# Center for the History of Electrical Engineering

Newsletter No. 40 Fall 1995

# **History Center Goes On-Line**

Beginning in early 1996, the history of electrical technology will meet its future, when the IEEE History Center launches its own home page on the World Wide Web. The Center's Web page will provide the world internet community with an opportunity to learn more about the Center and its programs; discover information about the history of electrical, electronics, and computer engineering; and connect to other organizations that investigate the role of all types of electrical technology in our society.

The Center's home page, which is currently under construction, will be mounted on the IEEE's file server around the beginning of the new year. Content that will be available on the Center's home page will include:

- Transcripts and abstracts of oral histories conducted with some of the most distinguished electrical engineers of the past 60 years.
- Reference material for historical research, such as the Center's Sources in Electrical History, Volume 1: Archives and Manuscript Collections in U.S. Repositories.
- Finding aids for collections in the Center's archives, such as the IEEE Merger Collection, which contains documents and letters relating to the decision of the American Institute of Electrical Engineers and the Institute of Radio Engineers to join together in 1963.
- Past issues of the History Center's newsletter, including a cumulative bibliography
- Information on current Center research programs and projects
- Information on the Center's Milestones program

- Advice concerning matters such as preserving paper records and artifacts, requesting historical information from the Center, applying for the Center's fellowship in electrical history, organizing historical sessions or finding historical speakers.
- Biographical information about Center staff
- The Center bookstore, offering sale of Center publications and other Center merchandise, including tee-shirts

ts, catalog of the Center's archives and more of the Center's reference guides.
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The best way, of course, to learn what the

The best way, of course, to learn what the Center has to offer on-line is to visit our home page. For those not already familiar with the Web, we have put together a brief primer (see below) that should get you sufficiently oriented to some Web basics so that you can begin to assemble the pieces you will need. For those of you who are already experienced Web crawlers, our URL is http://www.ieee.org/history\_center. See you soon.

· Links to other Web pages that have

Plans for the future include adding a full

electrical technology

material that is related to the history of

#### What is the World Wide Web?

The Web is an improved way of using the internet.

# Not so fast, smart guy...what is the internet?

The internet is the link that exists between many different computers (usually large ones) that allows them all to share files with one another.

# Why do these computers want to share files?

For the same reason that libraries want to share books; it increases the volume of material that each computer has to offer to its users. For example, if the Center's new historian David Morton types a complete list of all the brands of 8-track tape players that were ever manufactured into his home computer, then only he will be able to use that list. If he types it into the computer at the office (which is connected by wires to the other computers in the office), then anyone here in the History Center will be able to access his list. If, now, he types the list into the Rutgers University computer (which is on the internet), then anyone who has an account with a computer that is also on the internet (and there are estimated to be 34 million such people) will be able to see Morton's critical fact sheet. Any machine on the internet can connect to any other machine on the internet and look at those files there that have been made publicly available.

#### So what does the Web add?

The Web, as we said before, is just a better way for people to use the internet. First of all, it has sounds and pictures. When you visit a Web page, your computer screen usually fills with brightly colored pictures, all supplied over the internet by the computer which is the actual machine where the Web page you are visiting is stored. Before the Web, when you connected to another computer over the internet, you had to type commands (that you might or might not be familiar with) and received only text back as your response. The Web standardizes the interface across the many different computers the internet lets you connect to (by letting you point and click with your mouse rather than use text commands) and expands the range of possible formats for the data you can receive.

More importantly, however, the Web makes connecting to other machines on the internet easier. When someone puts a Web page together, they can build automatic links to related material on other computer directly into the content of their page. For example, one of the articles we have on the Center's Web page makes mention of the Smithsonian Institution. Now, the Smithsonian itself has a Web page on their own computer that has a lot of material that might be of interest to the readers of our page. With the Web, we can put a button on our page, right at the spot where the Smithsonian is mentioned,

Continued on page 3

#### STAFF NOTES

#### Staff Speaks at SHOT

Two of the Center's staff presented research papers at the annual meeting of the Society for the History of Technology held in Charlottesville, Virginia in October. William Aspray gave a lecture entitled The Early History of the Microprocessor: A Japanese and American Story in a session on the Post Post-War. He presented a longer version of this paper several days later at the history department of the University of Delaware. Janet Abbate presented a paper on "Open Systems' as a Sociotechnical Model for the Internet," describing how the engineering concept of an "open system" has taken on political connotations in the context of the Internet. She also chaired a session on the history of computing technologies.

#### **NEW DONORS**

With this issue of the newsletter, the IEEE Center for the History of Electrical Engineering welcomes four new members to our Partnership Program. Joining the program at the Associate level are:

- Earl Bakken
- The Central Research Institute of Electric **Power Industry**
- · Tokyo Electric Power Company
- Toshiba

Our sincere thanks go out to these people and organizations. For a complete list of the Center's partners, please turn to the last page of this newsletter.

# 1996-97 Fellowship in Electrical History

Applications are currently being accepted scripts, letters of recommendation, and for the 1996-97 Fellowship in Electrical History. The Fellowship is for 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 for up to one year of independent research for a recent Ph.D. graduate in the same field. The stipend is \$14,000.

The Fellowship committee evaluates applicants on the basis of a complete description of the proposed research, college tran-

additional information supplied on the application form. Students with undergraduate degrees in engineering or the sciences as well as those having degrees in the humanities are invited to apply. The deadline for receipt of applications is 1 February 1996, and three copies of the entire application package must accompany the original. Application forms are available from the Center. The Fellowship in Electrical History is made possible by a grant from the IEEE Life Members Fund.

#### Morton Lectures at Lehigh

On October 11th, staff Research Historian David Morton visited the Lehigh University campus in Bethlehem, Pennsylvania to deliver a talk as part of the University's visiting lecture series. The subject of the talk was "The History of the 8-Track Tape." Morton tracked the rise of this familiar technology from its early specialized application in the 1950s as a medium for background music to its eventual domination of the portable music market. He argued that the decline of the 8-track in the 1970s can be attributed not only to technical deficiencies and competition from the cassette, but also to cultural and economic factors. Morton drew his talk from research he conducted for his Ph.D. dissertation, which he successfully defended on November 2 at Georgia Tech in Atlanta, completing the requirements for the History of Technology program there.

#### Abbate Attends Confs.

In September Janet Abbate traveled to France to participate in two international conferences on the history of technology. The first, held in Paris, was entitled "Les Technologies du Territoire/Territorial Technologies" and focused on the social impact of infrastructural systems such as electricity and communications networks. The second, held in Autun, Burgundy, was an intensive workshop bringing together scholars from around the world to discuss issues in the historical and social analysis of large technical systems. Abbate presented a paper entitled "From Control to Coordination: New Governance Models for Network Systems," which described current US and international policy approaches for information infrastructure. The workshop papers are expected to be published as an edited volume.

#### **Nebeker Writes on Townes**

At the invitation of the editors of Engineering Science and Education Journal (a publication of the British Institution of Electrical Engineers), Frederik Nebeker has written an article entitled "Charles Townes, the maser, and the relationship between engineering and science," which will soon appear in that journal. In the paper, Nebeker describes how Townes' work at Bell Telephone Labs as an electrical engineer on radar systems led to his pioneering work in microwave spectroscopy and then to his invention of the

The Newsletter reports on the activities of the Center and on new resources and projects in electrical history. It is published three times each year by the Center for the History of Electrical Engineering

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# **Sources In Electrical** History 3

# An International Guide To Corporate Archives

The Center has just released Sources In Electrical History, Volume 3, An International Guide to Corporate Records and Archives of Companies in the Electrical, Electronics, and Computer Industries, a guide to the archival holdings of leading electrical companies. The book provides summary information about 132 companies in the named industries, including such information as a general description of the company's records holdings; notes concerning access to corporate records; the address of a contact within the company who can aid the historical researcher; the availability of a corporate history; the location of the company's headquarters; the date of the company's founding; and additional information concerning the company or its records, such as the location of a company museum, or information provided about future changes planned for company records. The volume also has an index which lists the included companies by their industry.

This volume marks the third installment of the Center's Sources in Electrical History series. The goal of the Sources series is two-fold—to promote research in electrical history by making scholars and students aware of the diverse collections of primary sources and to encourage the collection and preservation of these materials by archives and manuscript repositories. The first two volumes of the series covered U.S. collections of archives, manuscripts, and oral histories that relate to the history of electrical technology. We were concerned, however, that our past guides might have left an important gap in their coverage of available research resources. Much of the development of electrical technology has been accomplished by the industrial sector, and archival materials documenting this sector's involvement may not have been placed in publicly accessible repositories, or may not have been preserved at all. We saw a need to determine the extent of archival preservation that currently exists within the electrical industries and to give researchers an introductory guide to these resources.

This guide, an aspect of the Center's Power and Control project, was supported by a grant from the Andrew Mellon Foundation. Other project supporters include the IEEE Foundation, IEEE Life Member Fund, IEEE Foundation Friends Fund, and the AT&T Foundation.

#### Web Primer continued from page 1

that allows a user to leave our computer and connect to the Smithsonian's computer just by clicking. The pre-Web process for connecting to another machine over the internet was far more awkward. It is these built-in links that gives the Web its name. With each page linked to any other page, people are able to jump easily from computer to computer, led by the hand towards material that is of interest to

#### So if I want to use the Web, then I need to be on the internet, right?

That's right. Many people get on the 'net through their university or business. For example, I am at Rutgers University, so my connection to the internet is through my account on the Rutgers computer. My sister works for Pacific Bell, and her account on their computer provides her with connection to the internet.

### But my business doesn't have a computer that is on the 'net. How do I get connect-

People who aren't given accounts with a computer that is on the 'net through their job, etc., often can get on the 'net by buyng an account with a private computer owner who is connected. Ads for companies that offer this type of service are becoming common in the business or science pages of many newspapers. The arrangement is similar to how you get your local telephone service, except that you will probably have more choice in selecting an internet service provider.

#### What's the difference between one of those services and some of the other popular on-line services I hear about, such as America On-Line, Compuserve, and Prodigy?

Service from an internet provider actually is quite similar to those on-line services. The big difference is that those services have traditionally provide only limited connection to all of the other computers on the internet (although this is changing fast.) Their main focus is to provide interesting content on their own computer (which they can then charge additional fees to access) and to make the interface user-friendly. Most internet providers do little to make the accounts they offer easy to use, but they do offer free connections to every other machine on the 'net.

#### Once I have an account, then what?

Now it's simple. First, you need a way to connect to the computer that is supplying you with your account. The most common way is to attach a modem to your home computer. Then you need some

brand of communications software to run the modem (it's becoming more common for the communications software to come included on your home computer when you buy it; perhaps it is even built into the operating system.)

To get on the Web, you use the communications software to get the modem to call your internet provider, a process that is very much like placing a normal telephone call. The details of what follows differ from one internet provider to the next (since different providers have different computers), but the basic move is to log on to your account and then issue the command that tells the computer you have just logged on to that you wish to connect to

Now, to actually visit a Web page, you will need to use a piece of software called a browser. The browser is the program that displays the content of the Web pages that you visit and orchestrates the connections to other internet computers when you indicate that you want to follow a link to another Web page. The browser that you run might be located on the computer that is providing you internet access (in which case, it will often be text-only and not permit you to point and click with your mouse—you instead use the arrow keys on your keyboard to navigate around a Web page. "Lynx" is a well-known example of this type of browser), or it might be located on you own home computer. If the browser is on your home computer ("Netscape" is one of the most popular of these types of browsers. It is available for free), then you will probably get a flashier show, i.e. pictures, but you will need some special software on your home computer to help it work. Your communications software will have to allow what is called a SLIP connection (not all of them do), and you will need some additional software to allow your browser to work with the communications software. There are several varieties of this special software; popular ones include TCP or PPP.

Once you have logged on to your internet provider computer, and instructed it to allow you access to the 'net, then you start up your browser and tell the browser what Web page you wish to visit (the method for doing this depends on the browser, of course). You specify the Web page by giving its computer address, which is called its URL. This is the string of characters that you are seeing everywhere that almost always begins with

### **DONORS**

The Center continues to work hard to preserve the history of electrical engineering and spread the word widely to electrical engineers, students, and the general public. Half of our funding comes from the IEEE General Fund. The rest comes from Rutgers, project grants, and contributions from companies, foundations, and individuals like you. We need and appreciate your help to continue our work developing archives, exhibits, oral histories, popular articles, conferences, milestones, teaching, and research.

We have two programs by which companies, foundations, and individuals can help

to support the Center's activities: through an annual gift to the Friends Program or a lifetime gift to the Partnership Program. Whether you give to the Friends Program or the Partnership Program, your gift is tax-deductible and its use is overseen by the Friends Committee, a group of distinguished electrical engineers appointed by the IEEE Foundation. Partnership donations not earmarked for a specific project are treated like endowment funds, as a means to provide continuing support to the Center. Partnership contributions may be fulfilled over several years. All donations to either the Friends Program or the Partnership Program should be made Associate

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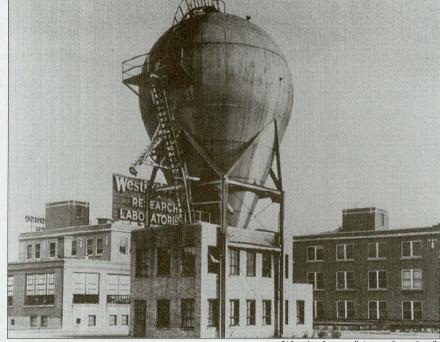
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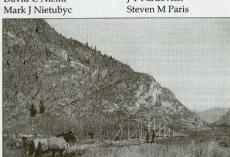
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Nagengast. Heat & Cold: Mastering the

Great Indoors. Atlanta, GA: American

Society of Heating, Refrigerating and Air-

Conditioning Engineers, 1994. xxvii + 339

This book, subtitled A Selective History of

Heating, Ventilation, Air-Conditioning and

Refrigeration from the Ancients to the

1930s, was published to commemorate the

100th anniversary of the American Society

of Heating, Refrigerating and Air-

Conditioning Engineers. Following an

introductory essay by Gershon Meckler on

the scientific roots of the technology, the

book begins its survey of technical devel-

opments, moving swiftly from ancient

times through the 18th century and into the

19th century, and most of the book con-

cerns the late 19th and early 20th century.

There is much of interest for historians of

electrical technology. The two largest

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# **Business History Project**

Hagley Museum and Library hold the nation's largest collections of corporate records, and are collaborating on a project to deal with the issues surrounding the documentation of American business and industry. Through their Records of American Business Project, the two organizations hope to promote the preservation and use of documents revealing business operations, decision making, and strategic planning, which they fear are often neglected in favor of records that concern quantifiable output, efficiency, and economic impact. With a grant from the

The Minnesota Historical Society and the National Endowment for the Humanities, the MHS and the Hagley are sponsoring a symposium, a publication of major papers from the symposium, and a records appraisal document for corporate archival

> The symposium is scheduled for 12 April 1996, with publication of the appraisal guidelines and the book of essays to follow. The symposium will be open to all interested participants. For more information, contact James E. Fogerty, Minnesota Historical Society, 345 Kellogg Boulevard West, St. Paul, MN 55102.

A new exhibit entitled "It's Alive! The Science and Myth of Frankenstein" opened at the Bakken Library and Museum in Minneapolis on September 9 and will be on display throughout August 31, 1996. In addition to the first and later editions of Mary Shelley's book, the exhibit features works by members of her literary circle, relevant scientific books of that era, a replication of Victor Frankenstein's laborator, and a selection of scientific instruments and medical devices related to the show's theme. For further information about the exhibit or its accompanying programs, contact David Rhees, Director, The Bakken, 3537 Zenith Ave. So., Minneapolis, MN, (612) 927-6508, drhees@aol.com.

#### Book Reviews:

Note: The Newsletter's "Bibliography" section will return next issue.

Emerson W. Pugh. Building IBM: Shaping an Industry and its Technology. Cambridge, MA: MIT Press, 1995. xvi + 405 pp.

Emerson Pugh's fourth book on the history of IBM provides an excellent overview of the corporation's technical and business history, from its roots in Herman Hollerith's tabulator company to its travails of the past decade. More general than his earlier, technically focused volumes, Building IBM integrates technical, business, and human factors to explain IBM's successes and failures in developing and marketing new information processing products. Pugh argues convincingly that IBM's financial success depended on its leaders' commitment to coordinating research and development with manufacturing and customer requirements: "They understood the importance of technology and were continually active in the crucial interfaces between technical developments rise of this computing industry giant. and business strategies" (321-322).

Topics covered by the book include Hollerith's tabulating machines, used in the 1890 U.S. Census: the formation of IBM from three independent companies; management styles and strategies of Thomas J. Watson, Sr., Thomas Watson, Jr., and other key personnel; involvement with academic and government-sponsored projects such as the Mark I, NORC, and SAGE; the transition from electromechanical to electronic machines; and the growing importance of software. Pugh describes in detail the development of IBM's major computer lines—701, 1401, 360/370—explaining the business rationale for introducing these systems and showing how designs were chosen from among alternatives. Coverage of more recent years is sketchy, perhaps reflecting IBM's own faltering performance: only 20 pages are devoted to post-1970 developments, with the IBM PC relegated to a single page. Several appendices provide useful data on the company's revenues, patents, and products.

Overall, Pugh offers a remarkably balanced, lucid, and insightful account of the

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1895 advertisement—could electrical technology solve all of America's problems?

chapters, entitled "Electric Power Changes the Industry" and "The Early Twentieth Century:1900-1930", give central places to the development of suitable electric motors and and that of electrical control systems.

The book, handsomely produced in large

format, is extremely well illustrated, showing in more than 450 illustrations, some of them in color, the people, the inner workings of the technology, the technology in its architectural setting, and the advertisements for the technology. It is written in an engaging way, with historical anecdotes and quotations of contemporaries. Though the emphasis is on the technical developments themselves, there is also a great deal of information about the inventors and engineers, about the companies marketing the technology, and about the social and political setting of the technical story. The book is also impressive as a scholarly

work, as the authors have relied principal-

ly on primary sources and carefully record-

ed, in endnotes, the provenance of infor-

mation.

# Centre for the History of Defence Electronics

The Centre for the History of Defence The recollections of those involved in early Electronics (CHiDE) has recently been technical developments and associated functioning under the umbrella of the University's School of Conservation Sciences, will be a UK pioneer in the use of advanced electronics and information technology to promote the public understanding of the history of electronics.

The broad aim of the Centre is to contribute to the study and public awareness of the history of electronics. Initially the Centre will concentrate on radar, sonar, communications, and electronic countermeasures and their wider social consequences. Work has already started on researching and collecting a range of material, including documents, photographs, film and oral recordings, which will be stored and retrieved electronically. A Virtual Museum will be created on the internet and on interactive CD providing easy access to the Centre's resources both for the public and for scholars. It will contain a bibliography and index to relevant sources at other locations, allowing the Centre to become a natural focus for researchers in the field. The Centre will also promote awareness of the subject through more conventional media such as displays, publications, conferences and day schools.

established at Bournemouth University in work will form a key component of the Great Britain. This exciting new initiative, archive and the Centre is interested in making contact with those who are interested in contributing material of all kinds, either for archiving or directly to the Virtual Museum.

> Sir Bernard Lovell, FRS, one of the foremost pioneers of radar development, and who was closely involved in the war-time work in the Isle of Purbeck, is serving as patron of the Centre. The Imperial War Museum and the Institution of Electrical Engineers are both major supporters of the project. Since its beginning, the Centre has worked in close collaboration with the Purbeck Radar Museum Trust, and enjoys support from the Royal School of Signals-Royal Signals Museum, The Communications and Electronics Museum, the Tank Museum, the Historical Radar Archive, the Defence Evaluation & Research Agency, and HMS Collingwood.

A brochure containing details of how organizations and the general public can support CHiDE is available on request. For more information, contact Dr. John Beavis, Bournemouth University, Dorset House, Talbot Campus, Fern Barrow, Poole Dorset, BH12 5BB, Great Britain, tel. 1202 595178.

10

# **Lipartito Wins 1995 Electrical History Prize**

Each year the Society for the History of Technology (SHOT) presents an award for the best paper on the history of electrical technology published during the preceding year. The award is sponsored by the IEEE Life Member Fund and administered by the Center. At the recent SHOT meeting in Charlottesville, Virginia the award for 1995 was presented to Kenneth Lipartito for his article "When women were switches: technology, work, and gender in the telephone industry, 1890-1920," published in The American Historical Review, vol. 99 (1994), pp. 1074-1111.

In comparison with many European countries, the United States was slow to adopt automatic telephone switching. It was not until just after World War I that Bell System managers decided to develop and implement automatic switching. A great many factors played a part in this decision: the problems of maintaining good service as telephone use increased, the technical possibilities and difficulties of automatic equipment, the political vulnerability of AT&T at a time when many people thought that the Bell near-monopoly ought to be broken up or that telecommunications ought to be nationalized, and labor issues of high turnover, unionization, and wage costs. Lipartito ably explicates these and other factors, drawing upon work in technical history, labor history, women's history, business history, and government history, and thus illuminates the process of change in a large technological system. He demonstrates the social embeddedness of decisions about technologies, making clear their multicausality and their widespread consequences.

# **Partnership Program**

We are grateful to the organizations and individuals listed below who provide generous support to the center in the form of operating, endowment, and project funding. If you or your organization are interested in joining our Partnership Program, please contact the Director, Dr. Aspray.

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