

ELECTRICAL
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the History of
ENGINEERING



IEEE
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CENTER'S LATEST BOOK: FACETS

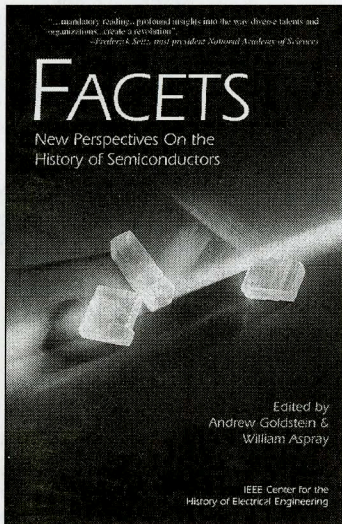
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As the 50th anniversary of the invention of the transistor draws near, more and more attention is focusing on the historical details of the semiconductor revolution that has transformed electrical technology all across our planet. In sync with that celebration, the IEEE History Center is proud to announce the publication of its most recent book, *Facets: New Perspectives On the History of Semiconductors*, edited by Center curator Andrew Goldstein and former Center director William Aspray.

Facets is a collection of six historical papers, each shedding new light on specific episodes in the history of semiconductor technology. Hailed as "mandatory reading for...anyone who wishes to obtain profound insights into the way diverse talents and organizations direct, often in an erratic way, the flow of events in creating a revolution" by Frederick Seitz, the well-known semiconductor pioneer and former president of the

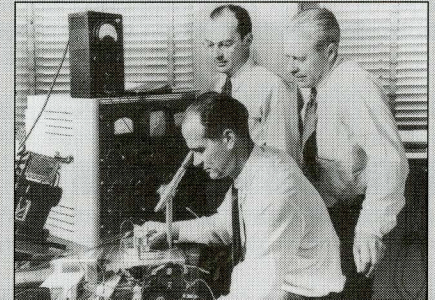
National Academy of Sciences, *Facets* pulls together some of the freshest writing on semiconductor history in an effort to provide new insights into the remarkable developments that led engineers from the first tentative hints of the potential of semiconductor electronics to the day of the technology's full bloom.

Facets delivers its new insights in two distinct ways: through its content and through its reach. First, the material published in *Facets* brings new historical perspective. Some of the chapters shed light on very specific topics that have not received extensive treatment in the existing histories of the semiconductor era, and others reinterpret certain well-known events, revising our understanding of these landmark episodes. Second, the book presents different audiences with material to which they might not be routinely exposed. Members of the general public and historians should be interested to find in the book details about the nuts and bolts of semiconductor technology. The volume's authors have been careful to include meaningful technical content pitched at an appropriate level. Non-technical people should come away from this book with a greater appreciation of some of the technical issues that have affected, and will con-



Celebrating Transistor's 50th

The upcoming transistor anniversary is inspiring a small explosion of historical publications. Here are two of particular note:



William Shockley (seated), John Bardeen, and William Brattain at Bell Labs.

- **The January 1998 issue of the Proceedings of the IEEE.** This will be a special issue on the transistor's anniversary, guest edited by Dr. Probir K. Bondyopadhyay. It will include 18 articles; some reprints of classic technical papers and some new historical treatments. Special treats include Gordon Moore's first articulation of his famous "law" of miniaturization, which he published in 1965; Takuo Sugano writing on the progress and impact of semiconductor devices and processing technologies in Japan; C. Mark Mellier-Smith (et. al.) writing on how the transistor was converted from an invention to a commodity; John Pierce on how the transistor got its name; and W.S. Gorton with the 1949 Bell Labs memorandum for record on the genesis of the transistor. Of course, there are also technical papers by Shockley, Bardeen, and Brattain.
- **Scientific American's "The Solid State Century"** A chronicle of the 50 years since the invention of the transistor that examines the explosive advance of solid state technology today. This comprehensively illustrated issue presents a wide variety of definitive articles, written by the world's foremost experts. It highlights the benchmarks of solid state development, profiles its inventors and unveils tomorrow's technologies. The issue will be available on the newsstand.

And for those who carefully preserve their IEEE publications (or want to exercise their library cards), now might be a fitting time to flip back to the January 1973 issue of *IEEE Spectrum*, which was a special number celebrating the transistor's silver anniversary. Historians to this day continue to reference some of the articles that appeared in that issue for their basic information on the origin of that ground-breaking germanium wonder.

CENTER FOR THE HISTORY OF ELECTRICAL ENGINEERING

Issue 46 Fall 1997

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continue to affect, the semiconductor industry. Engineers, on the other hand, will benefit not only by learning the history of select moments of the semiconductor era, but they also will gain appreciation of the major themes that occupy historians of their field. For example, what is the nature of innovation and what are its sources? Is the old saw about necessity being the mother of invention a valid analytic insight and, if so, what are its limits? To what extent is technology applied science?

In two ways, the publication of *Facets* high-

lights some of the benefits that the IEEE History Center brings to the electrical history community, if we may so describe the many engineers, historians, and members of the general public who share an interest in the development of our electrotechnical world. First, the Center serves as a focal point for scholarly research. The Center's ongoing interaction with historians working on semiconductor history enabled the staff to identify interesting work being done in this field and collect the best of these efforts and package them in one convenient place. Second, there is the Center's connection to its constituents. These people, including the readers of this newsletter, provide a source of support and a

dependable audience for a book such as *Facets* that trade publishers, and even academic publishers, do not have. With the heightened attention on mass-market sales that is forcing most publishers in recent days to scale back the number of special interest titles they carry, these factors skew the grim logic of the bottom line, helping the History Center continue to bring out high quality books such as *Facets* at a low price, even if they do not achieve blockbuster status.

Facets is available for order directly from the IEEE History Center. For more information, see the insert in the middle of this newsletter or contact the History Center.

Staff Notes

STATIC FROM THE DIRECTOR

Although my arrival was announced in the last newsletter, this is the first issue pre-

pared completely during my administration, and I would like to take this opportunity to greet all of our readers. We have been working hard to get the word out about the Center to the broader IEEE community. Articles about our activities have appeared recently in *The Institute*, in the *Life Member Newsletter*, and in the *IEEE Annals of the History of Computing*, to name three venues. But it is our greatest pleasure to address you, our core supporters. As I think you will agree from a perusal of the last issue and this one, the IEEE History Center is continuing its fine record of preserving, researching and promoting electrical and computing history.

Although our research and publication work is not limited to following the cycle of anniversaries and birthdays, we would like to recognize in this issue the 50th anniversary of the transistor (see the cover story). As mentioned in the article on page 4, *LIFE* named the invention of the transistor as the 30th most important event of the millennium (!), and certainly the IEEE can be proud of the role it played in a development that changed the face of the world.

We are also working hard to improve our service to IEEE members and customers in the areas of preserving and promoting electrical history. We are proud of the Center's role in the IEEE's efforts in "Networking the World"™ and in this regard particularly proud of our enhancement of our Website (page 3) and the introduction of ECHOES (page 3).

Besides our research and our service

to IEEE members and customers, a glance at teaching and Graduate Assistant notes on page 8 shows our continuing efforts to improve our working relationship with our cosponsor, Rutgers University. By next issue I will be able to report on some concrete new steps that will be taken in this direction.

In addition to these programs, we are right now in the middle of our annual fundraising cycle, where we contact you directly immediately prior to the IEEE's membership renewal mailout, which then gives you an additional opportunity to help your History Center. Although everyone who gives will receive individual thanks both in the form of a letter and a listing in the newsletter, I wanted at this time to collectively thank all of you who are so generously supporting the Center. The gifts we are receiving now will help to support our programs in calendar year 1998, which is also the IEEE membership year. To get into sync with IEEE accounting, all gifts that we received since the last newsletter listing and all those we receive between now and next April will be make the donor a Friend of the Center for 1998, and will be acknowledged in the Spring 1998 newsletter. Gifts received after April 1998 will be credited for 1999, and acknowledged in the Spring 1999 newsletter.

In the next issue I hope to be able to report on many more exciting developments at the IEEE History Center. As a hint, look for a change in style that will be indicative of



Dr. Michael N. Geselowitz, Director of the IEEE History Center.

both the new IEEE corporate image and of our relationship with Rutgers.

Nebeker At Telecommunications Symposium

Research historian Frederik Nebeker presented a paper on "Telegraph and telephone communications in World War I" at the Fifth International Symposium on Telecommunications History, which was held in Kingston, Ontario on 26 and 27 September 1997. This Symposium, which was organized by Russell A. Pizer and hosted by the Military Communications and Electronics Museum, emphasized telephone history, as have the earlier Symposia in this series. There were presentations on Gardiner Greene Hubbard (who provided crucial financial support to Alexander Graham Bell), the U.S. government's assistance in building China's telephone system in the years around 1920, FBI wiretapping of Franklin Roosevelt's anti-interventionist critics, the role of the Cold War in telecommunications competition in Canada, and other topics. There was time for discussion, usually quite animated, after each talk. In addition, there was a presentation on antiquarian books on telephony and a tour of the museum's large collection of telecommunications equipment (which included a demonstration of a German Enigma encoding machine). The Symposia are notable for bringing together different groups interested in telecommunications history: collectors, academics, museum people, engineers, and journalists. An announcement of the Sixth Symposium appears on page 5 of this newsletter.

Rutgers Course

"Technology in American Culture" is the name of a small, senior-level undergraduate seminar that Center Historian David Morton is teaching. Morton's class is part of the IEEE History Center's ongoing teaching commitment to Rutgers University. The course is a research seminar in which the student's main product is a term paper exploring the relationship between technology and American culture and society. Term paper topics range from the disappearance of New Jersey's small farms to the introduction of color television.

Center Staff Attend Conference on Artifacts and the History of Electronics

In 1996 the Science Museum of London, the Smithsonian Institution, and the Deutsches Museum of Munich began a series of joint conferences on "Artifacts and the History of Technology." This year the conference was

held October 14-15 at the Smithsonian's National Museum of American History in Washington, DC, and focused on the role of the artifact in the history of electronics. IEEE History Center staff members Michael Geselowitz and Frederik Nebeker were invited to participate by conference organizer and IEEE History Committee member Barney Finn.

The conference was well attended. In addition to the representatives from the three sponsoring institutions, there were historians from other museums, from corporations, and from academia. The past and present importance of the IEEE to electrical history was amply represented and demonstrated not only by Finn, Geselowitz and Nebeker but also by former IEEE History Committee members W. Bernard Carlson and Stuart Leslie, former IEEE History Center directors William Aspray and Robert Friedel, and former Center employees David Rhees and Hugh Slotten.

Nebeker, in his paper "Radios, Wire Recorders and Calculators: The Importance of Artifacts for Writing the History of Electronics," ably summarized the theme of the conference. He enumerated three reasons for incorporating the artifact into historical analysis: artifacts can provide motivation to learn about the past; artifacts can make book-acquired knowledge come to life; and artifacts can provide information not otherwise available.

In a workshop setting, Geselowitz reported on the progress of the Center's effort to produce an up-to-date guide to museums containing significant collections of artifacts from electrical and computing history. It is hoped that this guide will make the artifacts-whose importance was outlined by Nebeker-more accessible to the historian. Both presentations were well received.

IEEE in Japan

For many years now the Center has collaborated with engineers and historians in Japan on promoting the history of electrical and computing technologies. In late July and early August, IEEE History Committee Chair Emerson Pugh and Research Historian Frederik Nebeker made a nine-day trip to Japan, which came about because of an invitation from the Institute of Electrical Engineers of Japan (IEEJ) to attend the Third International Conference on Electrical Engineering (ICEE) and participate in a panel session that would stress the importance of history to the electrical engineering profession.

Through the generous assistance of Dr. Hiroshi Suzuki, Pugh and Nebeker organized the trip so as to participate in the Conference and accomplish a number of other objectives.

The site of the conference was Matsue, a city on the west coast of Honshu. In a three-hour panel session, Pugh gave a paper on the support IEEE has given over many decades to the history of electrical technologies and Nebeker talked about the Center's efforts to take a transnational perspective in all its work. The panel session, whose other participants were from Japan, Korea, China, Russia, and the United Kingdom, was well attended.

Leo Esaki, Nobel Prize winner and IEEE Life Fellow, invited Pugh and Nebeker to Tsukuba University (of which he is president) in the "science city" of Tsukuba, where they met with Esaki and others associated with the university.

Tokyo was the site of most of the trip's activities. Pugh gave a 90-minute talk, followed by a question-and-answer period, on "How IBM Was Built" for a dinner meeting of the Engineering Academy of Japan. Nebeker gave a 90-minute talk, also followed by questions and answers, on "World War I and the Birth of the Electronics Industry" for a joint meeting of the IEEE and IEEJ Tokyo Sections. Pugh and Nebeker met with leaders of the IEEE Tokyo Section. Eiju Matsumoto of Yokogawa Electric Company gave Pugh and Nebeker a tour of the company's extensive collection of electrical measuring instruments. A meeting with Yuzo Takahashi, who has written extensively on the history of electronics, was followed by a visit to Sony headquarters to view the Sony museum. Takashi Maejima, historian at the National Science Museum, showed Pugh and Nebeker materials, both on exhibit

continued on page 4



l to r, Frederik Nebeker, Emerson Pugh, and Yoshiyuki Kono visit Matsue Castle, Matuse, Japan.

Staff Notes *continued from page 3*

and in storage, at the National Science Museum, relating to the history of electrical technologies.

Through these and other meetings, Pugh and Nebeker took every opportunity to create and strengthen contacts with engineers and historians interested in the history of electrical technologies. The trip was a welcome occasion to renew acquaintances with engineers of IEEJ and IEEE Japan and to meet engineers from China, Korea, and Russia.

Staff Wows SHOT Conference

Janet Abbate and David Morton both presented papers while attending the annual meeting of the Society for the History of Technology (SHOT). Abbate delighted

with a paper on the history and geography of computer networks. Morton's paper, entitled "The 8-Track Tape From High Tech to Low Brow: A Study in the Life Cycle of a Technology," wowed the audience with a discussion of the 8-track tape system, a consumer entertainment technology introduced in the 1960's. After outlining the history of the system, Morton presented the findings of his research on the relationship between advertising, public opinion, and the process by which a technology becomes obsolete.

Abbate and Morton also had the opportunity to attend the fascinating presentations of others. This year's conference featured many papers on electrical and computing history, ranging from electric guitars to semiconductors and including a session on electric cars that featured actual working vehicles.

In addition, a number of History Center affiliates were awarded prizes by SHOT. Former History Center postdoc Eric Schatzberg won the Abbott Payson Usher Prize for best publication, and History Committee member Ruth Schwartz Cowan was awarded the Leonardo da Vinci Medal, the Society's highest honor. Also presented at the conference was the IEEE Life Members' Prize (see p.11).

"Guy Talk" at Hagley

Research Historian David Morton recently attended one of the Hagley Museum and Library's regular one-day conferences, this one entitled "Boys and their Toys: Masculinity, Technology, and Work." The conference, held at the Hagley Library in Wilmington, Delaware, included many of the top historians of technology and up-and-coming graduate students in the field.

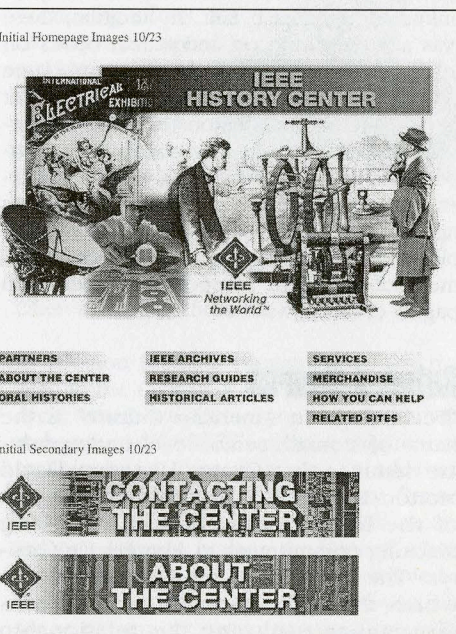
Center Activities**WEB ENHANCEMENT FEATURES ECHOES**

As a reader of this Newsletter, you already know that the IEEE History Center conducts fundamental research on the role of electrical and computing technology in the making of our modern world, but did you know that the History Center is also staffed to provide direct service to those seeking help with their own historical questions? Over 200 times a year, people like you contact the Ph.D. historians at the History Center for help in finding answers to their historical questions, locating historical images for their books and articles, preserving historical records, or organizing historical celebrations and publications. Sometimes people call just to bounce ideas off the Center staff, who are familiar with the historical origins of every technology in the IEEE universe. This popular service helps IEEE members and the historically-oriented general public bring something extra to their personal and Institute projects.

But we all know that electrical and computing technology has a complex and exquisitely detailed history. What happens when the historians get stumped? At the close of 1997, the IEEE History Center will dramatically improve its reference service capabilities by tapping into the greatest repository of historical data concerning electrical and computing technology in the world—the collective memories of the electro-history community. Late 1997 is the scheduled time frame for the introduction of ECHOES, a Web-based bulletin board that will permit internet users to review and respond to other users' historical questions

and comments. With ECHOES (Electrical and Computing History On-line Exchange Service), the History Center will be able to call on the knowledge and insights of the many thousands who routinely visit our Web site for help in answering our knottiest questions. The IEEE History Center will continue to receive member queries and respond to them with the personal attention that has made its service program so popular with those who have taken advantage of it. ECHOES will simply add to the resources at the staff's disposal to find answers, as well as permit users to sustain dialogs with one another about historical topics that interest them.

Here's how it works. A person with a historical service request will contact the History Center exactly as they do now, either by mail, telephone fax, or email. The staff at the Center will try to provide a response using the resources they have at hand, but if they believe that ECHOES can help them provide a fuller answer, then they will post the question on the system. In the meantime, visitors to ECHOES will see on their Web browsers a list of all the discussions that are currently active. They can review the original message posted by the Center staff and then read any of the responses to the comment, or responses to those responses. The system is fully "threaded"—that is, every message posted by a user is physically organized underneath the message to which it



A sample of the History Center Web Site's new look.

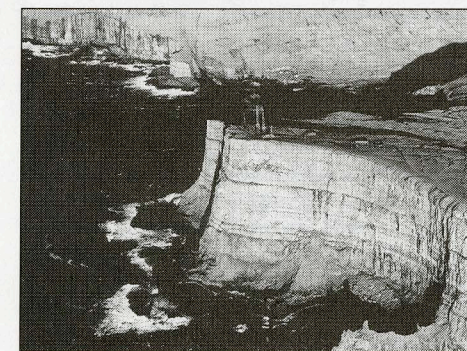
is a response, and all of these "threads" are organized underneath the original posting. When a thread has been exhausted and is no longer a topic of active discussion, it will be removed from the system and electronically archived.

The Center is confident that ECHOES can help all of us get more out of our mutual interest in the history of electrical technology, but its success depends on your participation. Now that you know about ECHOES, look for it on the History Center's web page at www.ieee.org/history_center.

In addition to ECHOES, there are several new enhancements to the History Center's Web site that should make it both more useful and more inviting for our patrons. First, there is now a search engine that is capable of finding specific text on any page in the site. This will vastly improve our visitors' ability to find historical information on any particular topic. Instead of dropping in on each page yourself, including the almost 120 oral history interviews on the site, to find relevant material on your subject, you can now execute your search just once and have the engine generate a list of hits for you to explore. The search engine will review all ECHOES threads as well as other the site's other pages, so you can be sure that if topic has been discussed, you will find it.

Second, the site now features an attractive new look that helps bring it up to the graphical standards that prevail on the World Wide Web. A visually exciting masthead that incorporates the IEEE's "Networking the World" theme, navigation buttons, graphical elements, and background colors are some of the simple, yet effective, additions that will make exploring the History Center's site a more productive and enjoyable experience.

Although the Web site is seeing a significant overhaul, the upgrades have been specifically designed to avoid any penalties in accessibility and performance. Users will not need to update their Web browser to take advantage of the new improvements, nor will they now be asked to wait long periods



Look closely to spot the LORAN (Long Range Navigation) station amidst the breathtaking scenery of Denmark's Faeroe Islands. (Courtesy of MIT Museum)

Historiography of Technology

The Second International Conference on Problems in the Historiography of Recent Science, Technology and Medicine will be held at Roskilde University in Denmark, 19-23 August 1998. Participants will gather from fields such as philosophy of science; sociology of science, technology, and medicine; social studies of scientific

of time while on-line for frivolous graphics to download. Following these guidelines, we have been able to accentuate the Center's Web presence for everyone.

These enhancements, along with ECHOES, have been supported by a grant from the IEEE Life Members.

Center Adds To Quality Of Life

The popular press has in the past showed occasional interest in the history of electrical and computer technology, but as the millennium draws near, we can expect such attention to rise dramatically. Case in point: the recent special issue of *Life* magazine on the 100 incredible discoveries, cataclysmic events, magnificent moments of the past 1000 years. This double issue of the familiar periodical, cover dated "Fall 1997", included several people and technologies from electrical history in its lists of history's important personalities and events. Most dramatically, their list of the 100 people who made the millennium was headed by none other than Thomas Edison, who was cited for his invention of the incandescent lamp and his contributions to copiers, radio, movies, TV, and telephones. Other electrical inventors to make *Life's* list include Guglielmo Marconi (#27 on the list), Alexander Graham Bell (#31), Samuel F.B. Morse (#39), Nikola Tesla (#57), and Michael Faraday (#70). Some of the technical milestones that were judged to be among the 100 most important events of

the millennium were Morse's telegraph (1844), Bell's telephone (1876), Edison's creation of a research & development laboratory (1876), Marconi's transatlantic wireless communication (1901); the 1st regular TV broadcast (1928), and the invention of the transistor (1947). Also of interest are items such as the earliest account of the nautical compass (1117) and Röntgen's discovery of X-Rays (1895), along with some other basic scientific discoveries known to most electrical and computing engineers.

The IEEE History Center was proud to play a part in the creation of this broad retrospective issue of *Life* magazine. Center staff worked with one of *Life's* reporters to sort out the details of the numerous technical milestones connected with the invention of television to settle on General Electric's 1928 transmission in Schenectady, New York as the signature moment of the technology's birth. It was a difficult judgment, given the intricacies of television and the many aspects of the television system that were each developed on their own schedule. *Life's* reporter impressed the Center staff with his knowledge of his subject and his respect the complex relationship in electrical history between the individual inventor and the technological system.

As a reward for our efforts we were pleased to see a brief nod for the IEEE History Center, alphabetized under the name of Curator Andy Goldstein, in the issue's long list of acknowledgments.

Things to See and Do

knowledge; and general history of science, technology and medicine. For more information contact Thomas Soederqvist, Division of Philosophy and Theory of Science, Department of Communication, Roskilde University, P.O. Box 260, DK-4000 Roskilde, DENMARK, or e-mail: thomass@ruc.dk.

Telecommunications Symposium Focuses on Telephone

The 6th International Symposium on Telephone History (formerly the International Symposium on Telecommunications History) will be held at George Washington University in Washington DC. 26-27 June 1998. The event is open to anyone interested in telephone history. Previous topics have included, "Portraits of Independent Telephone Personalities," "Some Tainted Truths in Telephone History," and "The Hawthorne Works." For more information about attending the symposium and/or presenting a research paper, contact Russell A. Pizer, 305

Cooper Rd., North Babylon N.Y. 11703-4430, fax: 516-422-2324.

In France, History of Computing

The Fifth French Conference on the History of Computing will be held in Toulouse, France, in March 1998. The conference will be sponsored by the Ecole nationale supérieure d'électrotechnique, d'électronique, d'informatique, et d'hydraulique de Toulouse (ENSEIHT) at the University of Toulouse. The conference will focus on five major topics: 1) Informatics and aerospace (Toulouse is a leading European center of aerospace research); 2) The teaching of informatics; 3) Man/machine/system communication (languages, software, peripherals); 4) Norms, standardization, patents; 5) Software industry. For more information, contact Pierre-E. Mounier-Kuhn, Centre Roland-Mousnier, Paris-IV Sorbonne, 1 rue Victor-Cousin 75005, tel: (33) 01 40 46 25 40; fax (33) 01 40 46 31 92, email:

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Things to See and Do *continued from page 5*

mounier@sorbonne.msh-paris.fr.

Culture of Interactivity

A two-day event that aims to bring to the public a critical exploration of its relation-

ship with computers will be held at Rockefeller University in New York City 17-18 January 1998. *The Culture of Interactivity* is a project produced under the auspices of the Visual Arts Foundation with the support of the MFA Photography and Related Media Program of the School of Visual Arts. Event organizers plan to bring together distinguished guests from inside and outside the

field of computing to participate with the audience in dialogues, demonstrations of interactive applications, and a community networking experiment. Topics to be discussed include "The History of Interactivity," and "New Social Spaces." To find out more about this unique community-building event, visit <http://www.interactice-culture.org>

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HAUBEN, MICHAEL, and RONDA HAUBEN. *Netizens*. Los Alamitos, CA: IEEE Computer Society Press, 1997.

Michael and Ronda Hauben's book presents some fresh material on the history and significance of Usenet, the system of on-line discussion groups for Internet users. The authors' main theme is that the Internet has created a new social and political space, and that the people interacting in that space-network citizens, or "netizens"-have evolved their own culture, of which Usenet is one important example. They are optimistic about the potential of global networks to provide economic opportunity and end social and intellectual isolation.

The book is divided into four parts. The first section describes the present state of the Internet and Usenet, with examples of how network access can give people new options for work, socializing, and political action. Part two surveys the history of interactive computing and networks. Chapter 10 on the origins of Usenet, which grew out of the UNIX operating system, may be most useful to historians, as it presents information that is not readily available elsewhere. The third section of the book discusses the future of networking, exploring diverse topics such as government policy, the effect of the network on news media, and New York City's online community. The final section attempts to outline a "theoretical framework" for studying the network, making interesting but rather superficial comparisons between the Internet and the printing press, 18th century industrial technology, and the free press. A set of glossy illustrations commemorates computing and networking pioneers, and a glossary of acronyms helps the novice reader navigate the network jargon.

The book is uneven and occasionally repetitive, reflecting its origins in a series of independent papers by the two authors. The authors' claims for the social effects of Usenet and Internet are occasionally overbroad or implausible, as in Michael Hauben's assertion that network access will eliminate the problems of overpopulation (7). More convincing are the focused

analyses of the social norms and values of "netizens," which are illustrated by a wealth of excerpts from actual Usenet discussion groups. Overall, the book provides an enthusiastic, readable introduction to the history and culture of Usenet.

TOBEY, RONALD C., *Technology as Freedom*. Berkeley, CA: University of California Press, 1996.

Historians of electric power and electrification have made remarkable progress in the last decade and a half, beginning with the publication of Thomas Hughes' *Networks of Power* (1983) and continuing with Harold Platt's *The Electric City* (1983) and Mark Rose's *Cities of Light and Heat* (1995), among others. Now Ronald Tobey of the University of California has written *Technology as Freedom*, a history and critique of the social meanings of electrification in the New Deal period. Tobey argues persuasively that the electrification of most American homes, and particularly the transformation from very limited electric lighting service to the more intensive use of electricity, took place not during the 1920s, despite the postwar economic boom and the gung-ho boosterism in electric power industry, but later, during the period between the early 1930s and the 1950s. After all, nearly 30 per cent of American homes had no electricity in 1932, and another 30 per cent had minimal, lighting-only wiring installed. What the author defines as modern electric service was not a purely market-driven phenomenon in which consumers exercised real choices between viable alternatives. Rather, it was part of the broader social agenda of the New Deal period and had as much to do with, as he puts it, "collective, public decisions," as individual choice.

It was not private industry, either the makers of household electrical equipment or the providers of electricity, that was ultimately responsible for putting appliances in American homes. The only appliance owned by a majority of electrified homes in 1929 was an electric flatiron, although electric dishwashers, clothes washers, refrigerators, ranges, vacuum cleaners,

heaters, radios and other items were readily available, if perhaps too expensive for most budgets. The pattern of ownership and use of electric appliances reflected the fact that electricity was a status symbol for the rich in the 1920s. The general transformation of everyday life for ordinary people came about through Federal action. By identifying electrification as a modernizing and uplifting force, the government set in motion a course of action that would reshape the way electricity was sold and used. In numerous ways, the Federal government encouraged electrification through policies that began during the New Deal era but outlived that era. Some programs were direct, like the Tennessee Valley Authority and the Rural Electrification Administration, but many more were less visible, such as the establishment of wiring standards for houses built under Federal loans and subsidies, that assumed not only the use of electricity but its rather intensive use. The country was nearly all electrified by the early 1960s, supplied not just with electric lighting, but "modernized" according to the vision of Depression-era policy makers. Tobey's account, well-researched and richly documented, is a significant contribution to this important field.

LATHAM, COLIN, and ANNE STOBBS. *Radar: A Wartime Miracle*. Phoenix Mill, Gloucestershire: Sutton Publishing, 1996. xvii + 238 pp.

This book tells the story of Royal Air Force radar in World War II. RAF radars were used on the ground for early warning and tracking of aircraft and in aircraft of Fighter, Bomber, and Coastal Commands. Both authors served as radar specialists for the RAF during the war, and they have drawn also on the memories of about 70 other RAF radar personnel (most of them British, but some volunteers from Canada, Australia, New Zealand, and the United States). There are technical descriptions of equipment (supplemented with about 100 photos and line drawings), along with explanations of how different devices worked. People who operated the radar sets describe the controls, the displays, and the procedures, as well as some of the difficulties and some

unusual successes. The use of radar in the field-in Europe, in Egypt, in the Far East-is also described. Among the many interesting topics covered are the Chain Home Electrical Calculator (an electromechanical calculator supplied to radar stations for converting readings from the radar units to grid references and heights), radio-navigation aids (such as Gee and Oboe), and the Bruneval raid in 1942 when important parts of a German radar were taken back to England.

The Newsletter's "Bibliography" section was prepared with the assistance of Prof. Thomas J. Higgins of the University of Wisconsin-Madison.

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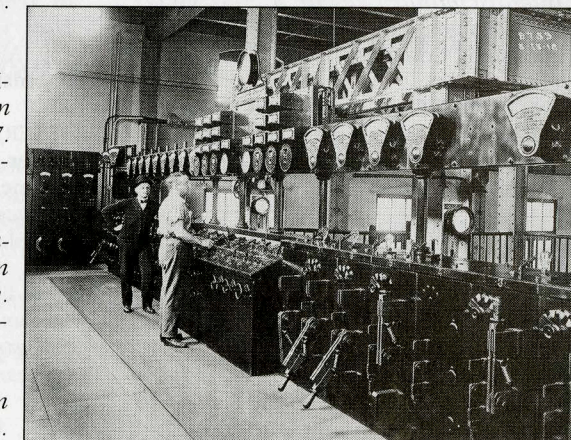
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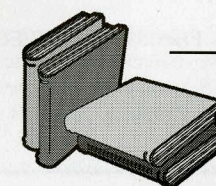
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On the occasion of the 150th anniversary of Alexander Graham Bell's birth, Abrams press has just published *Alexander Graham Bell: The Life and Times of the Man Who Invented the Telephone*, by Edwin S. Grosvenor and Morgan Wesson, two well known science writers and popularizers. It has been getting a fair amount of play in the popular press—look for a review of it in an upcoming IEEE History Center Newsletter. Other items of special interest include:

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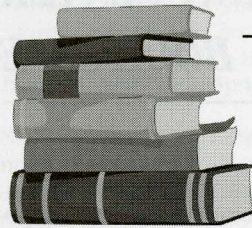
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Season's Greetings!



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ducting research at The Bakken. The minimum period of residence is one week. The grants are open to all researchers. The deadline for applications for 1998 is March 2, 1998. Please keep in mind while making your plans that because of construction and remodeling currently taking place, The Bakken will not be open to researchers until Fall 1998. For application guidelines and further information, please contact: David J. Rhees, Executive Director, The Bakken Library and Museum, 3537 Zenith Avenue So., Minneapolis, MN 55416 U.S.A. (Telephone: 612-927-6508; fax: 612-927-7265)

Marconi Collection

The GEC-Marconi company has decided not to auction off its historical collection of papers and artifacts. This is welcome news to those who protested the company's previous intention, announced in late January 1997, to offer the collection for sale at Christie's in London. Instead, GEC-Marconi will deposit the letters and other documents



Guglielmo Marconi, 1896.
(Courtesy of Marconi Company Archives)

in the County Record Office in Chelmsford, UK., while the objects will be moved to the Science Museum in London. The collection is valued at over US\$5 million.

Life Member Prize Awarded

Larry Owens is the winner of the 1997 Life Member Prize. His article, "Where Are We Going, Phil Morse? Changing Agendas and the Rhetoric of Obviousness in the Transformation of Computing at M.I.T., 1939-1957," published in IEEE Annals of the History of Computing, vol. 18 (1996), pp. 34-41, was selected for recognition by the Society for the History of

Technology (SHOT). Each year SHOT presents an award for the best paper on the history of electrical technology published during the preceding year. The award, established to encourage the publication of scholarly research in the field of electrical history, is sponsored by the IEEE Life Member Committee and administered by the History Center.

Owens' article discusses the transition at M.I.T. from analog computing research in the Electrical Engineering Department's Center of Analysis to digital computing in the Center for Machine Computation, formed in 1957 under the direction of Philip Morse. Owens relates the analog-digital debate to larger changes in technical capabilities, institutional priorities, professional identities and curricula in the Post-W.W.II United States.

Owens reverses the common perception of digital computing as more sophisticated than analog computing. Contrary to Morse's assertion that digital computers superseded analog computers because digital comput-

ers were simply faster and more versatile, Owens avers that the declared victory of digital over analog was instead the "rhetoric of the obvious" used by those who wished to reshape the discipline of engineering. They promoted the idea of digital computing as "obviously" faster, more flexible, and, therefore, more sophisticated than the old, slow, and simplistic analog computing, much as they presented themselves as technically superior, faster, and more flexible than pre-W.W.II electrical engineers.

Although digital computing did eventually supersede analog computing, Owens demonstrates throughout his article the fallacy of viewing digital as obviously superior to analog. He discusses the complex elements contributing to the change from analog to digital at M.I.T., including the technical intricacies of different computational instruments, as well as significant changes in electrical engineering education, research, and practice, and in funding sources, institutional support, and new analytical challenges.

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