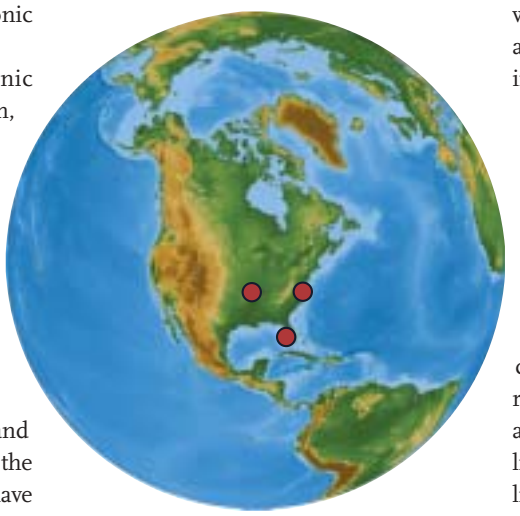
Rich Bonkowski
Santa Rosa, Calif., USA

I think an electronic newsletter is a poor substitute for the printed issues of *The Institute*. Online newsletters are fine for reminders. For example, the Boston Section's *E-Reflector* provides reminders of upcoming meetings. Or, electronic announcements are okay for facts I might be anticipating such as election results.

But when I think about things that have prompted me to get involved in the IEEE, it was always a result of a printed announcement. Printed media is just more fun to read.

I think reducing the number of printed issues of *The Institute* creates a false economy that will drive away members. I won't opt out of the e-mail alert because I need the information. You have just made finding relevant news harder for me.

Tom Vaughan
Stoughton, Mass., USA



The advent of the Internet age has changed our lives in numerous ways. However, the simple idea of going online everywhere is not practical. I would like to

study my issue of *The Institute* when I am taking a rest from my computer monitor.

Also, the trend at *Spectrum* is another example of changes at the IEEE. *Spectrum* came out in 2002 with a new look and, unfortunately, a new philosophy. In the past, *Spectrum* contained strong coverage of various aspects of our broad profession in addition to useful content for professionals and researchers, such as a conference calendar. Today, *Spectrum* looks more like a news magazine. With a focus on news and advertisements and with a more commercial look, I am afraid we'll end up with a consumer electronics or computer games flyer sometime soon.

Kamyar Hazaveh
Toronto, Ontario, Canada

Bravo for *The Institute* Online

I applaud moving *The Institute* online. In my view, the IEEE could immediately stop publishing *The Institute* on paper and save even more money.

I must also urge you to move *Spectrum* to an online format.

There are many things that should be available on paper. As we are discovering, we really need to have the choice among Internet-accessible materials, CD-ROM editions, or a published hard copy. Costs will go down, accessibility will increase, and benefits to members will greatly improve.

Steve Grout
Spring Hill, Fla., USA

I suggest that the IEEE should provide publications, including *The Institute*, in a format suitable for personal digital assistants (PDAs). Currently, I read newspaper articles, weather forecasts, technical news, and software release information on my PDA. In a simple implementation, the publisher only needs to provide a hyperlink to where the articles in a simple format are stored.

This would allow me to read *The Institute* whenever I have the time for it, anywhere I am.

Mario De Weerd
Argenteuil, France

The editor responds

As Rich Bonkowski notes, the reduction in the number of print editions of *The Institute* and its move online were indeed made to cut costs during a difficult time. So far, members who have written to tell us their opinion of the change have divided roughly 60 to 40 in favor of online editions.

David LeBlanc can be assured that the IEEE has no plans to make *Spectrum* only available electronically. The magazine's new look, noted by Kamyar Hazaveh, is meant to make articles easier to read and to include more places to write about—in a news section and in more departments—on new technologies and to present information relevant to our members' careers. Often, a short news story, and not a long feature, is the best way to handle the information.

Spectrum's feature articles will continue, however, to highlight new developments in broad areas of coverage [the March *Spectrum* has an article on digital amplifiers, which could soon take over from analog in audio systems, and a roundup of several developments in nonvolatile memory, which could replace flash memory so common in handheld electronics].

Using the Web, it is also possible for *Spectrum* to list a much greater number of meetings, their locations, contacts, and dates than we ever had room for in a print edition. The calendar is available through http://www.ieee.spectrum.org. Readers should also be aware that the number of editorial pages *Spectrum* can publish is a function of the number of advertising pages it can attract.

TELL US WHAT YOU THINK

We welcome letters from readers expressing opinions on matters of interest to IEEE members and to the technical community at large. Please include your city, state or province, and country.

Mail: *The Institute, IEEE Operations Center, 445 Hoes Lane, Piscataway, NJ, USA 08855-1331* **Fax:** *1-732-235-1626*
E-mail: *institute@ieee.org*

MARKETPLACE OF IDEAS

Each month, *The Institute* poses a question for discussion. Responses are published on a three-month cycle; reader comments to the question below will appear in June.

Logging Off

Q In 2000, Kevin Mitnick, a computer hacker once described as the most wanted computer criminal in the United States, was released on probation for breaking into corporate computer networks and stealing software. One of the conditions of his probation was that he could not use the Internet for several years, a prohibition that ended earlier this year.

As cybercriminals complete their sentences and enter probation, law enforcement has to decide if it is reasonable and fair to prohibit them from using the Internet. Some say barring a person from using the Internet impedes their daily life unfairly. Many people couldn't work, conduct research or take distance learning courses, or even check the weather or read news articles without the Internet.

If someone is convicted of robbing a bank with an assault rifle, that person, once released from prison, would not be allowed to own a gun. Separating a convicted criminal from his or her chosen weapon is not unreasonable. But how are probation officers to monitor a convict's computer use after he or she is released? If criminals are smart enough to hack into networks, why can't they hide evidence of surfing the Internet?

The question this month is, if a person is convicted of using the Internet to commit a crime, should he or she be barred from surfing the Web or was Mitnick an extra special case?

TO RESPOND, *use any of the following contacts:* **Mail:** The Institute, IEEE Operations Center, 445 Hoes Lane, Piscataway, NJ, USA 08855-1331 **Fax:** +1 732 235 1626 **E-mail:** institute@ieee.org

An e-mail response is preferred, although no written submission will be ignored. It is unlikely that space will permit publication of all responses, although we will try to draw a representative sample. Comments are subject to editing for brevity and libel protection. Suggestions for discussion subjects are welcome. Please send them to any of the above contact points.

A Responses to December's Question

What's the value of peer review if it doesn't catch fabricated lab results, as in the case of Jan Hendrick Schön at Lucent?

Peer review isn't the problem

As a member of the committee investigating Schön's work, I do not see how external peer review could have uncovered data manipulation before publication. Peer review isn't designed to do that. A reviewer may be critical of many aspects of a manuscript, including the interpretation of whatever data are presented. But the reviewer must assume that the data itself is honest—especially if one of the authors is a senior individual with impeccable credentials, in effect adding credence to the work.

Even apparent disagreement with established science is not a reliable guide. Many of the spectacular 20th century advances in physics flew in the face of established principles that later had to be revised. The last thing in the world we want is a peer review process that stifles progress by blindly siding with negative reviewers. There are plenty of horror stories where major advances were rejected by journals, and the authors had to find another journal to publish their work.

The way to resolve any questions of credibility is not by behind-the-scenes arguments across the editors' desks, but by encouraging the scientific community at large to check the work. It is only when others are unable to confirm spectacular claims that suspicions may arise, but even then, honest mistakes and sloppy procedures are statistically more likely than outright deception and, therefore, are the first assumption. If we want a peer review process that does not retard progress by being destructively critical, we must accept the risk that a certain number of fraudulent papers will slip through.

What is shocking is that in Schön's case, a long series of such papers slipped through, before other researchers in the field went public with evidence of data fabrication. Some observers feel that the journal editors themselves should have caught on earlier. To me, it was less a failure of the external peer review process by the journals than a failure of the internal peer review at Bell Labs, especially within Schön's research group, which collectively had the expertise to conduct a review.

What we need is a code of conduct by the professional societies that represent the scientific community, a code that establishes the principle that every author shares responsibility for the entire contents of a paper, except for matters that fall demonstrably outside his or her competence. The American Physical Society has reacted quickly, and has already issued a code of conduct roughly along those lines. I believe it is time for the IEEE to do the same.

Herbert Kroemer
Santa Barbara, Calif., USA
Editor's note: *Kroemer is the 2002 IEEE Medal of Honor recipient.*

Stopping an epidemic

The sickness that drove Schön to commit academic fraud is the same one shared by countless other scientists—a senseless need to publish as many research papers as possible, regardless of merit. I have noted from reading researchers' biographies that this is something of a minor epidemic. Why hasn't there been closer scrutiny of these super-prolific people who sometimes claim to have written one paper every two or three weeks over the span of their professional careers? Nothing of importance can be done in two or three weeks. A respectable paper can rarely be written, typeset, and proofread in that time, never mind the research involved.

Furthermore, the co-authors involved in these fraudulent papers should be held equally responsible for any wrongdoing, and the shame they bear ought to serve as a warning to résumé-padding scientists who like to casually attach their names to papers that they have little or nothing to do with. Signing your name to a published paper should be like signing a contract, meaning all parties involved must know exactly what it contains.

Mark A. Mendlovitz
Los Angeles, Calif., USA

Choose interested parties

Peer review of papers is not a top priority for the average reviewer. It's probably done most carefully when professors hand manuscripts off to graduate or postdoctoral students. People pay the most attention to a paper when it may compete with their own work, so perhaps making sure that competing groups always get to review each other's work is the best we can do.

Robert Lingle Jr.
Atlanta, Ga., USA

Not the referee's main job

Many engineers will be as amazed as I was when I read of the subterfuge practiced by Jan Hendrick Schön. I can only wonder at what prompted him to pass off the same data several times in different papers.

It is not the principal purpose of referees to determine whether a paper is fraudulent, but whether the material presented for review is up to the standard expected for publication. It may happen that their suspicions are aroused, but in only the most important circumstances will they try to verify data.

It has always been understood that the person presenting papers for review is submitting valid data from his or her work. To expand the review process to find evidence of fraud will undermine the publication doing so and spoil the ethos surrounding it.

The ignominy of being discovered is sufficient to stop most engineers from passing off old work as new. Clearly there is a dilemma facing reviewers because unknown authors presenting papers probably need support and not condemnation.

More damage will be done if the review process is more explicit in seeking out fraud. If the process is more rigorous, then the reviewers will need access to similar papers at the outset. It is likely to extend the review process, which is already protracted.

Keith Moss
Tunbridge Wells, Kent, UK

Here's a response to November's question:

Can engineers build nuclear waste containment facilities that will be safe in perpetuity?

Beyond forecasting

Design issues include containment vessels, protection from earthquakes and other natural events, and, most problematic, protection from people and vice versa.

Protection against people is beyond forecasting. A containment facility will need continuous security and maintenance. But considering the rate of change in human society, how could engineers assure that these arrangements can survive any transmutations to come or extrapolate financial arrangements for 10,000 years into the future? How could this liability be included in the cost of a new power plant?

Long before 10,000 years, people will probably develop the technology to convert these wastes into isotopes with short half-lives. Of course, that will require money and energy. In that case, fission power is a way of borrowing energy and money from our descendants.

Jerry Morrison
Mountain View, Calif., USA

Meet the 2003 Class of Fellows

FROM ALI ABUR TO MENGCHU ZHOU, altogether 260 IEEE members from around the world have been designated IEEE Fellows this year. The highest grade of membership that any IEEE Senior Member can achieve, the distinction is awarded each year to no more than 0.1 percent of the voting membership as of 31 December of the preceding year. Like the 5,751 other active IEEE Fellows, each person in the 2003 Class of Fellows displays an extraordinary record of accomplishment in one or more of the IEEE fields of interest.

During this 40th anniversary year of the IEEE Fellow program, *The Institute* salutes these 260 new Fellows. They join a group that includes thousands of other distinguished IEEE members—past and present—who have contributed significantly to the advancement of engineering, science and technology.

Ali Abur
Richard A. Ackley
Ramesh K. Agarwal
Makoto Ando
Yasuhiro Ando
Teruaki Aoki
Ronald Craig Arkin
Ercument Arvas
Carl D. Avers
Heinrich Peter Baltes
Quirino Balzano
Robert T. Bannon
Michel Barlaud
Richard A. Belgard
Khaled Ben Letaief
Marek Edward Bialkowski
Josef Bigun
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Sreejit Chakravarty
Prosper Chemouil
Homer H. Chen
Dan De-vu Chen
Shang-Yi Chiang
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Kazuo Hotate
Shu Yuen Hui
Richard Henry Hulett
Dong-Seok Hyun
Hiroaki Ikeda
Ronald Scott Indeck
Mohammad Reza Iravani
Fumitada Itakura
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Kinam Kim
Ken-ichi Kitayama
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Toshio Koga
Henry F. Korth
Masanori Koshiba
John August Kosinski
Randall William Kreutel
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Vijay P. Kumar
Prem Kumar
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Yi-Bing Lin
K.J. Ray Liu
David B. Lomet
Qiang Lu
Kwai-Man Luk
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Mitsuo Makimoto
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Kemin Zhou
Mengchu Zhou

BY MICHAEL S. ADLER

The Rewards of Volunteering

One of my top priorities in my year in office is to focus on areas of strategic importance. Volunteerism is one of the most important. On a recent visit to our New Jersey office, I was surprised to hear the results of a recent survey, which suggested that most members are only vaguely, if at all, familiar with ways in which they can volunteer for the IEEE.

The IEEE is very fortunate to have a dedicated and very professional staff that supports its daily operations, but volunteerism is, and always has been, a core value of our organization. It's our volunteers who lead the IEEE at many levels and in many ways. Your elected and appointed officers, whether at the local or national level, are all volunteers. Editors, reviewers, authors, and conference organizers are volunteers, too. And there are numerous committee activities, including accreditation, pre-college, and public policy, for which volunteers carry out the work.

I recognize that many of you are very busy, and may sometimes find it hard to make time to volunteer. In fact, in the survey I cited, many of you told us that your time is at a premium. As you seek to balance your personal and professional lives, I hope you will consider the rewards of volunteering for the IEEE.

For me, the rewards have been great. My career has been enriched by what I have been exposed to as a volunteer. I have improved my "soft skills," including my ability to run meetings, solve problems, understand finances, and even how to deal effectively with others when we don't see eye-to-eye. I have also valued the professional exchanges on technical topics that I've had the good fortune to have with my fellow members.

I feel very strongly that we need to promote the importance of engineering as a profession, and that we need to encourage young people to consider engineering as a career. The IEEE is a great organization that does a lot for engineering by maintaining a global community of professionals. Volunteering is one way to give back something to the profession that has been the cornerstone of our careers.

As IEEE members, we all come from different places and experiences. Being able to share our backgrounds, work experiences, and technical ideas makes us all better and smarter people. Finally, and yet the most valuable aspect of volunteering, is the number of long-lasting friendships I have made along the way.

Dan Benigni, a former vice president of IEEE Regional Activities and this past year's Sections Congress chair, said it best: "You haven't made the most of your IEEE membership unless you have volunteered."

Volunteerism is, and has always been, a core value of our organization. It's volunteers who lead the IEEE at many levels.

If you are currently a volunteer, thank you. I hope you are finding your efforts personally and professionally rewarding. Please see what you can do about convincing some of your colleagues to get involved. If you are not presently volunteering, but would like to get involved, please send me an e-mail at president@ieee.org. I will get your name to the people who can discuss the opportunities.

Welcome to 'The (Revamped) Institute'

WITH THIS ISSUE, *The Institute* shifts to its new quarterly print frequency. As you see, the in-depth, feature-length articles are longer and have more photographs and illustrations, often in full color. New columns also profile individual members' careers and highlight products and services. In addition, we are covering professional accomplishments and honors in greater detail. We hope you like what you see. Look for the next edition with your June issue of *IEEE Spectrum*.

If you haven't read *The Institute Online*, please take the time to do so at www. ieee.org/theinstitute. Issues are posted by the 7th of every month.

Another novelty for *The Institute* is an e-mail alert service. Its job is to notify members when each online issue is posted each month, as well as highlight a selection of articles. Members who want to receive the alert and all other IEEE-related correspondence by e-mail can do so by providing an e-mail address at the "Update Your Address or Contact Info" link on www.ieee.org/membership. Members who want to receive the alert only should use the "Signup for The Institute Email Alert" link under the Services section at www.ieee.org/theinstitute.

We welcome your thoughts on these new formats. Send them to institute@ieee.org. —*Ed.*

Nomination Deadlines for 2003 Elections

ON 1 MAY, THE IEEE BOARD OF DIRECTORS will announce the candidates for elective positions who are to be placed on the 2003 annual election ballot for service beginning in 2004. The list will consist of those nominated for President-Elect by the IEEE Board of Directors and for other offices by the Regional and Divisional nominating committees, Standards Association, Technical Activities, and IEEE-USA. The Board must also consider proposed constitutional amendments. Members who have not been nominated by the Board of Directors or the committees, but who want to run for office may do so by filing written petitions to the Board by noon Eastern Time, 13 June 2003.

To get on the ballot, a member must accompany his or her petition with the necessary number of valid voting members' signatures. For information on these procedures, contact Angela Wyckoff, IEEE Corporate Activities, 445 Hoes Lane, P.O. Box 1331, Piscataway, N.J. 08855-1331; +1 732 562 3934; e-mail: a.wyckoff@ieee.org.

Nominations and appointments

Getting on the ballot is a three-step process. First, candidates are considered by the IEEE Nominations and Appointments Committee, and their names are forwarded to the Board of Directors, the IEEE Executive Committee, or the IEEE Assembly. Then, the Board selects candidates for IEEE President-Elect; the Board and Executive Committee appoints chairs and members of Standing Committees and the IEEE Assembly appoints officers.

Nominations are needed for positions on the following committees: Admission and Advancement, Audit, Awards Board, Credentials, Employee Benefits, Ethics and Member Conduct, Fellow, History, Individual Benefits and Services, Life Members, Meetings and Services, Membership Development, Nominations and Appointments, Publications Services and Products Board (PSPB), Strategic Planning, Tellers, and Women in Engineering. Nominations also are needed for Vice President-Educational Activities, Vice President-Publications Services and Products, IEEE Secretary/Treasurer or IEEE Secretary and IEEE Treasurer.

Recommendations must be submitted in writing to the Staff Secretary, IEEE Nominations and Appointments Committee, by noon Eastern Time, 14 March 2003. The general qualifications for committee and board service are the same as for other positions of leadership: competence, experience, willingness to take on the task, the time to participate, enthusiasm, vigor, and cooperation with others in achieving the objectives of the committee or board.

For information on nominations of candidates for 2004 Standing Committees and Boards, contact Mary

Ellen Hanntz, IEEE Corporate Activities, 445 Hoes Lane, P.O. Box 1331, Piscataway, N.J. 08855-1331; +1 732 562 6834; E-mail: m.hanntz@ieee.org.

2003 Deadlines

14 MARCH - Regional Committees submit slates of candidates for the office of Regional Delegate-Elect/Director-Elect, as applicable.

14 MARCH - Divisional Nominating Committees submit slates of candidates for the office of Divisional Delegate/Director or Divisional Delegate-Elect/Director-Elect, as applicable.

14 MARCH - Standards Association submits slates of candidates for the offices of Standards Association President-Elect and Standards Association Board of Governors Members-at-Large.

14 MARCH - Technical Activities submits slate of candidates for the office of Technical Activities Vice President-Elect.

14 MARCH - IEEE-USA submits slates of candidates for the offices of IEEE-USA President-Elect and IEEE-USA Member-at-Large.

14 MARCH - Recommendations to IEEE Nominations and Appointments Committee for candidates to 2004 Standing Committees and Boards. Assembly-elected positions and 2005 President-Elect.

1 MAY - Board of Directors submits to the voting membership a list of nominees for President-Elect; Delegate/Director or Delegate-Elect/Director-Elect, as applicable; and other positions to be elected by voting members for the coming term.

1 MAY - Board of Directors announces its intention to put forward a Constitutional Amendment(s).

1 MAY - Members of the IEEE Nominations and Appointments Committee must resign by this date if they expect to be candidates for 2004 IEEE Assembly-elected positions or any office nominated by the Board of Directors to the voting membership.

13 JUNE (NOON) - Petitions for Constitutional Amendments must be received. (Friday preceding 15 June.)

13 JUNE (NOON) - Petition nominations for candidates to be elected by the membership must be received. (Friday preceding 15 June.)

13 JUNE - Initial statements by principal initiators and opponents of Constitutional Amendments must be received.

13 JUNE - Corporate Activities must receive initial statements from all candidates.

23 JUNE - Corporate Activities mails copies of candidates' initial statements, as accepted, to competing candidates.

23 JUNE - Corporate Activities mails initial statements by proponents of proposed Constitutional Amendments to opponents and opponents' initial statements to proponents.

7 JULY - Receive rebuttal statements from all candidates.

7 JULY - Receive rebuttal statements from initiators and opponents on Constitutional Amendment proposals.

1 SEPTEMBER - Mail ballots to all voting members of Regions 1-10.

3 NOVEMBER (NOON) - Last day for ballots to be received from voting members.

7 NOVEMBER - Last date ballots can be tallied by Tellers Committee.

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

12 NOVEMBER - Elections by IEEE Assembly.

16 NOVEMBER - Assembly election results announced.

16 NOVEMBER - IEEE Board of Directors acts on report of Tellers Committee.

16 NOVEMBER - Election results official.

Offices Up for Election in 2003

The voting membership will vote for:

- President-Elect
- Technical Activities Vice President-Elect
- IEEE-USA President-Elect and IEEE-USA Members-at-Large–Elected by all voting members in Regions 1-6
- IEEE Standards Association President-Elect–Elected by all voting members of the IEEE Standards Association who are also voting members of the IEEE
- IEEE Standards Association Board of Governors Members-at-Large–Elected by all eligible members of the IEEE Standards Association

These positions are elected by all voting members in the respective Technical Divisions:

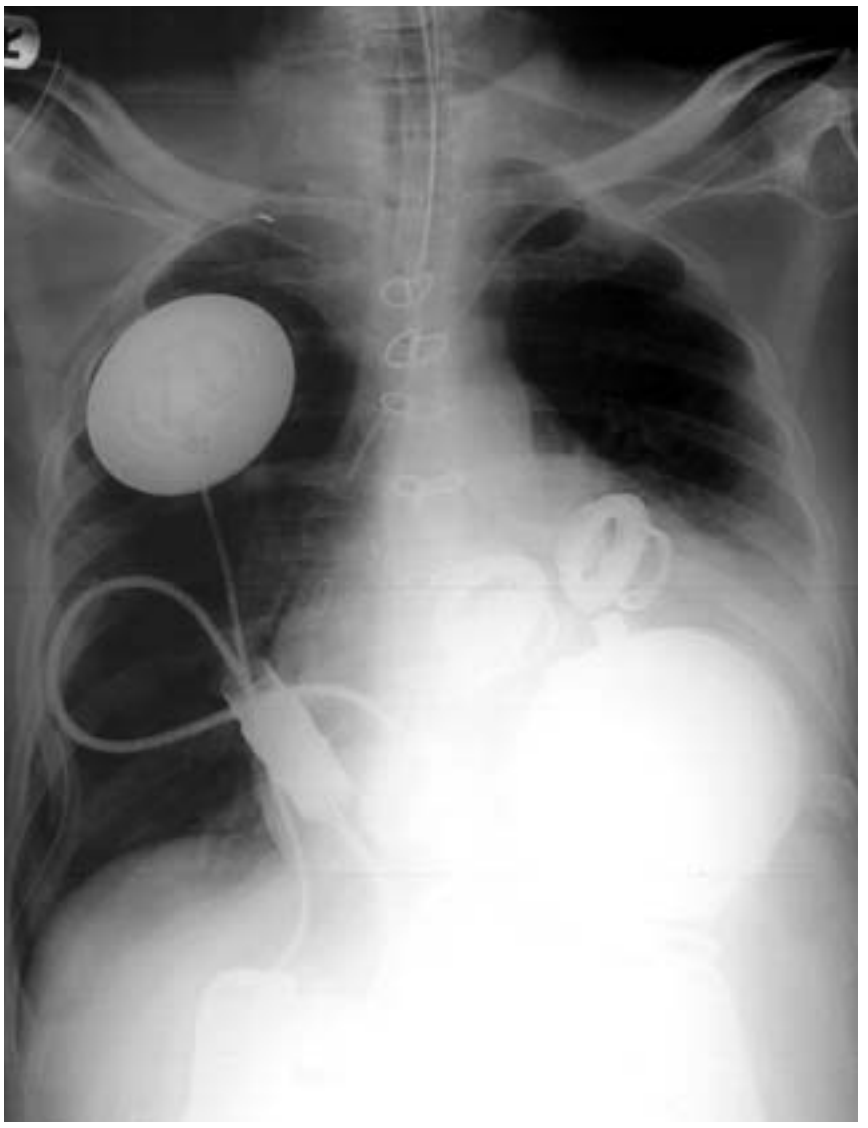
- Director, Division I (two-year term)
- Director, Division VII (two-year term)
- Director-Elect, Division IV (one-year term)
- Director-Elect, Division VIII (one-year term)

These positions are elected by all voting members in the respective Regions:

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

[**HEART** *from page 1*]
panelist at the meeting and chief of cardiopulmonary transplantation at the Texas Heart Institute, Houston. Meanwhile, there has been a gradual decrease in donor organs because deaths from homicide and automobile accidents have decreased with the enforcement of seat belt and helmet laws.

In 2001, Abiomed Inc., of Danvers, Mass., started clinical trials of an artificial heart meant for permanent long-term use. The replacement heart is attached to the natural right and left atriums with manufactured valves and pumps blood through two chambers that replace the heart's ventricles. The energy that powers the artificial heart is transmitted from a rechargeable battery pack worn around the patient's waist, across intact skin, to a smaller battery implanted in the abdomen.



An X-ray shows the first self-contained artificial heart implanted in a human recipient. The pump portion of the device is at the lower right; the disk at the upper left receives power through the skin from an external battery pack.

One patient, Tom Christerson of Central City, Ky., USA, has survived for more than a year with the AbioCor™ and returned home after seven months in the hospital. When Christerson joined the physicians and nurses who aided his recovery in the annual American Heart Association walk, it was a small step for the patient, but a giant leap for artificial heart technology.

If we can put a man on the moon then...

Artificial heart research dates from the start of the aerospace age, in the 1960s, when anything seemed possible. The feeling was that if science and engineering could put a man on the moon, they could create a small, reliable pump to function as a complete artificial heart, says IEEE Member Alan Snyder, another Houston conference panelist and professor of surgery and bioengineering at Pennsylvania State University Medical School, Hershey, USA.

Scientists and engineers thought building an artificial heart would involve little more than the application of existing technology, including new energy sources and control theories and exotic materials, Arzbaecher says. But the project proved to be far more complex than they expected.

For one thing, engineers who began to work on artificial hearts "became bioengineers because they learned they had to work with biological systems," Snyder says.

The years since the 1960s has seen three generations of artificial heart technology, according to IEEE Member James Antaki, director of artificial heart research at the University of Pittsburgh Medical Center, Penn., USA. Early devices mimicked a normal heart by beating in a pulsating fashion but were so large that they were never meant to fit in a chest cavity. The second generation arrived in the early 1990s after engineers had studied and improved upon the conventional bearings used in turbo machinery and propellers. The new heart pumps were smaller, simpler, and less expensive, but it was difficult to get a propeller for pumping blood to spin for 10 years, Antaki says. Now, Antaki and his colleagues are exploring so-called third-generation technologies that use magnetic levitation in place of bearings to support the propeller.

NOW THAT HOSPITALS can send patients home with artificial hearts, researchers are seeing limitations in how the hearts operate.

An explosion in the use of artificial hearts and ventricular assist devices (VADs) came in the early 1980s when new drugs allowed better immune system suppression, which led to more transplant surgeries. Waiting lists for donor hearts grew, creating a new population of patients in desperate need. According to Snyder, he often gave assist devices to younger, otherwise healthier patients who were suffering from heart failure and would die without a transplant. He reports these patients not only survived on the devices until an organ was available, but could exercise while waiting. Today, patients who are supported by VADs do better than patients who go directly to heart transplant surgery.

The observation that the heart improved if rested paired with successes using VADs, led to more research on ventricular assist devices. These were a critical advancement in artificial hearts. Because VADs were used to sustain a patient for just a short time until a transplant was available, engineers had to prove they were durable and reliable only for weeks instead of years.

New technologies hit the spot

Advancements in consumer electronics have been a boon to artificial organ technology. The technology behind cellphones, laptops, and CD players also helps researchers develop smaller artificial hearts and VADs that fit comfortably inside the body.

"Look at the technologies benefiting consumer products, delay that by five years, and then they will be applied in medical devices," Antaki says.

The biomaterials used in the medical products are artificial but seem natural to blood and the body's tissues. Their durability and compatibility make implanted devices in general, not just artificial hearts, more useful and safe.

Modeling now allows engineers to use a computer to simulate how a device might interact with the body. The process saves time and money in what would otherwise be a trial-and-error process.

The external battery packs that power total artificial hearts (TAHs), like Abiomed's, and VADs are getting smaller and easier not only for a patient to carry but to recharge and maintain.

Improved technology, however, often uncovers unanticipated problems. Now that hospitals can send patients in heart failure home to live and work normally, researchers are beginning to see limitations in how artificial hearts operate. For example, a pump may do fine when a patient is at rest but cannot reproduce a heart's normal response to, for instance, the adrenaline that indicates stress. To address this, Antaki and his colleagues are exploring sensors that detect signals from the nervous system and chemicals like adrenaline in the blood and then designing software to adjust the pump accordingly.

"We're taking a relatively ignorant piece of hardware—a pneumatic pump—and giving it a brain," Antaki says. "Then we steal from nature and copy what the natural heart does."

THE FEELING WAS THAT if engineers could put a man on the moon, they could create a small pump to function as an artificial heart.

Researchers are also trying to understand why complications such as infection, blood loss, and strokes occur after an artificial heart is implanted. Fortunately, one complication biomedical engineers have not often encountered is component malfunction, says IEEE Member Harvey S. Borovetz, another panelist in Houston and professor and chair of bioengineering at the University of Pittsburgh, Penn., USA. The electronics are very reliable.

Also, biomedical engineers' understanding of how blood and other systems interact is incomplete. An artificial organ needs to be inserted not just physically but functionally in a larger system, one that is not completely understood, Snyder says.

"Often, we don't know what it is that we don't know," Antaki says.

Take a chance on life

In the AbioCor™ artificial heart trial, few of the nine patients were as fortunate as Christerson and died within a few months. Snyder says that even such a short survival is an amazing achievement. TAH patients are chosen because they are not expected to live another month with traditional medical treatment.

"It is typical that the first patients to get this device are very ill because it's easier to justify the use of an experimental device for someone who has no conventional treatments left," he says. "And when you put devices in patients who are extremely sick, you can't expect complete recovery."

Long-term survival was not even considered when Borovetz started working with artificial hearts. The best researchers could hope for was to support a patient in an intensive care unit for a short time. Now biomedical engineers are talking about patients with implanted hardware playing golf, going back to work, and living quality lives.

Using an artificial heart as an interim step until a donor's real heart is available has been much more successful than permanently implanting an artificial heart. Borovetz and the University of Pittsburgh Medical Center (UPMC) surgeons implanted their first artificial heart in anticipation of a donor in 1985. That patient lived 11 years after receiving a donor heart. Overall, 85 percent of patients at UPMC implanted with artificial hearts, which include Jarvik, Novacor, Thoratec, HeartMate, and TandemHeart devices, lived long enough to receive donor hearts.

Science's growing interest in regenerative medicine is evidence that researchers know that artificial heart technology has its limits. Using these devices to sustain a patient until a transplant can be done acknowledges that the best solution is a natural organ, Antaki says.

"Pleased as we are with using this technology as a bridge to transplant, it has had little effect on the ultimate outcomes of congestive heart failure because of the low availability of donor hearts," Snyder says. "Both permanent mechanical devices and new technologies for building and regenerating natural tissue will play important roles in the future."

Society Snapshot

With more than one-fourth of its approximately 8,000 members residing outside of the United States, the IEEE Engineering in Medicine and Biology Society (EMBS) is the largest international society of biomedical engineers in terms of the number of individual members.

The Society publishes the following Transactions and Magazine:

- *IEEE Transactions on Neural Systems and Rehabilitation Engineering*
- *IEEE Transactions on Information Technology in Biomedicine*
- *IEEE Transactions on Biomedical Engineering*
- *IEEE Transactions on Nanobioscience*
- *IEEE Engineering in Medicine and Biology Magazine*

In collaboration with other Societies it also publishes:

- *IEEE Transactions on Medical Imaging*
- *IEEE Transactions on Neural Networks*
- *IEEE Transactions on Pattern Analysis and Machine Intelligence*

Writing a Code of Ethics

"A code of ethics functions like a technical standard, only it's a standard of behavior," says Joseph Herkert, former president of the IEEE Society on the Social Implications of Technology and now an associate professor of multidisciplinary studies at North Carolina State University, Raleigh, USA.

BY ERICA VONDERHEID

Like any other standard, creating and writing a code of ethics has many stages, each requiring careful consideration and review. Every engineering company should have such a code. But unlike a normal standards-setting process, engineers can skip the step of gaining the consensus of employees because the need for such a standard is very clear.

"A code of ethics is a way of telling engineers it's all right to follow their own sense of values," says Roy E. Harris, ethics officer at NASA Jet Propulsion Laboratory (JPL) at the California Institute of Technology, Pasadena, USA. "And it establishes for employees, customers, and the public just what kind of company the company is."

More Than Just Conduct

Many companies have a code of conduct that includes statements on discrimination, conflict of interest, and employment regulations, but these codes may omit specific mention of ethics.

"Codes of conduct don't say much about ethical principles," says IEEE Member and Computer Society Distinguished Lecturer Samuel Biondo. "They usually say 'you should not do this.'" A code of conduct might say an employee may not accept a lunch worth more than US $10 from a vendor or organization. Such regulations do not help an engineer learn ethical principles, Biondo points out, just that a US $8 lunch is acceptable.

A good code of ethics includes seven basic principles: truth, honesty, trustworthiness, respect for human life and welfare, fair play, openness, and competence, according to IEEE Life Fellow Stephen H. Unger in his book, *Controlling Technology: Ethics and the Responsible Engineer*.

Notes Herkert: "These are all things we should do every day, but putting it down on paper and framing it in the context of the organization is a more concrete reminder that you don't check your ethics at the door when you come to work."

Start at the top

"It would be best if the process started as a glimmer in the eye of the CEO," Harris says. The CEO's participation tells everyone else in the organization that ethics is taken seriously. Then ask coworkers from all organizational levels, including upper management and rank-and-file employees, what kind of company they want to work for, Harris continues.

Look at other codes of ethics

Codes of ethics at government agencies, universities, or large corporations often use vague language. A smaller entity may need more specific wording to reflect its values or provide guidance on dilemmas the group may face, Herkert says. A good place to start is the IEEE Code of Ethics, found online at http://www.ieee.org/about/ whatis/code.html.

When determining what issues your code should encompass, says Biondo, keep three words in mind: exposure, liability and conscience. As he explains, think about what would happen if a certain behavior were exposed, what the liability to yourself and the company would be, and if your conscience would allow it.

Read case studies, but don't rely on them exclusively

Examples of ethical dilemmas, both real and fictional, prod an engineer to think about how he or she would react in a similar situation. But case studies don't always provide the insight and guidance needed to face other ethical dilemmas.

"You can study the Challenger disaster [the 1986 U.S. Space Shuttle explosion caused by a faulty O-ring that killed five astronauts and a school teacher and payload specialist] every which way," Biondo says. "But as an electrical engineer, you may never get into a similar situation."

The Online Ethics Center for Engineering and Science at Case Western Reserve University (Cleveland, Ohio) at http://www.onlineethics.org has compiled case studies covering engineering practice, diversity, and responsible research, and other resources such as profiles of ethical leaders, essays on ethics, and a bibliography of books and articles.

Get it approved

Go through the same organizational channels used to get any other policy matter approved. For example, in 1999, the IEEE Computer Society and the Association for Computer Machinery worked together to develop a code of ethics for software engineers. Organizers decided to get it approved using the same process as a technical standard. The authors put the code on the Internet, developed a working group of engineering ethics experts, solicited suggestions and then voted on a final code. View the finished product at http://computer.org/ certification/ethics.htm.

Remind and reinforce

The organization's top executive should introduce the new code of ethics to everyone in the company and, at the same time, provide an introduction to ethical principles, according to Harris.

No matter how good a code is, a group needs someone to interpret it and show how to apply a general code to a specific situation. Thus, each organization should designate one person or a group of people as ethics officers, whose job it is to answer questions about the code. What's more, company executives and managers need to talk to their co-workers about ethics every chance they get, and explain how ethical principles may have influenced any of their decisions. Adds Harris: "Employees should take an ethics refresher class periodically. At JPL, all employees must take an ethics class annually." [Read more about ethics officers in "The Ethical Officer," *IEEE Spectrum*, December 2002, pp. 56–58.]

IEEE

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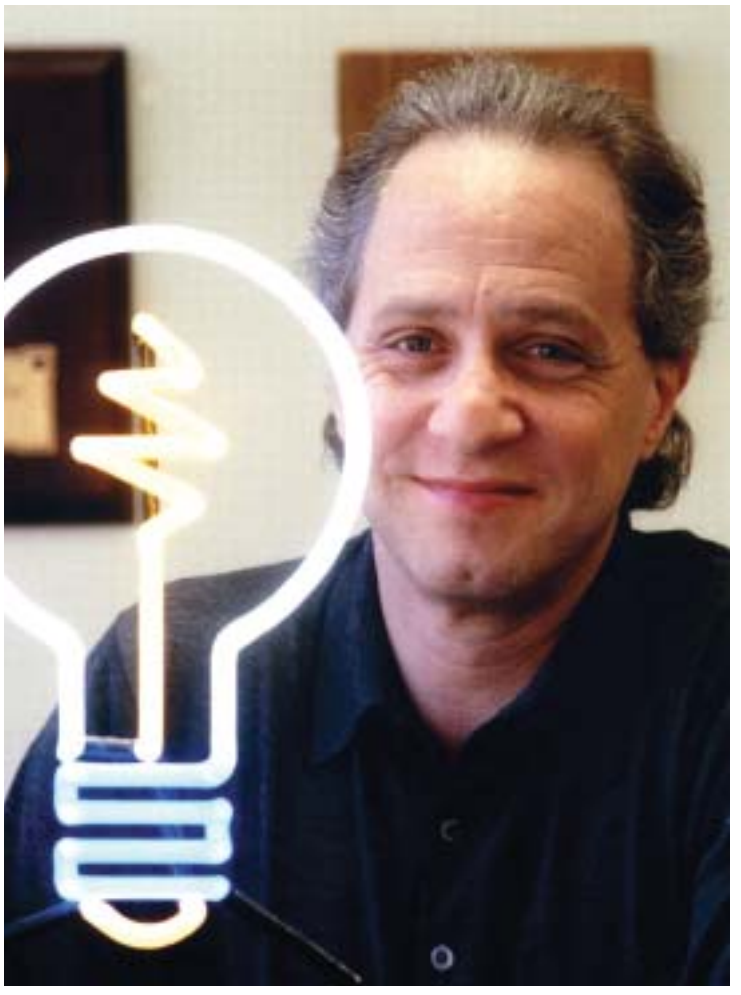
Among IEEE members, who can claim to have correctly predicted a host of technological breakthroughs, jammed with musician Stevie Wonder, shared secrets with U.S. television host Steve Allen, and performed as a virtual 25-year-old rock 'n' roll star named Ramona?

BY ERICA VONDERHEID

Ray Kurzweil is the only one who can, and he's been led to do all this by his interest in technology.



Looking to the past to see the future

Kurzweil's interest began in high school when he invented a machine for recognizing patterns in music and writing original melodies in the style of composers such as Mozart or Chopin. The machine landed him on the "I've Got a Secret" TV show hosted by Steve Allen, where a panelist — a former Miss America — failed to guess that Kurzweil's machine had composed the music she just heard.

"Human thinking is based on pattern recognition, not fast logical analysis, and we're very slow at it, compared to a machine," Kurzweil says. "So how can a human play chess against a machine? It's because of pattern recognition."

After studying the unusual combination of computer science and creative writing at the Massachusetts Institute of Technology, Cambridge, Kurzweil founded Kurzweil Computer Products, also in Cambridge. From it emerged the first text-to-speech reading machine for the visually impaired and the first flatbed scanner to use a charge-coupled device (CCD). A friendship with Stevie Wonder grew after the blind musician bought one of Kurzweil's reading machines. Wonder's friendship led to another first for Kurzweil Computer: a computer-based musical instrument that could sound just like a grand piano or various other orchestral instruments.

After working on just a few projects, Kurzweil realized that because they each took time "the world was different when I finished a project [from] when I started," and he had "to time the projects so they make sense when they're done." This insight prompted him to study technology trends, which turned into another vocation, writing books. In *The Age of Spiritual Machines* (1990) Kurzweil predicted the emergence of the World Wide Web and a computer's winning the world chess championship. *The Age of Intelligent Machines* (1999) imagined a world where the line between computers and humans blurs and Kurzweil predicts where technology can take us in the next century.

Kurzweil's predictions are no small feat if, as he believes, the rate of innovation doubles every decade, according to his law of accelerating returns.

"Some say it took us 40 years to adopt the laser, so it will take us 50 years to adopt other new technologies such as nanotechnology," Kurzweil says. He disagrees. "You can use lessons of the past to predict the future only if you factor in the inherent acceleration of the pace of progress," he says.

His forthcoming book, *The Singularity is Near*, examines the geometrical growth of technology over the last century and predicts a "technological change so rapid and so profound that it represents a rupture in the fabric of human history." When this event, which Kurzweil calls the singularity, occurs, machine intelligence will match human intelligence. He predicts the singularity could happen as soon as the middle of this century.

Hanging around

Will his predictions about the next century's technology prove accurate? At 55 years of age, Kurzweil intends to live long enough to find out.

Several years ago he was diagnosed with diabetes, but through diet and lifestyle changes, he is now symptom free. The illness provoked an interest in health. This year he is publishing his second book on longevity and health, *A Short Guide to a Long Life*, with Dr. Terry Grossman, a physician and author of *The Baby Boomer's Guide to Living Forever*.

Kurzweil argues that if you can live to the year 2010, biology and technology innovations could theoretically carry you on for another 800 years or more, maybe not in the same body but with the same mind.

He suggests thinking of our bodies as hardware and our minds as software. When a personal computer crashes or becomes obsolete or unrepairable, we simply transfer the old data onto a new machine. If biological science can re-grow every organ system, including our brains, as Kurzweil predicts will happen by the end of the 21st century, then when our bodies fail, we can upload our "software," our memories and intelligence, into new "hardware," a healthy new body.

Considering that by 2020, an inexpensive computer will have the same processing power as the human brain, Kurzweil writes there is no reason our minds can't expand and survive.

"We can profoundly expand the [*Continued on page 16*]

IN MEMORIAM

Robert Tanner First Canadian IEEE President

BY ROBERT T. H. ALDEN

2002 IEEE Haraden Pratt Award recipient

I met Bob Tanner on perhaps only half a dozen occasions, but had several long chats with this gentleman. Both in my initial impressions of him and in coming to learn about the IEEE's history and development, I found my fellow Canadian to be a very kind, caring, able, and devoted volunteer. He did a tremendous amount of work to help the IEEE become a more international organization and give non-U.S. Regions more independence and self-governance. In 1973, when he was the first Canadian IEEE President, the IEEE was only just beginning to allow Regions to be self-governing.

I remember attending my first Region 7 (Canada) meeting, which was held and run by the IEEE staff at the United Engineering Center in New York City—so much for making local arrangements. His involvement as chair of the first IEEE long-range planning committee, the first after the merger of the American Institute of Electrical Engineers and the Institute of Radio Engineers that became the IEEE, and the differences of opinion and practice contained therein, certainly set the stage for the IEEE's forward-thinking evolution.

When Bob became IEEE President, I was just beginning my involvement in Region 7 activities and since those early days, he has inspired me to become a pro-active IEEE volunteer in both my Region and worldwide.

As IEEE members, we continue to enjoy the benefit of his wisdom and guidance over his distinguished volunteer career. It was a real pleasure to have known one of the IEEE's brightest stars.

ROBERT H. TANNER, 87

DIED: 2 Nov. 2002

MEMBER GRADE: Life Fellow

EDUCATION: Imperial College of Science, Technology and Medicine, London

FIELD OF INTEREST: Acoustics

CAREER MILESTONES: Before World War II, Tanner worked for the British Broadcasting Corp. in the U.K. After the war he immigrated to Canada and joined Northern Electric in Belleville, Ontario. After retiring from electrical engineering, he designed acoustical systems for the Festival Theatre in Stratford, Ontario, the Elgin and Winter Garden Theatres in Toronto and the Naples Philharmonic Hall in Florida, USA.

IEEE VOLUNTEER ACTIVITIES: IEEE President 1973

AWARDS: IEEE Canada's McNaughton Gold Medal, IEEE Haraden Pratt Award for Service, and the IEEE-USA Award for Engineering Professionalism.

MEMBER RECOGNITION

Kudos to Two Members for Global Positioning System

BY HELEN HORWITZ

WHAT TELLS YOU WHERE YOU ARE and helps you get to where you want to be? The Global Positioning System (GPS), as navigators of ocean-going vessels and many earthbound motorists and plain old hikers will quickly respond.

Last month, IEEE Fellow Ivan A. Getting and IEEE Senior Member Bradford W. Parkinson shared the US $500,000 Charles Stark Draper Prize of the U.S. National Academy of Engineering (NAE) for their individual efforts in the development of GPS.

Originally designed for the U.S. Department of Defense, the GPS is highly valued for its precise, real-time positioning coordinates. It is particularly helpful to the U.S. military, which applies the system in nearly all facets of modern warfare, supplying equipment to its foot soldiers and installing it on ships, vehicles, helicopters, and aircraft.

"With over 50 years in development and system implementation, many dedicated scientists and engineers made significant contributions to the GPS," Getting says. Adds Parkinson, "The Draper Prize is a wonderful recognition, and I thank the NAE [on behalf of] all the people who worked so hard to make the GPS possible."

Getting, who served as 1978 IEEE President, noted GPS is being used in a growing number of applications because of its wide range of designs, high accuracy, and all-weather capabilities.

Prior to becoming president of Aerospace Corp. in 1960, Getting was a professor of electrical engineering at the Massachusetts Institute of Technology. During World War II, he worked in its famous Radiation Laboratory.

From 1972 to 1978, Parkinson, a retired U.S. Air Force colonel, created and headed the NavStar GPS Joint Program Office, responsible for developing GPS for the military. He later served as a vice president at both Rockwell International and Intermetrics, and as president of PlantStar, a subsidiary of Intermetrics. Since 1984, he has been a professor of aeronautics and astronautics at Stanford University. He and his students pioneered the use of the more accurate differential GPS for blind airplane landings, automatic tractor steering, and automatic space-vehicle guidance.

The annual Draper Prize is intended to increase public understanding of the contributions of engineers and the technological advances that foster human welfare.

Send your recent recognition or honor by e-mail to institute@ieee.org, by fax to +1 732 235 1626 or by postal mail to The Institute, 445 Hoes Lane, Piscataway, NJ, USA 08854. Include the member's name, city, state or province, country, IEEE member grade, the name of the recognition and its significance.

[MEMBER PROFILE *from page 15*]

Introduced in 1976, the Kurzweil reading machine, one of Kurzweil's early inventions, was the first print-to-speech reading machines for visually impaired people.

human bandwidth and ability to experience the world while we expand our longevity," Kurzweil says.

Kurzweil is already working on expanding his own world, or, more accurately, his own reality. He uses virtual reality to metamorphose himself into Ramona, a 25-year-old female rock star. When Ramona performs, occasionally during keynote speeches Kurzweil has been asked to deliver at technology conferences, she usually sings a cover of Jefferson Airplane's "White Rabbit" or an original composition called "Come Out and Play," with Kurzweil's movements and voice being transformed into hers on a screen.

"Virtual reality gives you a different sense of your own identity. Kurzweil says. "Ramona gives me a more relative view and opens up other personalities,".

For more information on Ray Kurzweil's projects, visit http://www.kurzweilai.net.

Help! I'm Hosting a Conference

BY KATHY KOWALENKO

If you're a first-time organizer of an IEEE conference, your to-do list can become much too long. Everything from selecting a site to budgeting and putting together a technical program can turn into a temporary full-time job. As a sponsor or co-sponsor of more than 300 conferences a year, IEEE Conferences can save you time and give your meeting a professional look.

"At any given time, we are monitoring 500 to 1200 conferences that the IEEE is involved with financially, technically or just lending its name to," says Mary Ann DeWald, senior manager, conferences. Her department, located at the IEEE Operations Center in Piscataway, N.J., acts just as an outside contractor would to help you plan, organize and make the arrangements for your conference. It is divided in two groups: Conference Services and Conference Management. Other IEEE groups help with travel arrangements and publishing a proceedings.

Navigating the maze

Conference Services should be the first stop for all IEEE conference organizers. Register your conference here and the staff will enter its details—like date, location, Web site address if it has one yet, keywords relating to the conference topic, and contact information—in the IEEE's Web conference search site at www.ieee.org/conferencesearch. This site replaced the IEEE's printed Technical Activities Guide.

The staff of Conference Services will also guide organizers through the maze of compliance and financial reporting requirements. A guide for organizers has been put together on the Web at www.ieee.org/organizations/tab/conflink.html. Included are items such as a meetings organization manual, which has tips on how to plan and schedule a meeting, a list of forms to complete, guidelines on using the IEEE Master Brand, and samples of the contracts with which every conference organizer will have to get involved.

The next step, or even the concurrent step, is to check in with Conference Management. This group helps you through the nitty-gritty details for everything from picking your hotel to making sure speakers have water at their podiums [see "Getting Organized," below].

Once a place and date have been chosen, the next step is make travel arrangements for your attendees. Enter IEEE Global Travel Services. They can offer attendees zone fares and bonus discounts. Zone fares are only available to groups of 10 or more traveling to the same destination at the same time. But these fares require no Saturday night stays and are ideal for mid-week conferences.

Conference organizers also are entitled to benefits like free airline tickets, car rentals, and other incentives based on the travel volume.

Global Travel also can make rental car reservations, provide trip protection insurance, and even help obtain visas or passports for U.S. citizens traveling abroad.

"Travel Services, Conference Management and Conference Services work as a team to coordinate all the organizer's needs," says Sherry Russ, who manages the IEEE Global Travel Services area.

Timely conference proceedings

The most critical concern for many organizers is publishing the conference proceedings and getting them to the meeting on time.

Even though a conference may be held each year, many organizers are new to the process of collecting manuscripts, converting files and, finally, printing a proceedings. "It's really a difficult task for them," says Ann Burgmeyer, manager of IEEE Conference and Custom Publishing. "We are the glue that holds the conference together because of our publishing experience, and we provide a stability factor as organizers change from year to year."

Burgmeyer's group of publishing experts has not missed a distribution deadline since it started more than a decade ago. Whether the conference is small or large, the custom publishing staff will handle everything from pre- and post-conference publishing and setting up the submission Web site to converting manuscripts into an IEEE Xplore®–compliant printed book or CD-ROM and handling delivery to the conference.

Custom Publishing can also help authors of conference papers through an automated manuscript submission, conversion and proofing system.

To learn more about **Conference Services** or **Conference Management** contact Mary Ann DeWald at +1 732 562 3873 or by e-mail at m.dewald@ieee.org.

To reach **Global Travel Services**, contact Sherry Russ at +1 732 562 3980, by e-mail at: s.russ@ieee.org, or visit www.ieeetravelonline.org.

For more information about **Conference and Custom Publishing**, contact Ann Burgmeyer at +1 732 562 3980 or by e-mail at: a.burgmeyer@ieee.org or conferencepublishing@ieee.org.

Getting Organized

From site selection and technical program coordination to registration and financial reports at the very end, IEEE Conference Management helps organizers produce professionally managed conferences. While Conference Services deals primarily with compliance and financial reporting issues, Conference Management staff can coordinate an entire event or just some of its components. These include reviewing contracts prior to execution, handling online conference registration, managing your exhibit and, once the conference is under way, even, should you wish, surveying the attitudes of attendees. Find out more about the services by visiting www.ieee.org/conferences/cms/intro.html.

To update organizers on the latest conference management issues, an electronic newsletter is distributed quarterly to conference chairs, Society officers, and Regional conference coordinators.

IEEE Quick Guide

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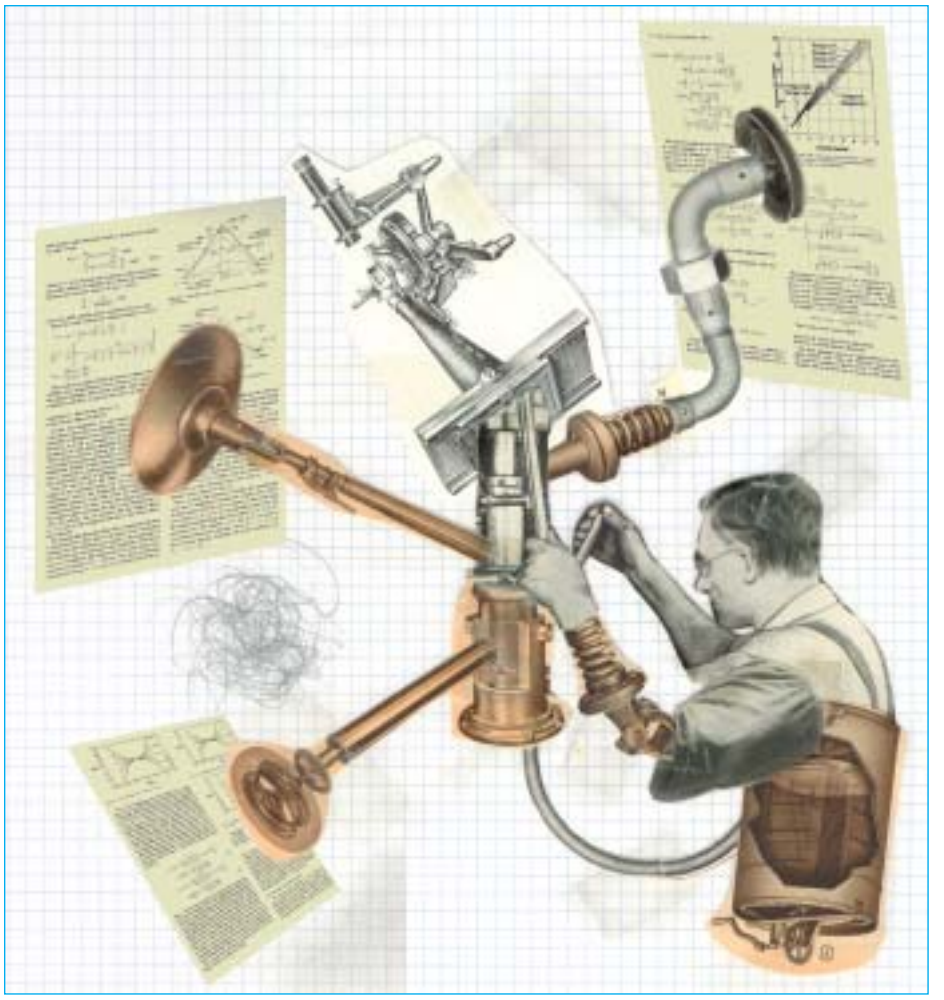
[**E-PUBLISHING** *from page 1*]

templates to submit articles are guaranteed their articles meet the IEEE's criteria. They will be able to log on from anywhere and retrieve pages to proofread and correct by using Web-based PDF files. What's more, shipping charges are eliminated because article proofs need not be mailed back and forth.

E-Publishing Tool Box

Here's what the tools being developed for the IEEE'S e-publishing system will allow authors to do.

- Submit articles for publication
- Validate references cited in articles
- Submit keywords so articles can easily be searched
- Include ancillary files from multimedia, interactive equations, or data sets, along with text
- Easily drop in and format graphics
- Create equations
- Validate articles through online peer review
- Create and format text according to predesigned templates that make it look good on a page
- Review articles before publication
- Fill out copyright forms
- Order reprints
- Determine the article's status as it moves through the production process



How it works

The publishing process begins once a decision has been made that a paper is worth publishing—in other words, once its contents have been validated by the IEEE Manuscript Central™ peer-review system. The author may then choose to submit the material electronically, using an MS Word or LaTeX template that mimics an IEEE formatted paper. Embedded in the template are instructions about how to provide material, and these the author replaces with the actual article text.

Next, IEEE staff editors electronically compose the article on the page and check spelling, formulas, and tables. Once they consider the article to be in a final state, they generate high-resolution PDF proofs of the pages and such associated documents as reprint orders and copyright forms, plus instructions for filling them out.

When the documents are ready, the author can check proofs of them on the Web. A staff editor sends the author an e-mail notification with the article's title, a user-identification number and password, and a link to the site from which the article can be downloaded, along with instructions for doing so. The proofs are of the actual composed pages as they would appear in the print journal or transaction and in IEEE Xplore®, according to Melley.

"If authors have the full version of Adobe® Acrobat®, they can make notations on the proof. Or they can use other methods, such as e-mail or fax to communicate changes," Melley explains.

Next target: graphics

The next phase is improving the Web-based tools for creating graphics. Because graphics can be complicated to format, authors will use new tools enabling them to drop in their graphics and get instant notification of whether they are suitable for printed and Web-based products. If the graphics don't make the grade, authors will be instructed on how to fix them.

"We are striving to be the publisher of choice, and these new tools will help us be that," Melley says.

Insure Your Future

Guaranteed 10-year protection

NEW PROGRAM FOR IEEE MEMBERS

The new 10-Year Level Term Life Insurance Plan from the IEEE Financial Advantage Program helps offer your family financial security if you or your spouse were to die prematurely.

Designed specifically for IEEE members under age 65, this Plan offers ten years of financial security with a benefit amount and premiums that are guaranteed to remain level.

The Plan features options up to $2,000,000. Attractive rates and money-saving discounts are available if you're a qualified non-smoker and/or you elect higher options of coverage. Other valuable benefits include a continued interest account and an accelerated death benefit provision.

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