

# Center for the History of Electrical Engineering

Newsletter No. 33 Summer 1993

It is with great pleasure that I am able to report the generous support that the Center has received over the past few months from numerous individuals, companies, and foundations. This financial support is very welcome—indeed, essential—to our continued operation; and it is heartwarming to receive this most tangible form of endorsement of our activities.

This past fall we were able for the first time to accept contributions through a checkoff on the annual IEEE dues bill. Many people

who had not previously received our literature were able to express their interest in our historical activities. This means of donation also freed people from giving in U.S. currency, through credit card payments; and the upshot was an outpouring of donations from almost every industrialized nation in the world, especially from Japan. Some

3,000 people made donations to the Center this past year; and their donations reached the highest level we have achieved—three times our best previous year and more than ten times the giving level of only four years ago. We thank each and every one of you for your generous support.

I am also pleased to report the generosity shown in foundation gifts for Center projects. We recently announced (see Newsletter #31) the commencement of our multi-year Power and Control project, which has the twin goals of producing a written history of all electrical technology since 1850 and recording the memories of our leading engineers in a collection of oral history interviews. Last year the IEEE Foundation offered a generous donation to initiate this project. Building upon this support, the IEEE Life Member Fund made a five-year commitment to the project.

Recently, the Andrew W. Mellon Foundation made a major contribution to expand the project, insuring that it will be truly international in scope and allowing us to add an archival component to the project. (See the related story on the archival work in sidebar.) With this funding in place, we can now proceed at full speed on the many tasks ahead of us to make Power and Control a success and of value to IEEE.

We have also been very fortunate to have received generous contributions from several sectors to our

endowment fund. IBM has made a leadership gift at our highest (Funding Partner) category of giving. And three of the IEEE Technical Societies (Antennas and Propagation, Electron Devices, and Microwave Theory and Techniques) have also contributed—setting what we hope will be a precedent for other IEEE Societies

and outside professional organizations that serve the electrical, electronics, and computing professions.

We anticipate that the income from the endowment will be a critical part of our funding over the coming decade; without it we will have to scale back many of our research and public outreach programs. Building an endowment will enable the Center to continue and increase its activities. Project grants and support from our parent organizations will continue to provide a significant part of our operating budget; but endowment interest will provide an increasing share of our operating budget over the coming years. This endowment is achievable if we are blessed with continuation of the good-will and support we have received over past years from individuals, companies, foundations, and other organizations.✦

## ARCHIVAL COMPONENT ADDED TO POWER & CONTROL PROJECT

Newsletter No. 31 reported on a major new project of the Center to research and write a comprehensive history of electrical technology (*Power and Control: A History of Electrical, Electronic, and Computer Technology*) and to conduct oral-history interviews with leading engineers in all of the technical areas represented in IEEE. The Andrew W. Mellon Foundation has recently awarded the Center a grant to enhance the project in several ways: to make the project more international (see the main article, to the left), to allow for transcription of many of the oral-history interviews, and to add an archival component to the project.

The Center has long had the practice, when conducting oral-history interviews, to ask about personal and company papers and about plans for their preservation, and the Center sometimes assists in arranging appropriate placement of records. The Mellon Foundation support will allow the Center to do much more than this. The Center will prepare two documents: "Guidelines for Companies for the Preservation of Records" and "Guidelines for Individuals for the Preservation of Records". These guidelines and survey forms will be sent to several hundred leading companies and several hundred of the most eminent engineers from around the world. The survey form for companies will ask not only about company records, but also about the existence of company histories, which exist in many cases as in-house publications.

The results of the surveys would be used in selecting the most promising sites for research on Power and Control and in preparing, for the benefit of other researchers, a guide to company records and to company histories. The Center believes that this kind of archival research is especially important now when a great many historically valuable records are in danger of being lost forever.✦

Thanks  
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Support...

## STAFF NOTES

## Oral History Results

The IEEE Oral History Project, in which members of the History Center staff conduct in-depth, career-spanning interviews with distinguished engineers (see Newsletter #28), has resulted in the recent publication of two detailed biographical articles. William Aspray, who interviewed Edwin Harder in July 1991, has published an article in the current issue of *The IEEE Annals of the History of Computing* (volume 15, number 2.) The article, entitled "Edwin L. Harder and the Anacom: Analog Computing at Westinghouse", identifies the growing complexity of power networks and the electrification of railroads during the interwar period as the backdrop for Westinghouse's involvement in analog computation. Aspray describes how the mathematically sophisticated Harder replaced a variety of special purpose calculating machines with the general purpose Anacom, an analog computer kept in service between 1946 and 1991.

A different article, the product of an oral history interview of Ernst Weber conducted by Frederik Nebeker in April 1991,

## Center Exhibits

The Center's curator Andrew Goldstein recently exhibited a portable display celebrating the achievements of Harold Alden Wheeler at a celebration given by Hazeltine Corporation in honor of Wheeler's 90th birthday. The exhibit, centered around a breadboard with a superheterodyne circuit built by Wheeler in 1925, highlighted Wheeler's contribution of automatic volume control to radio sets. After the birthday banquet, the exhibit was moved to Hazeltine's Long Island, NY headquarters where it remained on display for several weeks.\*

appeared in the April 1993 issue of *Proceedings of the IEEE*. Nebeker's article, entitled "Ernst Weber: Bridger of Cultures" focuses on the former IEEE president's tendency during his remarkable career to bring together different traditions harmoniously. Nebeker's point is illustrated with details of Weber's involvement in European and American electrical engineering, engineering and pure physics, industry and academia, and with both the AIEE and the IRE.\*

the pedagogical ups and downs of Oliver Heaviside's operational calculus. After falling out of favor in the early years of this century, operational calculus again came to be taught at engineering schools in the period between the two world wars. The principal proponents in the United States were John R. Carson, Louis Cohen, Vannevar Bush, and Ernst J. Berg.

Ronald Kline (Cornell University) analyzed the effect of World War II on EE education in the United States, with a focus on Cornell University. He argued that some of the changes popularly attributed to the war, such as expansion of the curriculum to include electronics, in fact began earlier. The war did, however, have a great influence, as in bringing about a higher degree of specialization, an increase in the scientific content of the curriculum, and a greater attention to research on engineering fundamentals.

*The Golden Age of Radio*

Frederik Nebeker presented a talk on "Radio Engineering in the Golden Age of Radio" at the annual awards banquet of the Rochester IEEE Section, held 8 June 1993. Nebeker described both the rise of radio broadcasting and the development of

*Continued on next page*

## Competitiveness Volume

The IEEE Press has just published William Aspray, ed. *Technological Competitiveness: Contemporary and Historical Perspectives on the Electrical, Electronics, and Computer Industries*. This book, the result of the Center's three-day conference on technological competitiveness held in October, 1991, features papers on Japanese electronics, U.S. electronics, computing, telecommunications, electrical technology for the home market, industry, and commerce, and electric power in France. Along with expanded versions of the papers presented at the conference, the book offers analytic introductions to each section as well as a general introduction. The price for IEEE members is \$40. To order a copy, contact IEEE Customer Service, 445 Hoes Lane, Piscataway, NJ 08854-1331, tel. (908) 981-0060.\*

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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## NOTICES

*Continued from previous page*

quantitative measures of the performance of radio receivers. He argued that the ability to accurately measure receiver perfor-

## Radio History Resource

A useful resource for those interested in the early history of radio and broadcasting is *Antique Radio*, in Austin, Texas. *Antique Radio* is principally an electronics supplier, selling vintage radio parts by mail order, but it also offers an extensive collection of literature, both original material with operational details about specific radio sets and secondary work on the history of broadcasting. Along with familiar titles such as Tom Lewis's *Empire of the Air* and the three-volume guide *Radio Manufacturers of the 1920s* by Alan Douglas, *Antique Radio* also offers exclusive items such as *Border Radio*, which tells the story of super-power million-watt outlaw "X" stations along the US-Mexico border during the 1930s to 1950s, and the colorful characters who broadcast on them. For more information, contact Durell Roth, *Antique Radio*, 5555 N. Lamar, Bldg. H-105, Austin TX 78751, tel. (512) 467-0304.\*

## Reprint of First Transactions of AIEE Available

The IEEE Power Engineering Society recently announced the availability of reprints of the first volume of the *Transactions of the American Institute of Electrical Engineers*, originally published in 1885. The book's eleven papers, with titles such as "Telegraphing Without Wires", "Notes on Phenomena in Incandescent Lights", and "The Patent Office: It's Relation to Inventors and its Needs", provides an excellent snapshot of the interests of the 19th century electrical

engineer. The new edition comes with an historical preface, also reprinted from the original edition, which sets the stage for the formation of the AIEE and describes the steps undertaken by the founders to launch the organization. Copies of the 152-page book are available to IEEE Members for \$10 and to non-members for \$20. The product number is JP1879-6. To order a copy, contact IEEE Customer Service, 445 Hoes Lane, Piscataway, NJ 08854-1331, tel. (908) 981-0060, fax (908) 981-9667.\*

## Lamme Honored

On April 17, 1993, at an award banquet in Plymouth, Montana, the IEEE Twin Cities Section unveiled an exhibit on Bertha Lamme, the first woman awarded a degree in electrical engineering. Lamme, who earned a bachelor's degree in EE from Ohio State University in 1893, was cited as an inspiration for today's female engineers in a speech delivered by IEEE president Martha Sloan. Lamme worked for Westinghouse, along with her brother Benjamin Lamme, for whom the IEEE Lamme medal is named. The History Center contributed to this worthy effort by supplying background information on Lamme to Max Goldberg, who oversaw construction of the exhibit.\*

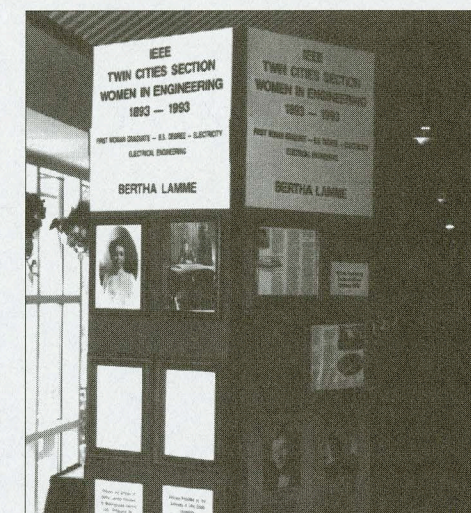


Exhibit honoring Bertha Lamme

## Fellowship Available

The Dibner Institute is accepting applications for ten to fifteen fellowships it is offering for research in the history of science and technology. Funds are available for travel, housing accommodations and living expenses for applicants who have advanced degrees in appropriate fields and offer evidence of significant scholarly accomplishment and professional experience. Applicants may request support for periods from one to three academic terms over the course of the year. The Institute provides office space, support facilities, and library privileges at Boston area university libraries (MIT, Boston University, Brandeis, Harvard, and the Burndy library.) Dibner Fellows are expected to reside in the Boston area during the terms of their grants. The deadline for receipt of applications for 1994-1995 is January 1, 1994. For more information, contact Helen Dippold, Dibner Institute for the History of Science and Technology, Dibner Building, MIT E56-100, 38 Memorial Drive, Cambridge MA 02139, tel. (617) 253-8721, e-mail dippold@mit.edu\*

## Correction--

The Center reported in the last Newsletter that a microfilm edition of the papers of Karl Taylor Compton and James Killian was available from Research Publications International (RPI). We were recently informed that RPI has canceled the project and no microfilm edition is forthcoming. These important papers are still on deposit at the MIT archives, however. For more information, please contact Helen Samuels, MIT Institute Archives and Special Collections, Room 14N-118, Cambridge, MA 02139, tel. (617) 253-5688.\*

## History Committee Active

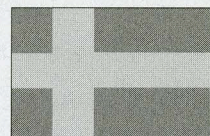
W. Bernard Carlson, chairman of the IEEE History Committee, is being promoted to the rank of Associate Professor in the University of Virginia's School of Engineering & Applied Science's Division of Humanities. Carlson, whose book on Elihu Thomson was reviewed in Newsletter #32, continues his historical research on the cognitive process of invention.

Committee member Yuzo Takahashi has been working actively with the Technical Committee on the History of Electrical

Engineering of the Institute of Electrical Engineers of Japan. Takahashi chairs a subcommittee which will soon launch studies of professional organization and engineering education in Japan. This follows his successful work as chair of a subcommittee which has finished a study of the history of Japanese electrical insulation technology since World War II. For more information, contact Yuzo Takahashi, Tokyo U. of Agriculture & Tech., Dept. of Electrical Engineering, 2-24-16 Koganei, Tokyo 184, Japan, tel. 0423-81-4221.\*

## MUSEUMS

The Center tries to call attention to museums around the globe which are of special interest to electrical engineers and historians of electrical technology. In previous issues of the Newsletter, we have reported on museums in Canada, Japan, the former Yugoslavia, and the United States (new subscribers can obtain back issues of the Newsletter free of charge by contacting the Center. Photocopies will be sent if no back issues remain.) In this issue, we report on several additional institutions.



## Sweden

In Stockholm, the Swedish National Museum of Science and Technology features exhibitions on electrical technology among its attractions. The exhibit on electric power offers numerous electrical artifacts ranging from voltaic piles to large dynamos, with special emphasis on alternators and other equipment important in the development of AC power. The display places the viewer on a Swedish street, circa 1910s. Under the then-new electric street lights is parked an electric automobile from 1919 and an electric tram built in 1901. A different view of the application of electricity is offered in the exhibit on domestic technology. There, examples of vacuum cleaners, refrigerators, and sewing machines show how electric power revolutionized Swedish domestic life.

Attached to the National Museum is the Telecommunications Museum, which is dedicated exclusively to exhibits on communications and computer technology. In its telegraph and telephone display, the museum has such attractions as the 1878 telephone built by Lars Magnus Ericsson, the person who introduced the telephone to Sweden. Examples of wood and bakelite telephones illustrate the development of the device from its origins to the present day. Also represented are vintage and contemporary switching systems. The radio/television exhibit tells how Sweden adopted and developed those technologies. It includes special displays on modern satellites and cable transmission technologies. In the computer section, native machines such as Georg Scheutz's difference engine from the 1840s, the BARK automatic calculator from the 1950s, and a SAAB D21 from 1962 represent Sweden's contributions to computing.

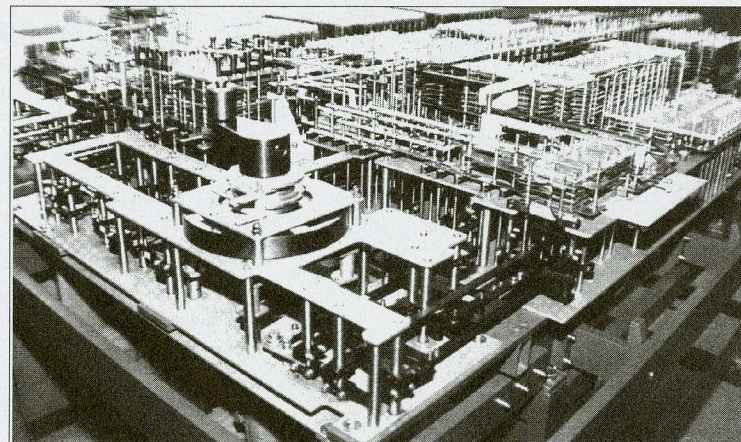
In addition to displaying artifacts in informative exhibits, the museum tries to extend understanding of science and technology in Sweden through documentation

and research. Museum staff collects artifacts, takes photographs, obtains archival records, and conducts interviews to further this ongoing project. For more information, contact The Museum of Science and Technology, PO Box 27842, S-11593 Stockholm, tel. 46 8 663 10 85.



## Germany

The history of data processing in Germany is preserved at the Museum für Verkehr und Technik in Berlin. The museum's exhibit, which covers the period between 1936 and the present day, focuses on the landmark contributions of German computer pioneer Konrad Zuse. The exhibit features a reconstructed Z 1, Zuse's binary-



Detail of Zuse's Z1 computer

Photo courtesy of Deutsches Museum

coded program-driven calculator (the original was destroyed by allied bombing during World War II); the Z 11, a relay calculator built in 1956; the Z 22, Zuse's first true computer; and the Z 23, one of Europe's first transistorized computers. Supplementing the machines in the exhibit are historical documents, photographs, and components, each of which contribute to the understanding of Zuse's work and its context. The post-Zuse era is represented by computers running CAD programs and artificial intelligence systems, available for visitors to experiment with.



## United States

Near Minneapolis, The Pavek Wireless Museum is a non-profit institution for the exhibition and preservation of the social and technological history of wireless and electronic communications of the period 1900-

1950. The museum, located in the Minneapolis suburb of St. Louis Park, contains and exhibits thousands of radio sets, components, vacuum tubes, transmitters and receivers, broadcasting station equipment, "ham" amateur equipment, and wireless communication apparatus for the news and entertainment industries, for business, and for communications functions of all types. The collection chronicles the history of early communications technology from the first mineral-based radio receivers through the development of television. Displays representing more than 150 brands of home radio receiving sets—as well as telegraph equipment, microphones, speakers, antenna, televisions, and tubes—fill the museum. Specialty items, such as crystal sets, World War I aircraft and ship-to-shore communication systems, battlefield equipment, and spark transmitters are also represented.

For the researcher, the museum maintains a library of hundreds of text books relating to magnetism, electricity, and the development of the wireless spectrum. In addition to these, the holdings include catalogs, schematics, and biographies of inventors. For more information, contact The Pavek Wireless Museum, 3515 Raleigh Avenue, St. Louis Park MN, 55416, USA, tel. (612) 926-8198.



## Italy

A museum of the History of Electricity has been built in Rome by the Ente Nazionale Energia Elettrica, the Italian National Energy Board. Exhibits in the museum trace the story of electricity back to 640 BC, giving detailed attention to the contributions of major Italian figures such as Da Vinci, Galileo, Galvani, Volta, Marconi, and Fermi as well as those of non-Italians. The vast collection of artifacts is organized in exhibits concentrating on early batteries, electrical instruments, communications, radio and television, electric light, motors and electric traction, dynamos and power meters, atomic energy, and other themes.

Continued on page 7

## BIBLIOGRAPHY

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

**Coopersmith, Jonathan**, *The Electrification of Russia, 1880-1926* Ithaca, NY: Cornell University Press, 1992, 274 + xii, illus.

The electrification of Russia took place within a rich and complex socio-political context that spanned the twilight years of imperial Russia, the dawn of the Soviet regime, and the revolutionary years in between. Coopersmith's book, based on study of czarist and Soviet archival materials, analyzes Russia's entwined technical, political, and economic trajectories through her second industrial revolution. Foreign commercial and technical influence, electrification's political constituencies within Russia, and Russia's peculiar institutional and organizational environment are important themes Coopersmith traces as he constructs the story of the development of central and regional power stations throughout Russia.

Coopersmith also seeks to explore how electrification in Russia differed from that of Western countries. Russia lagged the West generally in electrification and related developments, and rural areas within Russia lagged further still. These gaps persisted well into the Soviet period, despite the government's increasing interest in electrification. Coopersmith finds their basis not in technical shortcomings of Russian engineers, but rather in political, social, and economic factors—some of which spanned both czarist and Soviet regimes. While the government and the electrical engineering community shared a general agenda of electrification, bringing their interests into reality required struggle and conflict over technical and political issues alike.

Rich detail, careful analysis, and a sensitivity to interconnections among technical, social, political and economic issues make this book a valuable contribution to the history of technology, and also to the study of Soviet society during its crucial early years. Electrical engineers as well will welcome its portrayal of the complex process of introducing electricity and electrical technology to the vast territory of Russia.\*

**Leslie, Stuart W.**, *The Cold War and American Science* New York: Columbia

University Press, 1993, 332 + xiii.

Leslie's book analyzes the development of science and technology in post-WWII America through an examination of programs sponsored by MIT and Stanford in instrumentation, aerodynamics, nuclear energy, materials science, and other fields. Leslie argues that military, and to a lesser degree industrial, funding changed for the worse the fundamental character of scholarly research, intellectual freedom, and science and engineering discipline definition as it was practiced in the academic sector.

The title is somewhat a misnomer in that it considers technology as much as, if not more than, science. At MIT, he considers, among other organizations, the Gas Turbine Lab, Naval Supersonic Lab, Aeroelastic and Structures Lab, Instrumentation Lab, Lab for Nuclear Science and Engineering, Center for Materials Science and Engineering, and the National Magnet Lab. At Stanford, he considers, among other organizations, the Applied Electronics Lab, Ames Research Center, SLAC, Microwave Lab, the Center for Materials Research, and the Stanford research park.

Even readers who dispute Leslie's claims about the negative impacts of the military on academic science will find much of interest in the book. As with his other historical writings, Leslie has done a thorough job of locating and analyzing archival sources, and his writing is clear and witty.\*

## Other Books

Alberts, Gerard, ed. *Conference on the History of ALGOL 68*, Amsterdam, 11 February 1993, Amsterdam: Centrum voor Wiskunde en Informatica, 1993.

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## Historical Exhibit at Microwave Show

By David Morton

Visitors to the 1993 Microwave Theory and Techniques Society convention, held in Atlanta, Georgia June 15-17, were treated to an exhibition of artifacts related to the history of radar and microwave communications. Begun in 1980 by IEEE History Committee member Theodore Saad, this exhibit has been a regular feature at the annual convention. This year, however, the historical exhibit, located in the midst of the commercial exhibition area, rather than at the convention hotel as in previous years, had its highest profile ever. The location gave the exhibit constant exposure and ensured a high volume of visitors.

The focus of the exhibit was a collection of artifacts borrowed from the Historical Electronics Museum in Baltimore, MD. Museum volunteer (and Westinghouse engineer) Steven Stitzer arranged for display an assortment of microwave tubes, technical literature, test equipment, historical books, and videos. Tubes bearing such unlikely names as the "acorn", the "door knob", and the "bathtub", as well as the more familiar magnetron and klystron, documented the technical development of radar, especially during World War II. A video from the MIT Museum illustrated the production process for a Raytheon sub-miniature tube.

Stitzer planned to demonstrate the measurement of standing wave ratios with a "slotted line" analyzer and a microwave spectrum analyzer, but was stymied by technical troubles.

Additional items on display, obtained from the Air Force and from the Naval Research Laboratory, included several phased antennas and a chronology of the development of super-miniaturized monolithic microwave integrated circuits.\*

## IEEE Life Members Offer Fellowship

Applications will be accepted beginning in October for the 1994-95 Fellowship in Electrical History. The Fellowship, which is funded by a grant from the IEEE Life Members Fund, 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 transcripts, letters of recommendation, and additional information supplied on the application form. Students with undergraduate degrees in engineering as well as those having degrees in the sciences or the humanities are invited to apply. The deadline for receipt of applications is 1 February 1994, and three copies of entire application package must accompany the original. Application forms may be obtained from the Center.\*

### 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. William Aspray.

Founding Partners:

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Environmental Research Institute of Michigan  
KBR Foundation  
Sematech  
Takashi Sugiyama

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