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IEEE HISTORY CENTER

THE STATE UNIVERSITY OF NEW JERSEY RUTGERS

Preserving, Researching, and Promoting the Legacy of Electrical Engineering and Computing

STATIC FROM THE DIRECTOR

As this newsletter goes to press, we have passed the first anniversary of the horrific events of September 11, 2001. As I wrote almost a year ago, in the November 2001 newsletter, the recent occurrences make more vital our efforts to give the public a better understanding of technology and engineering, and a better appreciation of their place in society and their potential to benefit mankind.

On the education front, the IEEE Virtual Museum continues to be a major component in IEEE's pre-college program. The latest exhibit to

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TELESTAR Earth Station at Andover, Maine, as it appeared in TELSTAR's time

IEEE HISTORY CENTER

Issue 60 October 2002

WOMEN IN TECHNOLOGY

IEEE Virtual Museum, Celebrates Women's Contributions to Technology

Quick, name a famous woman technologist. Chances are, if you're like most people, the first name you thought of was either Ada Lovelace or Grace Hopper. While these women certainly represent milestones in women's involvement in technology, the flip side is the unknown women who, en masse, played a major role in the development and use of technology. The IEEE Virtual Museum's newest exhibit, *Women and Technology*, celebrates the contributions of both the remembered and forgotten.

Sometimes the role women played in developing technologies is direct, such as Lovelace's work with Charles Babbage or Hopper's development of a computer compiler. More often, it is oblique. Historically denied the education needed to become engineers, women most often made their contributions as users and builders of new technologies. This included their roles as telegraph—and then telephone—operators, factory workers for electrical manufacturers such as the Westinghouse Corporation, and finally as consumers of electrified products such as those needed to run a household. As the pri-

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open is *Women and Technology*, and for the first time an exhibit is accompanied by instructional material which will enable educators to make better use in the classroom of the VM's content (see page 1). On the collegiate front we continue our interaction with Rutgers University at the undergraduate, graduate, and faculty level.

In the area of outreach to the broader community, the IEEE Milestones in Electrical Engineering and Computing make up our flagship program. The Milestones Program is based in the IEEE Sections, and gives members a chance to engage their neighbors and local media in an activity promoting the contributions of engineers to the local community, the nation, and the world. This summer four more Milestones were dedicated. In the IEEE UKRI Section, IEEE honored the "Shannon Scheme for the Electrification of the Irish Free State, 1929."(see page 3) While the dedication ceremony for this event was very well received and publicized, an even more unusual dedication was held on July 11, the 40th anniversary of the first Telstar transmission, to recognize that momentous achievement as an IEEE Milestone. To do so, the IEEE's first ever three-way Milestone dedication was held at all three original Telstar ground stations in the IEEE France, Maine, and UKRI Sections, and linked via satellite. The descendent of the technology being honored was used to make the occasion an international celebration. IEEE members and dignitaries gathered at Pleumeur-Bodou in Brittany, France, Andover in Maine, USA, and Goonhilly in Cornwall, UK.

Each site brought its own local flavor to the event, as well as participating in the joint tele-activities. I was privileged to attend the doings in Andover, where I was impressed and gratified at the way the IEEE Maine Section and the Town of Andover pulled together to make it a day to remember. The Town set up a tent on the common where they allowed the plaque to be placed, and opened the town hall to exhibits by the IEEE Section and others. A local construction company installed the plaque for no charge. A local ski resort provided a bus and driver to ferry visitors to the site of the original radome. The local historical society opened their museum for special hours. The church catered a special lunch (including the Pastor's own special home-made ambrosia). Many of the old-timers who had worked on or at the Telstar ground station came back for a reunion. And not only did we have a great time, but the program fulfilled its mission. The story was picked up by Maine Public Radio and by local and statewide newspapers, which all made the point that people should not take for granted the global telecommunications network of the 20th century, which was made possible only by the brilliance and hard work of engineers.

Furthermore, as we go to press, preparations are underway for the dedications for two more Milestones that were just approved. These are "Pioneering Work on the Quartz Electronic Wristwatch, 1962-1967" in the IEEE Switzerland Section and "Code-breaking at Bletchley Park during World War II, 1939-1945" in the IEEE UKRI

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The newsletter reports on the activities of the Center and on new resources and projects in electrical and computer history.
It is published three times each year by the IEEE History Center.

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SHANNON HYDRO-ELECTRIC SCHEME CELEBRATES MILESTONE

It was 1925, shortly after the establishment of the Irish Free State, that Minister for Industry and Commerce, Patrick McGilligan pressed for approval of the dream project of native born engineer Thomas McLaughlin - the harnessing of the energy of the Shannon River. Visiting the United States and Canada he consulted with many prominent politicians and industry leaders, not the least of whom was USA Trade Minister (and later President) Herbert Hoover. One could speculate that his meeting with Hoover may well have inspired a later quote attributed to the President. Speaking about the importance of the engineering profession Hoover said:

"It is a great profession. There is the fascination of watching a figment of the imagination emerge through the aid of science to a plan on paper. Then it moves to realization in stone or metal or energy. Then it brings jobs and homes to men. Then it elevates the standards of living and adds to the comforts of life. That is the engineer's high privilege."

Certainly that kind of thinking was utmost in the mind of McLaughlin when he was discussing the Shannon Scheme abroad. He ultimately concluded that the success of the Shannon Scheme would require the Government to partner with private industry. After a careful analysis of the options available, Siemens-Schuckertwerke was selected and the project was initiated in August 1925. Almost immediately there followed a strike action where the principal issue was wages. This action was settled by December but reportly not entirely to the satisfaction of the workers. Apparently, for some time after, the patrons of the local Limerick pubs sang these satirical verses:

Ardnacrusha Generating Station, photo courtesy of ESB.

Thirty-two bob! Thirty-two bob!
Come and we'll give you a beautiful job!
Come and enjoy some light recreation,
Down on the Shannon electrification.

All you've to do is spend a few hours
Admiring the sun as it shines through the showers,
While you're up to your waist in mud and in stink,
Wielding a shovel or staking quick lime,
Shoving a barrow or lifting a load,
Digging a channel or making a road.

We don't want to strain you,
And so we won't detain you.
For more than fifty hours on the job,
And for that we will pay you thirty-two bob!

Nevertheless all's well that ends well. With the formation of the Electricity Supply Board (ESB) in 1927 and first energy out of the Ardnacrusha Generating Station in October 1929, the Free State of Ireland experienced an unprecedented growth in electricity consumption. It is this heritage and the unique engineering characteristics of the project which inspired the IEEE, in partnership with the American Society of Civil Engineers, to mark this site as an Engineering Milestone.

On July 29th, more than one hundred people gathered on the generator floor of the Ardnacrusha power plant for the dedication ceremony. IEEE President Ray Findlay and ASCE President-Elect Tom Jackson did the honours. Minister of State at the Department of Enterprise, Trade and Employment, Michael Aherne, representing the Government, ESB Chief Executive Padraig McManus, and Siemens Managing Director Richard Crowe rounded out the list of speakers. In celebration of ESB's 75th anniversary a book titled "The Shannon Scheme" was also launched by broadcaster John Bowman. Following the ceremony, tours of the generating

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Women in Technology

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mary decision makers as to what appliances to buy for the home, women exercised an enormous amount of economic power. The early electronics and computer industries, both born during the labor shortages bought on by World War II, also relied on women in its earliest days. Most of the first programmers of ENIAC, for example, were women.

Ada Lovelace

In addition to exploring the past, *Women and Engineering* also examines the present and future of women's involvement in technology. As we are all painfully aware—and despite the efforts of the profession—engineering largely remains the province of men. In the mid-1970s women comprised only about 1.5% percent of college level engineering students. By 1994 the number had leveled off at close to 15%. An improvement, but still a much smaller number than that which entered fields such as medicine.

Reasons for this are complex, but one thing needed is more role models for girls and young women as well as a greater understanding of what women are accomplishing now and what they have accomplished in the past. To that end a new feature of the VM, a Teacher's Lounge, is being launched in conjunction with *Women and Technology*. This area will contain instructional material that will facilitate the use of *Women and Technology* by educators in the standards-based pre-college classroom. With these materials it is hoped that the IEEE can help a new generation of students, both boys and girls, understand and appreciate the often-overlooked role women have had, and continue to have, in shaping our technological world. This exhibit and the accompanying instructional material were funded, in part, by the IEEE Life Members. We are grateful for their continued support and enthusiasm for the IEEE Virtual Museum. ♦

A switchboard operator from the 1920s, working at a "private branch exchange" in a large corporate office.

MYSTERY PHOTO CHALLENGE

This Coin Operated Television, Selectavision, was recently donated to the Smithsonian Institution/ National Museum of American History, which is looking for details. So far, this is what the NMAH knows:

The size is 84"H x 45"W x 34"D x ~500lbs. There's a nameplate on the front that says "Selectavision" but has no accompanying corporate reference. The picture tube is a Bendix Radio #27EP4 (B&W). There are two coin boxes / channel selectors from National Rejectors Inc. The 2nd coin box was found inside the cabinet and is a remote unit placed, supposedly, on a nearby bar or table. The picture controller is stamped "Zenith S-17266". There are half a dozen Ken-Rad tubes on the audio receiver / controller but no manufacturer name on the audio controller nor on the power supply so far as the Museum can see. The power supply does have a stamped position for a "record changer" so maybe the lower half of the unit is adapted from a traditional jukebox. There are various lights and color gels mounted in the cabinet so this unit must have looked quite impressive when operating.

The donor relates that when the unit is plugged in, the picture tube and lights activate. Dropping in a coin causes the audio to activate and the curtains to pull back from in front of the picture tube. The unit was found in a private clubhouse on the Magothy River outside of Annapolis, MD, in the mid-1970s. The unit might have been a prototype, it might be one of a small production run, or it could be a homemade . The Museum believes, based on the technology, that the piece dates from around 1955 — give or take a few years. There are patents listed on one coin box that date between 1929 and 1944 (although the coin boxes could have been purchased and installed years after they were made), and a 1937 patent listed on the Zenith component. **www.ieee.org/history_center/mystery_photo** ♦

Staff Activities

John Vardalas is History Center Post-Doc

John Vardalas, the author of *A History of the Computer Revolution in Canada* (MIT Press) and co-author of *Ferranti-Packard: Pioneers in Canadian Electrical Manufacturing* (MCGill-Queens University Press) has joined the IEEE History Center as its Post-Doctural Researcher. John Vardalas holds a Ph.D. in History from the University of Ottawa, and his specialization is the history of technology, economics, and business history and Canadian social history, examining competency formation as a process of learning-by-doing.

History Center 2002-2003 Graduate Assistants

The History Center is pleased to announce that its graduate assistants for the 2002-2003 academic year are **Tracy Eddy, Unique Fraser, Amanda Pipkin, David Randall**, and **Greg Swedberg**. ♦

Surf City

The National Museum of American History (NMAH): Although its name doesn't make it obvious, the museum and its web site contains a wealth of historical technological objects. **http://americanhistory.si.edu/**

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Originally named the Museum of History and Technology, NMAH first opened to the public in January 1964. This part of the Smithsonian is located on the National Mall at 14th St. and Constitution Ave., N.W. The museum receives more than 5.6 million visitors annually and maintains 3.1 million objects. No wonder people call it the Nation's Attic!

One particular exhibit, Information Age: People, Information and Technology, contains more than 900 original artifacts. They include Samuel Morse's telegraphs, Alexander Graham Bell's telephones, a Hollerith punched card machine, a four-rotor German ENIGMA encoder used during World War II, the ENIAC computer, the TELSTAR test satellite, a selection of early personal computers, and a digital high-definition television. With 50 interactive computer and video displays, Information Age also is the Smithsonian's most interactive exhibition.

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The Lighting a Revolution exhibit and web site explores the history of inventing electric lights. **http://americanhistory.si.edu/**

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Collecting history using the web is a challenge. The IEEE History Center maintains a web site entitled *Going Digital*, which was sponsored by the Alfred P. Sloan Foundation. The main purpose of this site was to be able to collect history of technology utilizing the web. **http://www.ieee.org/history_center/going_digital. html**

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The staff at George Mason University has constructed a new web site dedicated to **Women in Science and Engineering**. The main purpose of the site is to document the careers and experiences of women in science and engineering in recent memory. **http://echo.gmu.edu/wise/**. These sites are experimental, and it is still to be determined if this type of history collecting can be effective. As a very wise engineer conveyed to me about Going Digital: "You have planted a tree. You don't have to dig up roots to see how it is growing. Give it time. You are just taking some early steps along a long road."

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Code breaking during World War II greatly shortened the war and saved countless lives. **Bletchley Park** was one key operation and the Bletchley Park Trust maintains a web site dedicated to the numerous people who worked endless hours breaking the German Enigma and other codes. The site provides an interesting history of Bletchley Park, Enigma, and Colossus. It has an excellent applet that simulates the operations of an Enigma machine. **http://www.bletchleypark.org.uk/** ♦

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station were arranged, and a gala dinner was held in Knappogue Castle.

Enough can't be said about the superb arrangements made for this event. The organizing committee was chaired by Mark O'Malley of the IEEE UKRI Section and he had the able assistance of Michael O'Connor (Siemens), Brendan Delany (ESB), and Jim Christie of the UKRI Section. Our thanks to them and all the support staff of each of the organizations who participated. It truly was a memorable occasion and one that will be tough to duplicate, let alone to beat.

[Editors note: Two plaques were cast for the Milestone ceremony, one to be mounted at the Ardnacrusha site, and the other to be mounted at the Electricity Supply Board's building in Dublin. Thus, the IEEE History Center is pleased to offer congratulations to the ESB and best wishes for "A plaque on both your houses." ;-)] ♦

ELECTRICAL TECHNOLOGIES IN THE MOVIES: DIGITAL SIGNAL PROCESSING OF SPEECH

In the 1960s the new discipline of digital signal processing (DSP) emerged. Signal processing is the technology concerned with the changes made to signals so as to improve transmission, storage, or use of the signals. Digital computers had already established dominance over analog computers by the 1960s, and digital communications had begun to replace analog communications. Speeding this transition was a wide range of DSP techniques such as noise filtering, error-correcting coding, and signal compression. Since then DSP has come increasingly into prominence, and here we look at some ways speech processing has appeared or been utilized in movies.

A form of speech processing that predates the discipline of DSP is voice scrambling in order to thwart eavesdroppers. Many movies include a line of dialog similar to "Get the Air Ministry on the scrambler now" (from the 1949 war movie "Twelve O'Clock High") or "Use the red scrambler" (from the 1969 James Bond movie "On Her Majesty's Secret Service"). Today speech scrambling is a viable technology because of DSP methods.

Speak & Spell

Voice synthesis attracted much attention when Texas Instruments introduced the Speak & Spell toy in 1978; the toy had a prominent part in "E.T. the Extra-Terrestrial" (1982). A decade later a synthesized voice narrated the movie version of Stephen Hawking's "A Brief History of Time". One of the most memorable synthesized voices is that of the HAL 9000 computer in the movie "2001: A Space Odyssey" (1968). Here, of course, the voice was not really synthesized, but was that of the actor Douglas Rain. Five years later Rain parodied this role, providing the voice of the Biocentral Computer 2100 Series G in Woody Allen's "Sleeper". Another memorable talking computer is the Pentagon's Joshua in "War Games" (1983), which asks a teenage hacker "Shall we play a game?" In many other movies computers speak, and most of them, it seems, have male voices, the computer in "Star Trek: Insurrection" (1998) being an exception.

A favorite speech-processing technique of movies is the disguising of a person's voice. One of the earliest is the James Bond movie "Diamonds are Forever" (1971), in which an electronic device, implanted in the neck, makes one person's voice sound like another person's. In the "Scream" trilogy (1996, 1997, 2001) a hand-held device does the same job. Other movies that use voice disguising are "Coming Unglued" (1997), "Excess Baggage" (1997), and "Mission Impossible II" (2000).

Speech recognition is portrayed in the movie "The Bone Collector" (1999), in

SECTIONS CONGRESS 2002

Sections Congress 2002 will be held 18-21 October 2002 in Washington, D.C. The theme of this conference is "Creating a Global Community". Sections Congress is a triennial event that provides IEEE Section leadership with an opportunity to influence the future of IEEE. Congress is the perfect venue for the grass roots leadership of IEEE to network and share knowledge.

The goals of the 2002 Congress reflect the theme of "Creating a Global Community", and are three fold: to provide an opportunity for delegates to gain information and training skills, to network and build relationships with other volunteers within the IEEE; finally, and perhaps most importantly, to serve as a forum for Section representatives and other local leaders, enabling them to voice -on behalf of the collective membership -the ideas, issues, and recommendations which will impact on the development and growth of the IEEE throughout the world, reinforcing its vitality and relevance to those it serves.

The IEEE History Center will once again host an exhibit. It will feature two main areas: the IEEE Milestones Program and the IEEE Virtual Museum. The purpose of the Milestones Program is to foster an awareness among electrical engineers of their professional history; to increase public understanding of electrical engineering; to encourage the preservation of historically important materials and sites; and to collect documentation of significant historical events and to make the information widely available. Sections Congress is the perfect setting to inform the Section leadership about the Milestones Program. ♦

People and Places

NEBEKER IN ENGLAND AND SPAIN

Senior Research Historian Frederik Nebeker was an invited speaker at the launch in June of the IEE History of Technology Professional Network. (The IEE is the British-based Institution of Electrical Engineers.) For several decades the IEE has fostered the history of electrical technologies through its Professional Group G7, which every year organized a weekend conference on history. This Group is now replaced by the History of Technology Professional Network. (The Website **www.iee.org/OnComms pn/history/** explains its wide range of activities.) Nebeker presented a paper on digital signal processing and the rise of consumer electronics. He argued that signal processing, especially in the form of DSP chips, has been a vital factor in the remarkable growth of consumer electronics in recent years. Among the other speakers at the IEE History of Technology Professional Network Launch and Weekend were Anna Guagnini of the University of Bologna, Martin Campbell-Kelly of the University of Warwick, Lenore Symons of the IEE Archives, Colin Hempstead of the University of Teesside, Mary Croarken of the (British) National Maritime Museum, and Mats Fridlund of Imperial College.

This year ICOHTEC (International Committee for the History of Technology) held its annual conference in Granada from Monday 24 June through Friday 28 June. One of the themes of this year's meeting was globalization, and Nebeker presented a paper on consumer electronics and globalization. Among the issues he considered were the international dominance of a relatively small number of companies, the decrease over time in per-unit cost of consumer-electronics products and the services associated with them, and the fragmentation of the market with increased choice in broadcasting, recorded music, and recorded movies. ICOHTEC 2002 was well attended; there were almost 200 participants from dozens of countries.

Vincente Ortega, Rik Nebeker, and Antonio Luque

While in Spain, Nebeker conducted oral-history interviews of three highly distinguished electrical engineers. The first interview was of Gabriel Ferraté i Pascual, president (rector) of the Open University of Catalonia (Universitat Oberta de Catalunya). Dr. Ferraté has made significant contributions to the field of automatic control. For example, a hierarchical system he developed for controlling the traffic lights of a city was adopted in many countries. He has made an even greater impact as university president, first of the Universitat Politècnica de Catalunya from 1972 until 1994 (except for two years of government service as General Director of Science Policy), and since 1995 at the Universitat Oberta. The second interview was of Vicente Ortega Castro, professor at the Escuela Técnica Superior de Ingenieros de Telecomunicación (ETSIT) of the Universidad Politécnica de Madrid. The author of numerous articles and several books on telecommunications, Professor Ortega has served as General Director of the Universidades de la Comunidad Autónoma de Madrid and as Secretary General of the Spanish Council of Universities (Consejo de Universidades). The third interview was of Antonio Luque López, director of Instituto de Energía Solar of the Universidad Politécnica de Madrid. Professor Luque is a world leader in the development of solar power, with a great many patents and publications to his credit. ♦

Frederik Nebeker and Gabriel Ferrate

In the Movies

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which a quadriplegic plays chess with a computer. Speech recognition is combined with language translation in "End of Days" (1999), where it is used to understand someone speaking in tongues. In "Mars Attacks!" (1996) an electronic box translates, in real time, Martian speech.

Signal processing is involved in removing noise from an audiotape in "Smilla's Sense of Snow" (1997) and in discovering that the audiotape of an alleged conversation was in fact patched together in "Primary Colors" (1998). Voice-identification software plays an important part in the plot of "Charlie's Angels" (2000), since this software, when combined with GPS-based ability to locate any cell-phone user, confers great power. Cell phones and tapeless answering-machines, which of course occur in countless movies, also involve DSP.

As always, we would be grateful for reports from readers of other interesting cinematic depictions of speech processing. You may contact us at **history@ieee.org**. ♦

IEEE HISTORY CENTER SUPPORTS SCHOLARLY RESEARCH IN ELECTRICAL HISTORY

The IEEE History Center offers two programs of support annually for scholars pursuing the history of electrical engineering and computing: An Internship for a junior graduate student; a Dissertation Fellowship for an advanced graduate student or recent Ph.D. The Internship and the Dissertation Fellowship are funded by the IEEE Life Members Committee. The Internship requires residence at the IEEE History Center, on the Rutgers University Campus in new Brunswick, New Jersey; there is no residency requirement for the Dissertation Fellowship.

IEEE History Center Internship

Scholars at the beginning of their career studying the history of electrical technology and computing are invited to contact the Center to be considered for a paid internship at the Center's offices on the Rutgers University campus in New Brunswick, New Jersey.

The intern program seeks to provide research experience for graduate students in the history of electrical and computer technologies, while enlisting the help of promising young scholars for the Center's projects. The intern generally works full-time for two months at the History Center on a Center project connected to his or her own area of interest. This time is usually during the summer, but other arrangements will be considered. Interns are also encouraged to consult with the Center's staff and its associates, and guided to research resources in the area. The internship is designed for those near the beginning or middle of their graduate careers, but advanced undergraduates and advanced graduates will also be considered. Special consideration is often given to scholars from outside the United States who might not otherwise have an opportunity to visit historical resources in this country.

The stipend paid to the intern is US$3,500. Additional funds may be available to defray travel costs, depending on the intern's circumstances. This internship is supported by the IEEE Life Members Committee.

There is no formal application form. To apply, please mail a curriculum vitae showing your studies in electrical history along with a cover letter describing the sort of project you would be interested in doing. The deadline for contacting the IEEE History Center is 1 April 2003.

IEEE Fellowship In Electrical History—Academic Year 2003/2004

The IEEE Fellowship in Electrical History supports either one year of full-time graduate work in the history of electrical science and technology at a college or university of recognized standing, or up to one year of post-doctoral research for a scholar in this field who has received his Ph.D. within the past three years. This award is supported by the IEEE Life Members Committee. The stipend is $17,000, and a research budget of $3,000 has been added.

Candidates with undergraduate degrees in engineering, the sciences, or the humanities are eligible for the Fellowship. For pre-doctoral applicants, however, the award is conditional upon acceptance of the candidate into an appropriate graduate program in history at a school of recognized standing. In addition, pre-doctoral recipients may not hold or subsequently receive other fellowships, but they may earn up to $5,000 for work that is directly related to their graduate studies. Pre-doctoral Fellows must pursue full-time graduate work and evidence of satisfactory academic performance is required. These restrictions do not apply to post-doctoral applicants.

The Fellow is selected on the basis of the candidate's potential for pursuing research in and contributing to electrical history. This completed application packet should be sent to the Chairman, IEEE Fellowship in Electrical History Committee, IEEE History Center, Rutgers—The State University of New Jersey, 39 Union Street, New Brunswick, NJ USA 08901-8538. The deadline for receipt of applications is 1 February. Applicants will be notified of the results around 15 April.

The IEEE Fellowship in Electrical Engineering History is administered by the IEEE History Committee and supported by the IEEE Life Members Committee. Application forms are available on-line or by request from the IEEE History Center (see below). The deadline for completed applications is 1 February.

IEEE and Rutgers are AA/EO employers. Women and minorities are encouraged to apply for all positions.

The IEEE History Center is cosponsored by the Institute of Electrical and Electronics Engineers, Inc. (IEEE)—the world's largest professional technical society—and Rutgers—the State University of New Jersey. The mission of the Center is to preserve, research, and promote the legacy of electrical engineering and computing. The Center can be contacted at: IEEE History Center, Rutgers University, 39 Union Street, New Brunswick, NJ USA 08901-8538, email: history@ieee.org, **http://www.ieee.org/history_center/fin_support.html** ♦

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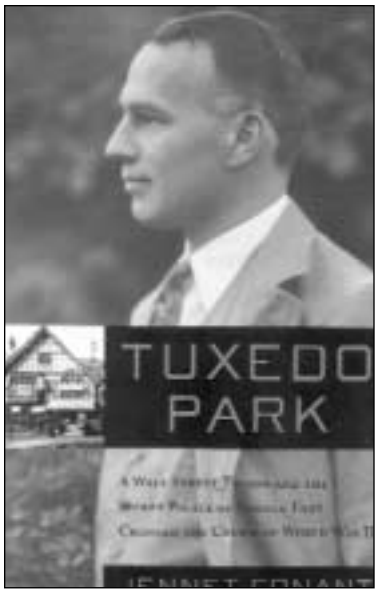


In the late summer of 1940, Prime Minister Winston Churchill, hoping to enlist U.S. resources in the development of certain military technologies, sent a group of scientists and engineers to the United States. Known as the Tizard mission, after its leader Sir Henry Tizard, it shared information about jet aircraft, submarine detection devices, gun directors, and radar. It was especially radar the British were keen to develop, believing that radar could have great impact on the war in various capacities. The United States had the world's largest radio manufacturing business, as well as large numbers of physicists and engineers, so might contribute greatly to developing radar. This, of course, came to pass, especially through the work of MIT Radiation Laboratory.

The Tizard mission first shared its information, including the prized cavity magnetron, with U.S. scientists and engineers at the mansion of Alfred Lee Loomis in Tuxedo Park, an affluent area forty miles northwest of New York City (which gave its name to the dinner jacket). Loomis had made millions on Wall Street on the 1920s and had had the foresight to protect his fortune from the stock-market crash of 1929. He was also an amateur scientist, and in 1928 he built at Tuxedo Park a luxurious physics laboratory. In following years many of the world's leading physicists paid visits to Loomis's "palace of science". When war came, he resolved to do whatever he could to encourage the development of military technologies. He played a large part in the establishment of the Radiation Laboratory and in the efforts to built an atomic bomb.

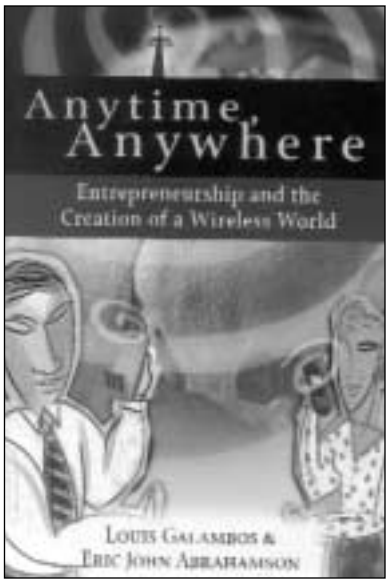
Jennet Conant, in *Tuxedo Park*, has written the first full-length biography of Alfred Loomis. She is a journalist with a strong personal interest in the subject. She is the granddaughter of the James B. Conant, the scientist and Harvard president who had many dealings with Loomis, and she has been personally acquainted with members of the Loomis family. There are no footnotes or endnotes to relate information to sources specifically, but at the back of the book is a listing of published and unpublished sources. The latter include personal papers of Loomis and many of the scientists associated with him, also several dozen interviews with people who knew Loomis. The book includes almost 50 photographs, helping to make the characters real and memorable for the reader.

Available from Simon & Schuster, New York City, $26.00, ISBN 0-684-87287-0, xvi + 331 pp., index.

GALAMBOS, LOUIS and ABRAHAMSON, ERIC JOHN, *Anytime, Anywhere: Entrepreneurship and the Creation of a Wireless World*, Cambridge University Press, Cambridge, 2002

When Pacific Telesis executive Sam Ginn took one of the first mobile phones to the Los Angeles Olympics in 1984, the people in the stands around him were fascinated by the device.

Galambos and Abrahamson's excellent book is both a study of a new technology, as well as an exploration of the role of innovation in society. The growing complexity of new technology, and the huge expense in developing it, have caused the corporation to assume the entrepreneurial mantle which used to rest on the shoulders of the individual. Sam Ginn was "eager to build an organization around values, rather than rules." Not only was he building a new technology and a new way of communicating, he was doing it with an organization which was still being spun off from AT&T, in partnership with corporations whose structure ranged from entrepreneurial startups to state-run enterprises. *Anytime, Anywhere*—with its wealth of detail and thorough research—gives the reader a seat at the negotiating tables and in the boardrooms where the deals were made and risks were taken. The chapter on how Pacific Telesis/Air Touch began to open up the Chinese market for wireless telephones shows how such agreements proceed by fits and starts, and how both sides may surprise themselves in coming up with an agreement neither at first foresaw.

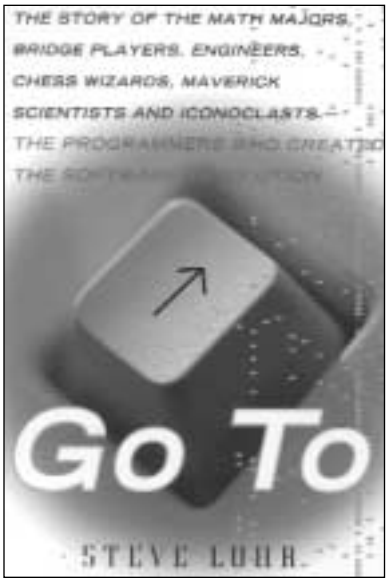


Galambos and Abrahamson take the reader through the complex spectrum auctions and the mating dances

of the many corporations (McCaw, MCI, Deutsche Telecom, Sprint, Vodaphone, Motorola, et al.) involved in the building of wireless networks, as well as through the reasoning behind the spinoffs and restructurings – many of which have come back to haunt the industry. The insatiable demand for capital and the dangerous overextension of debt are well described. Anyone wishing to understand the current turmoil in telecommunications stocks will gain much from reading this book. *Anytime, Anywhere* is equally satisfying to readers seeking to understand the technology itself, and the daunting task of building networks to handle customer volumes which again and again exceeded even the most ambitious projections. Between the technological obstacles and the legal constraints of the consent decree, it is amazing that wireless technology became ubiquitous as quickly as it did.

Available from: Cambridge University Press, **http://us.cambridge.org**, $29.00, ISBN 0-521-81616-5, 300 pp, illus., refs.

LOHR, STEVE, *Go To: The Story of the Math Majors, Bridge Players, Engineers, Chess Wizards, Maverick Scientists and Iconoclasts—The Programmers Who Created the Software Revolution*, Basic Books, 2001.



In the first decades of the digital computer, the people who designed the hardware held center stage, so it is not surprising that the historiography of computing has given most attention to these people. In recent years, however, a good deal of historical research has been directed to the development of software, and in the new book *Go To* Steve Lohr tells the story of dozens of men and women who wrote the computer programs that make computers useful.

Lohr, who is a science writer for the *New York Times*, provides an interesting narrative account, which is roughly chronological from the beginnings of programming around 1950 to the present.

Each of the eleven chapters tells a story. Examples are "Breaking big iron's grip: Unix and C", "Computing for the masses: the long road to 'gooey' and the Macintosh", and "There has to be a better way: Apache and the open source movement". As these titles suggest, Lohr has organized the book around ideas that motivated the software pioneers, and the book does describe a great many particular software products. But, in Lohr's account, it is a story principally of people, some very famous—such as Bill Gates, Steve Jobs, and Grace Hopper—some not very well known—such as Bjarne Stroustrup (creator of C++), Charles Simonyi (the person principally responsible for Microsoft Word), and James Gosling (author of Java).

Sources of information are given in endnotes. Though he has made use of many books and articles, the author relies principally on a great many interviews which he conducted with the software pioneers.

Available from Basic Books, New York City, $27.50, ISBN 0-465-04225-2, x + 250 pp., index.

McCURDY, HOWARD, *Faster, Better, Cheaper: Low-Cost Innovation in the U.S. Space Program*. Baltimore, Johns Hopkins University Press, 2001

Although it appears in Johns Hopkins' "New Series in NASA History," *Faster, Better, Cheaper* is really more a work of management science than of history. Still, it may be of interest to the readers of the *IEEE History Center Newsletter*. Howard McCurdy, a professor in the School of Public Affairs at American University who has written two earlier volumes in the series, admits in his acknowledgements that he is a life-long space buff who takes every opportunity to combine his professional interest in public administration and financial management with his hobby.

McCurdy states the purpose of this current volume right up front. In 1992, NASA's new Administrator Daniel S. Goldin announced a new paradigm for NASA's approach to its mission, which he dubbed "faster, better, cheaper." Through this initiative, Goldin hoped that NASA could launch spacecraft that were relatively inexpensive while retaining their reliability. Costs would be cut by designing and building spacecraft more quickly—which would be an asset in other ways as well—and by taking risks and applying new technologies. Between 1992 and 2000, NASA worked on 16 missions under this system. Between 1992 and 1998, nine of the 11 missions succeeded. In 1999, four

out of five failed. McCurdy's own mission is to determine whether or not the sixteen "faster, better, cheaper" attempts can be viewed collectively as a success, if so, why, and if not, why not.

Fortunately for the reader, McCurdy also states his conclusion up front. Small- and medium-sized missions—usually unmanned—do lend themselves to a "faster, better, cheaper" approach, which needs to be implemented with a flexible, decentralized management approach. Large missions, however, are so complex that they actually do require the old NASA expensive, redundant, systems management approach—developed to send humans to the moon—decried by Goldin and his supporters. McCurdy suggests that each of these paradigms requires not just a different management structure but a different culture. Resistance to some of Goldin's reforms turns out to be more than just old-timers' recalcitrance when faced with new ideas, but actually a positive adaptive response. He leaves the reader feeling that both types of space mission will remain possible in the future, but he makes it unclear how either will be able to succeed when yoked to the other.

The book is enjoyable and well-written, and readers are invited the follow McCurdy's argument as he builds it chapter by chapter, and decide for themselves if the United States and other nations will find in the 21st century the political will to continue to explore our "final frontier."

Available from Johns Hopkins University Press, Baltimore. xiii + 173 pp. ISBN 0-8018-6720-7 (hardcover, $34.95). ♦

Static from the Director

continued from page 2

Section. Look for a report on these dedications in the next newsletter. A list of all Milestones and full information about the Program can be found on our Web pages at **http://www.ieee.org/organizations/history_center/ milestones_program.html**. If you know of a potential Milestone in your area, I urge you to get your local Section involved. If you are not an IEEE member, contact the IEEE History Center and we will put you in touch with the appropriate Section that might wish to partner with you on putting forward a Milestone nomination.

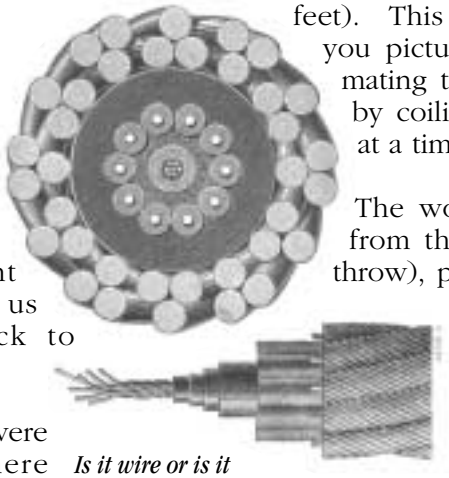
Of course, to run the Milestones and all of our programs requires resources. Over the summer we sent you a solicitation, and we are currently receiving additional donations through the mechanism of the IEEE membership renewal process. I am pleased to say that our constituents have responded fairly well, despite current economic and political conditions, which reinforces my faith in the importance of our mission and in the way we are carrying it out. Thank you, the readers of this newsletter, for your continued support.

Finally, let me take this opportunity to wish you and yours a safe, healthy, and happy holiday season and New Year. ♦

ORIGINS OF "WIRE" AND "CABLE" – TECHNOLOGY AND LANGUAGE

One of the most visible and important parts of the IEEE History Center's mission is providing a reference service to answer questions about electrical and computing history. The IHC answers approximately 300 of these reference cases per year. In some cases, the answers come quickly; others take days of research, leading us down many interesting turns. Not only IEEE members and electrical and computing engineering professionals, but also historians, documentary filmmakers, scholars, journalists (electronic and print), and the staff of government policymakers consult the IEEE History Center. We see these contacts as a vital opportunity to increase technological literacy, and — in the cases of contacts from government — an opportunity to assist informed decision-making.

From time to time, the staff will share some of our favorite cases with our readers. Here is a recent one, which took us all the way back to ancient Greece.



Is it wire or is it cable? Image Courtesy of the Burndy Library

Last summer, we were asked about where the words "wire" and "cable" originated, and what were the differences in usage between them. In researching the case, we found that "cable" is an medieval nautical term, originally a length measurement. A cable is either 100 or 120 fathoms — depending on which nautical tradition you come from. A fathom, in turn is a Dutch measurement, equal to the length from hand to hand of a man's outstretched arms (a little less than six feet). This makes sense when you picture a sailor approximating the length of a rope by coiling it one armlength at a time.

The word itself originated from the latin "capere" (to throw), progressing to "capulum" (lasso or halter for cattle), thus a rope. Cable has the implied meaning of twisted or braided, and is usually understood to be thick (25cm or thicker). Cable – at least in nautical terms – could be made out of either fiber or metal.

"Wire" comes from the Anglo-Saxon word for fine gold "wir", which in turn may derive from Latin, "viere" (to plait), possibly related to Greek "iris" ("rainbow," i.e., something with many strands).

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