

# Center for the History of Electrical Engineering

Newsletter No. 22 Fall 1989

## Center Expands Research Program

The IEEE Center for the History of Electrical Engineering was founded to promote the study and understanding of the history of electrical science and technology. This mission is fulfilled through a variety of programs. Exhibits, publications, archival collecting and description projects, and reference services disseminate information and help to preserve source materials. Independent historical research projects add to the body of knowledge about electrotechnology and its role in the development of modern society.

The Center is increasing its activity in this last area through participation in three research projects. The first of these is a study of the Hungarian-American mathematician John von Neumann and his contributions to the development of modern computing. Based on extensive archival sources, the research is uncovering von Neumann's influence on computer architecture, machine construction, numerical analysis, automata theory, and scientific applications (in particular, meteorology). The study is set in the context of von Neumann's earlier work in mathematics, physics, and economics, and his later work as a consultant to government and industry. The main product of this project will be a scholarly monograph, to be published by the MIT Press in late 1990. A small traveling exhibit is also planned. The von Neumann project is supported by the National Science Foundation and the Charles Babbage Institute.

The National Science Foundation is supporting a second Center research project as well, one that analyzes the NSF's contributions to computing over the past 35 years. Computing developed in the post-war period more rapidly in the United States than in other countries, in large measure due to financial support from U.S. government agencies. The NSF aided this growth through three programs.

- University facilities and training grants to accelerate the development of computer education;
- Research grants in almost every area of computer science and engineering;
- Computing facilities grants, such as those funding the development of networks and supercomputers, to enable scientists to carry out their research more effectively.

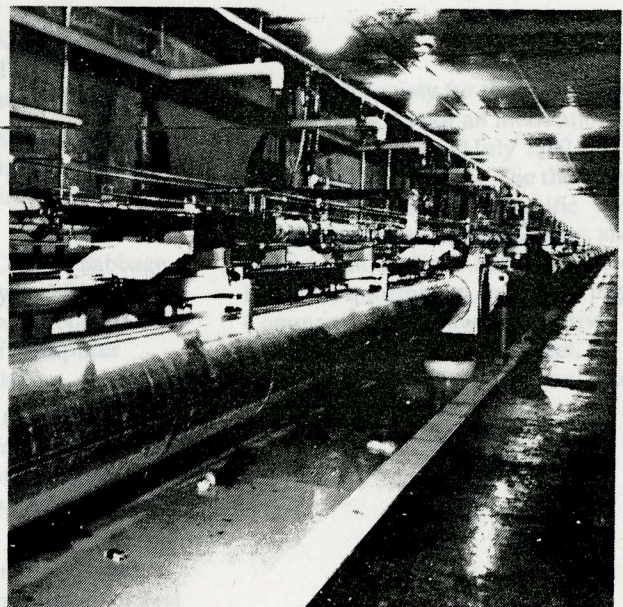
The NSF study involves individuals from several institutions: William Aspray, IEEE Center for the History of

*continued on page three ...*



Library of Congress

*The subjects of two of the Center's research projects. Above, John von Neumann (right), pictured with Werner von Braun, and, below, a section of the two-mile accelerator at the Stanford Linear Accelerator Center.*



Stanford University

## Meetings . . .

### SHOT

The annual meeting of the Society for the History of Technology, held in Sacramento, CA, on 12-15 October 1989, featured a number of presentations on the history of electrical science and technology.

#### Paper sessions

Wiebe Bijker (University of Limburg). "Framing Social Constructivism: A Comparative Study of the Bicycle, Bakelite and Fluorescent Lighting."

Brian Bowers (Science Museum, London). "Edison and Hopkinson: Transatlantic Relations in Electrical Engineering in the Early 1880s."

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, Institute of Electrical and Electronics Engineers, 345 East 47th Street, New York, NY 10017 (212-705-7501).

#### IEEE History Committee 1989

James E. Brittain, *Chairman*  
Thomas J. Aprille  
John H. Bryant  
W. Bernard Carlson  
Harold Chestnut  
Donald Erickson  
Bernard S. Finn  
Howard B. Hamilton  
Stephen L. Johnston  
Ronald R. Kline  
Paul J. Nahin  
Edward L. Owen  
Karle S. Packard  
Erwin Tomash  
Charles R. Wright

#### Center for the History of Electrical Engineering

William Aspray, *Director*  
Joyce E. Bedi, *Curator*  
Charles Dwight, *Research Assistant*

The *Newsletter* is made possible by a grant from the IEEE Foundation.

W. Bernard Carlson (University of Virginia). "Mastering the Muses of Creativity: Thomas Edison and the Management of Innovation."

John Collett (University of Oslo) and Olav Wicken (Norwegian Institute for Defense Studies). "The Many Roles of Government in the Norwegian Computer Industry."

Martin J. Collins (National Air and Space Museum) "RAND and the Organization of Postwar Science and Technology."

Jonathan Coopersmith (Texas A&M University). "Education and the Rise of Russian Electrical Engineering."

Pascal Griset (CNRS/Institute d'Histoire Moderne et Contemporaine). "Women in the Telecommunication Labor Market in the 1920s: The French Telephone Administration and the American Radio Industry."

Mikael Hard (Gothenburg University). "Technological Drift in Science: Radio and Astronomy in Sweden, 1945-70."

Ronald Kline (Cornell University). "Edison, Steinmetz, and Tesla: Electrical Wizards in a Corporate Age."

Lillian D. Kozloski (National Air and Space Museum). "The Wrong Stuff [Women in the Space Program]."

Bill Luckin (Bolton Institute of Higher Education). "Questions of Power: Electricity and Environment in Inter-war Britain."

Arthur L. Norberg (Charles Babbage Institute). "Military and Civilian Convergence on United States Goals for Development of Computer Systems in the 1960s."

Bryan Pfaffenberger (University of Virginia). "The *Second Self* in the Third World: The Meaning of Personal Computing for Sri Lankan Tamils."

Trevor Pinch (University of York). "The Social Accomplishment of Test Results in Computer Design."

Robert W. Righter (University of Texas at El Paso). "Charles Brush and the First American Wind Generator."

Bayla Singer. "Shaping the Symbol: Electromyoth, 1890-1910."

Jan van den Ende (Delft University of Technology). "On Future Waves: Calculations on Water Movements, 1920-1960."

Tom Wang (Dataquest Inc.). "The Silicon Road: Asian Industrial Policy for the Semiconductor Industry."

#### Alternative format sessions

Joyce E. Bedi (IEEE Center for the History of Electrical Engineering). "Through a Glass Brightly: A History of Television in America."

Paul Ceruzzi (National Air and Space Museum). "Beyond the Limits: Flight Enters the Computer Age."

Bernard S. Finn (National Museum of American History). "The Information Age."

Paul Israel and Robert Rosenberg (Thomas A. Edison Papers). "Edison's Electric Pen and Universal Stock Printer: Artifacts and Interpretation."

Pamela W. Lurito Laird. "Women and their Machines: Selling the Nineteenth-Century Domestic Utopia."

#### BSHS

The British Society for the History of Science will sponsor an international meeting during 17-20 July 1990 at Keble College, Oxford. The theme of the conference is "The Scientific Revolution: Science, Technology, and Medicine in the Early Modern Period." For more information, contact Wing Commander G. Bennett, Executive Secretary, BSHS, 31 High Street, Stanford in the Vale, Faringdon, Oxon SN7 8LH, England.

## Briefs . . .

### IEEE/SHOT Prize Awarded

At the annual meeting of the Society for the History of Technology (SHOT), W. Bernard Carlson (University of Virginia) received the IEEE Life Members' Prize in Electrical History for his article, "Academic Entrepreneurship and Engineering Education: Dugald C. Jackson and the MIT-GE Cooperative Engineering Course, 1907-1932" (*Technology and Culture* 29, no. 3 [July 1988]: 536-567). The prize citation states, in part, that Carlson "combines thorough historical research with illuminating analysis of an issue of major contemporary importance: how to educate engineers in an industrially-competitive world. He focuses on . . . the MIT-GE Cooperative Engineering Course . . . and the efforts of the course's creator, Dugald C. Jackson, to illuminate the



Dugald C. Jackson in his MIT office.

transformation of the U.S. engineering profession in the early 20th century."

The IEEE Life Members' Prize in Electrical History is sponsored by the IEEE Life Member Fund, IEEE History Committee, and SHOT.

### Electricity Kits

The Bakken Library and Museum of Electricity in Life has received a grant from the Division of Material Development, Research, and Informal Science of the National Science Foundation. The award of \$65,905 will allow the Bakken to develop prototypes of an 18th-century electricity kit for use by physical science teachers who teach electricity at the junior-high level. Each kit will include a cylinder electrostatic generator, a Leyden jar and electrophorus, an electrometer, and a teacher-student guide. A 30-minute video tape will be offered as a supplement to the kit. Once the prototypes have been evaluated, the Bakken expects to manufacture kits for nationwide sale.

For further information, contact John E. Senior, Director, Bakken Library and Museum of Electricity in Life, 3537 Zenith Avenue South, Minneapolis, MN 55416 (612-927-6508).

### Street Railway Library Donated

McGraw-Hill Inc. has donated 274 volumes of electric railway and transit periodicals from its corporate archives to the Seashore Trolley Museum in Kennebunkport, Maine. The gift includes complete runs of the trade magazine, *Street Railway Journal*, and its successors, *Electric Railway Review*, *Electric Railway Journal*, and *Transit Journal*. In addition, there are whole or partial runs of eight other electric railway, transit, and electric railway - investment periodicals published from 1883 to 1942.

The Seashore Trolley Museum, now celebrating its 50th anniversary (see *Newsletter* No. 20), is administered by the New England Electric Railway Historical Society. For more information on the museum's library, contact Donald G. Curry, Director, Seashore Trolley Museum, P.O. Drawer A, Kennebunkport, ME 04046 (207-967-2712).

continued from page one ...

Electrical Engineering; Bernard Williams, University of Kansas; Bruce Bruemmer and Arthur Norberg, Charles Babbage Institute; and George Mazuzan, National Science Foundation.

The third research project in which the Center is involved is coordinated by the American Institute of Physics Center for History of Physics. With support from the Dept. of Energy and the National Science Foundation, the AIP Center has undertaken a five-year archival research project on multidisciplinary, multi-institutional, collaborative scientific research (see *Newsletter* No. 18). The period since World War II has been a time of big science and engineering, typified by projects that require very expensive equipment and the collaboration of hundreds of scientists, engineers, and technicians, often from many different institutions (for example, Fermi National Accelerator Laboratory and the Stanford Linear Accelerator Center). The sheer size of such projects and the lack of information about the types and location of records produced by them makes historical study difficult.

The AIP project will study a number of multi-institutional projects in order to produce a documentation model for future historians and archivists. The Center's part in this study is two-fold: to investigate the role of electrical engineering subcontractors in such research and the records produced as part of the subcontracted work, and to look at the role of computing in collaborative projects and the kinds of records that result. Researchers from Stanford University, the University of Illinois, Indiana University, FermiLab, and other institutions, along with the IEEE and AIP Center staffs, are participating in the research.

For more information on the Center's research program, contact William Aspray, Director, at the Center for the History of Electrical Engineering.

---

 Center for the History of Electrical Engineering
 

---



---

 New Publications . . .
 

---

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

**Books**

Robert Clayton and Joan Algar. *The GEC Research Laboratories, 1919-1984*. IEE History of Technology Series, no. 10. London: Peter Peregrinus Ltd./ Science Museum, 1989. 438 pp.

Much attention has been paid to the laboratories established in the United States near the beginning of this century at AT&T, General Electric, and RCA, and to their role in shaping and legitimating a new institution, the industrial research laboratory. Much less well known, but perhaps no less important, was the formation of the research laboratories at GEC (General Electric Co., Great Britain) at about the same early date.

Written in an encyclopedic style, *The GEC Research Laboratories* focuses strictly on the areas of research undertaken at the Laboratories. Clayton and Algar begin with an account of the origins, philosophy, and organization of the Laboratories and a chronological overview of the research. Rather than organizing the account around a few major historical themes, the authors provide a subject-oriented description of the research programs. The GEC Laboratories, conceived in 1916 and opened in 1919, were founded to solve problems in lamp manufacture. The scope of research quickly broadened in the 1920s to include thermionic valves and telecommunications. Television in the 1930s and radar in the 1940s led the laboratories to the intensive study of electronic systems. Major programs began in physics in the 1950s, engineering applications in the 1960s, optical telecommunications in the 1970s, and solid-state devices in the 1980s.

Sir Robert Clayton is a former president of the Institution of Electrical Engineers. He was on the GEC staff from 1937 until his retirement in 1983. Joan Algar is an information officer for the GEC Research Laboratories, specializing in the Laboratories' history and archives.

Alberta I. Wallen. *Genius at Riverhead: A Profile of Harold H. Beverage*. North Haven, ME: North Haven Historical Society, 1988. 128 pp.

Harold Beverage is a pioneer in radio communications. This IEEE Fellow holds over 30 patents and is the recipient of many awards, including the IRE Morris N. Liebmann Award (1923), IRE Medal of Honor (1945), the AIEE Lamme Medal (1957), the IRE Professional Group on Communications Systems Achievement Award (1958), and the IEEE Centennial Medal (1984). Among his many contributions to radio technology are a barrage receiver (1918) employed by the U.S. Navy as part of a system to protect against enemy reception of communications, the Beverage wave antenna (1922) for receiving signals from overseas, and his work during the second World War on a radio ground observer net used to detect the approach of enemy aircraft.

Born in 1893, Beverage grew up in isolation on an island off the coast of Maine. His early interest in wireless was solidified by a formal education at the University of Maine, followed by a first job as a test engineer at General Electric. At GE, he came under the influence of Ernst F.W. Alexanderson, who transferred Beverage to RCA at its founding. Except for the war years, when he served as a military consultant, Beverage spent his entire career at RCA. He was involved in establishing RCA's first research laboratory (in a tent on Long Island in 1919), and rose quickly through the company ranks to the position of Chief Research Engineer (1929) and later to Vice President for research and development. In retirement (from 1958), he continued as a consultant.

Wallen's book aims to give a personal and anecdotal account of Beverage's life, rather than a detailed description of his technical accomplishments. Her sources are family records, records of the local historical society, and interviews with Beverage and his family. An ample number of photographs, many still in private hands, illustrate and enrich the book.

Alberta I. Wallen is a freelance writer in Maine.

**Other Recent Books**

Ceruzzi, Paul E. *Beyond the Limits: Flight Enters the Computer Age*. Cambridge, MA: MIT Press, 1989. 270 pp.

Joliet, H., ed. *Aluminium, der ersten 100 Jahre*. Düsseldorf: VDI-Verlag, 1989. 344 pp.

May, Peter. *Georg Simon Ohm—Leben und Wirkung*. Erlangen: Druckhaus Mayer Verlag, 1989. 120 pp.

Rassweiler, Anne D. *The Generation of Power: The History of Dneprostoi*. New York: Oxford University Press, 1988. 248 pp.

Rydnik, V. *Electrons March in Step: A History of Superconductivity*. Moscow: MIR Publishers, 1989. 190 pp.

Wilson, J.F. *Ferranti and the British Electrical Industry, 1864-1930*. Manchester, UK: Manchester University Press, 1988. 165 pp.

**Articles**

Aspray, William. "John von Neumann's Contributions to Computing and Computer Science." *Annals of the History of Computing* 11, no. 3 (1989): 189-195.

Barrett, R. "Computer Aids for Electronic Equipment Design—21 Years On." *Computer-Aided Design* 21, no. 5 (June 1989): 338-341.

Bell, Trudy E. "[Harold E.] 'Doc' Edgerton: An EE for All Seasons." *IEEE Spectrum* 26, no. 9 (Sept. 1989): 52-57.

\_\_\_\_\_. "Back to the Future: A [Historical] Perspective [of the Defense Industry]." *IEEE Spectrum* 26, no. 11 (Nov. 1989): 42-44.

Bézier, P. "First Steps of CAD." *Computer-Aided Design* 21, no. 5 (June 1989): 259-261.

Ceruzzi, Paul. "Electronics Technology and Computer Science, 1940-1975: A Coevolution." *Annals of the History of Computing* 10, no. 4 (1989): 257-275.

Cooper, C. Drayton. "160 Meters: A Tribute." *QST* 78, no. 8 (Aug. 1989): 49.

- Cover, Thomas M., Peter Gacs, and Robert M. Gray. "Kolmogorov's Contributions to Information Theory and Algorithmic Complexity." *Annals of Probability* 17, no. 3 (1989): 840-865.
- "Cragside—The First Home of Hydro Power." *IEE Review* 35, no. 7 (July/Aug. 1989): 246.
- Dillin, Carol A. "A Century of Investor-Owned Electric Service—A Utility History." *Public Utilities Fortnightly* 124 (31 Aug. 1989): 9-12.
- Döring, Herbert. "Drei Jubiläen auf dem Gebiet der Elektronenröhren." *Nachrichtentechnische Zeitschrift* 42, no. 6 (1989): 344.
- Edwards, Marion Lee. "The Master's Degree Program in Electrical Engineering [and Its Historical Development]." *Johns Hopkins APL Technical Digest* 10, no. 2 (1989): 146-153.
- "Gauss et la Méthode des Moindres Carrés." *Revue d'Histoire des Sciences et de leurs Applications* 42, nos. 1-2 (1989): 5-26.
- Guterl, Fred. "The Dual Origins of a Bipolar Breakthrough." *IEEE Spectrum* 26, no. 7 (July 1989): 25-29.
- Hogg, Clayton L. "The Marshall H. Ensor Memorial Museum." *QST* 78, no. 8 (Aug. 1989): 45.
- Hutcheon, I.C. "Intrinsically-Safe Electronic Instrumentation" (Letter to the Editor). *Measurement + Control* 22 (Sept. 1989): 218.
- Kniedstadt, J. "A Century Ago Heinrich Hertz Discovered Electromagnetic Waves." *Telecommunication Journal* 56, no. 6 (1989): 376-380.
- König, Wolfgang. "Friedrich Engels und 'Die Elektrotechnische Revolution'—Technikutopie und Technikeuphorie im Sozialismus in den 1880er Jahren." *Technikgeschichte* 56, no. 1 (1989): 9-37.
- Kryzhanovsky, L.N. "Mapping the History of Electricity." *Scientometrics* 17, nos. 1-2 (1989): 165-170.
- Larkins, D.H. "Radar Reminiscences (a Letter to the Editor)." *IEE Review* 35, no. 6 (June 1989): 218.
- Layer, Harold A. "Microcomputer History and Prehistory—An Archaeological Beginning." *Annals of the History of Computing* 11, no. 2 (1989): 127-130.
- Meyers, Stephen, and Jayant Sathaye. "Electricity Use in the Developing Countries: Changes Since 1970." *Energy* 14, no. 8 (1989): 435-441.
- Miser, Hugh J. "The Easy Chair: What Did Those Early [Operations Research] Pioneers Have Uppermost in Mind, Model Building or Problem Solving?" *Interfaces* 14, no. 4 (July/Aug. 1989): 69-74.
- Morwing, Bo. "ERICON [Radar Beacon]—Experience and Further Development." *Ericsson Review* 66, no. 2 (1989): 48-57.
- Nickelson, Richard L. "The Evolution of HDTV in the Work of the CCIR [International Radio Consultative Committee of the International Telecommunication Union]." *IEEE Transactions on Broadcasting* 35, no. 3 (Sept. 1989): 250-258.
- Nulty, Greg. "The Evolution of the Channel Bank." *Telephony* 217, no. 2 (10 July 1989): 19-20.
- Perry, Tekla. "Tektronix: No More Mr. Nice Guy." *IEEE Spectrum* 26, no. 8 (Aug. 1989): 41-45.
- \_\_\_\_\_, and John Voelcker. "Of Mice and Menus: Designing the User-Friendly Interface." *IEEE Spectrum* 26, no. 9 (Sept. 1989): 46-51.
- Pierce, John A. "The Origin of Omega." *IEEE AES Magazine* (of the IEEE Aerospace & Electronic Systems Society) 4, no. 7 (July 1989): 14-23.
- Rosenhead, Jonathan. "Operational Research at the Crossroads: Cecil Gordon and the Development of Post-War OR." *Journal of the Operational Research Society* 40, no. 1 (1989): 3-28.
- Saunders, Peter. "Bringing Babbage's Computer to Life." *Professional Engineering* 2, no. 6 (June 1989): 26-27.
- Sawyer, F.L., A. Charlesby, T.E. Easterfield, and E.E. Treadwell. "Reminiscences of Operational Research in World War II by Some of Its Practitioners." *Journal of the Operational Research Society* 40, no. 2 (1989): 115-136.
- Scroggie, M.G. "Radar Reminiscences (a Letter to the Editor)." *IEE Review* 35, no. 6 (June 1989): 218.
- Searle, Loyd. "The Bombsight War: Norden vs. Sperry." *IEEE Spectrum* 26, no. 9 (Sept. 1989): 60-64.
- Shanahan, Timothy. "Kant, Naturphilosophie, and Oersted's Discovery of Electromagnetism: A Reassessment." *Studies in History and Philosophy of Science* 20, no. 3 (1989): 287-305.
- Shiryayev, A.N. "Kolmogorov: Life and Creative Activities." *Annals of Probability* 17, no. 3 (1989): 866-944.
- Shoucair, F.S. "Joseph Fourier's Analytical Theory of Heat: A Legacy to Science and Engineering." *IEEE Transactions on Education* 32, no. 3 (Aug. 1989): 359-368.
- Smith, Richard E. "A Historical Overview of Computer Architecture." *Annals of the History of Computing* 10, no. 4 (1989): 277-303.
- Stern, David P. "A Brief History of Magnetospheric Physics before the Spaceflight Era." *Review of Geophysics* 27, no. 1 (Feb. 1989): 103-114.
- Swanson, E.R. "John Alvin Pierce." *IEEE AES Magazine* (of the IEEE Aerospace & Electronic Systems Society) 4, no. 7 (July 1989): 3.
- Voelcker, John. "The Gunn Effect." *IEEE Spectrum* 26, no. 7 (July 1989): 24.
- Wilson, Andrew D. "Hertz, Boltzmann and Wittgenstein Reconsidered." *Studies in History and Philosophy of Science* 20, no. 2 (1989): 245-263.

**Special Issues**

*Annals of the History of Computing* 10, no. 4 (1989). This tenth anniversary issue of the *Annals* includes an extensive section on museums and archives interested in the history of computing. Organizations mentioned include the IEEE Center for the History of Electrical Engineering, the Charles Babbage Institute, the Computer Museum in Boston, and history of computing groups in Britain, Germany, and France.

### 1989 Friends of the Center

The Friends of the IEEE Center for the History of Electrical Engineering further the study and understanding of electrical engineering's history and impact on society through support of the Center's programs. We would like to thank each of you who contributed to the Friends Fund of the IEEE Foundation during 1989.

#### Sustaining

Dwight C. Baum  
Harold H. Beverage  
Robert B. Dudley  
Parry R. Dybing  
Charles W. Flint  
J. Scott Hamilton  
John W. McGrath  
Masao Morishita  
Emerson W. Pugh  
Robert N. Riley  
Robert and Sylvia  
Sackman Foundation  
Yuzo Takahashi  
Everett E. Thompson  
Erwin Tomash  
Ernst Weber

#### Regular

Thomas A. Abbott  
Andrew Affrunti, Sr.  
Yasuo Akao  
Michelle Aldrich  
Adolph Amend, Jr.  
A.E. Anderson  
Leland I. Anderson  
Oscar E. Anderson  
Robert E. Anderson  
Warren R. Anderson  
John C. Andreas  
Paul D. Andrews  
Stephen J. Angello  
Robert E. Ankers  
Martin A. Antman  
Henry J. Antosz  
Fumio Arakawa  
Nathan W. Aram  
Rolland B. Arndt  
John G. Atwood  
Isaac L. Auerbach  
Werner F. Auerbacher  
Maynard A. Babb  
William C. Bachtel  
Labon Backer  
Renato J. Baculo  
John J. Barabas, Sr.  
Alfred W. Barber  
Herbert M. Baruch, Jr.  
Henry L. Bassett  
Laurence Batchelder  
Frank F. Bateman

Carleton A. Bayless  
R.K. Beach  
K.G. Beauchamp  
Frank H. Beberdick  
William O. Beck  
Ralph D. Bennett  
George P. Bentley  
Theodore Bernstein  
Carl D. Bethel, Jr.  
Charles E. Bethge  
Stanley A. Bixby  
Leslie F. Blanchard  
John P. Blewett  
Gustav H. Bliesner  
Neal A. Bodin  
Otto R. Boll  
Jeane M. Bond  
Richard C. Booton, Jr.  
S.P. Bordeau  
Theodore J. Boselli  
Sierd Bouma  
Myron J. Boyajian  
Glen E. Bredemeier  
William B. Bridges  
Frank W. Brigham  
James E. Brittain  
J.D. Browder  
Stephen C. Brown  
William F. Brown  
Stanley S. Browne  
Joseph F. Brumbach  
John M. Brumbaugh  
Eugene H. Brussel  
John H. Bryant  
R.G. Bullock  
Bernard B. Burklund  
Elmer J. Burnham  
Anson C. Burwell, Jr.  
Bernard M. Cain  
Wallace C. Caldwell  
Edward C. Callahan  
Frank Capellupo  
Robert Casey  
John Joseph Cassidy III  
Wilson A.  
Charbonneaux  
Solomon Charp  
Ted Chernin  
William C. Chesney  
Harold Chestnut  
Rudolf E. Chope

Harold C. Christian  
C.V. Chung  
Salvador C. Cisneros  
Richard C. Clarke  
Arnold A. Cohen  
Harry W. Colborn  
Donald R. Cone  
Del Conger  
Louisa & George Cook  
Jonathan Coopersmith  
Lloyd P. Cornell, Jr.  
Robert F. Cotellessa  
Charles A. Coulomb  
John V. Craig, Jr.  
C. Glenn Crawford  
H. Almer Crawford  
Daniel J. Crouch  
Elliott C. Cutler, Jr.  
James R. Davey  
L.A. Davidson  
Marion F. Davis  
Howard R. Daykin  
William P. Dayton  
Francis P. Dean  
William E. Dean  
Kenneth C. Dederling  
Dexter T. Deeley  
John A. Derry  
Warren D. Devine, Jr.  
Frank Di Iorio  
Bernard Divins  
William H. Dodson  
William H. Doherty  
William J. Dowis  
Robert S. Duggan, Jr.  
George K. Durfey  
R.H. Eberstadt  
E.E. Edgell  
Gene L. Edwards  
Robert W. Eglington  
Adolph C. Ekvall  
W.W. Elder, Jr.  
William J. Ellenberger  
James E. Ellerbe  
Denzil D. Elliott  
Orval T. Ellsworth  
Lucian J. Endicott, Jr.  
Sherwin Epstein  
John R. Eshbach  
V. William Farat  
Lyle D. Feisel  
Anselmo Fini  
Arnold D. Finley  
Bernard S. Finn  
Leonard W. Finnell  
Charles R. Fisher  
Carl Flick  
Alton E. Foster  
George B. Foster  
Donald R. Foyer  
Mario R. Franceschini  
Robert L. Frank  
Dean M. Frederick  
Robert Friedel  
Alfred B. Friedman

Joseph E. Gallo  
John K. Galt  
Henry E. Gamache  
Fred T. Garcia  
Karl N. Gardner  
William J. Garmany, Jr.  
Kenton Garoff  
Henry W. Gayek  
Emile N. Gebran  
Ivan A. Getting  
Ray M. Gilbert  
Brice E. Gilman  
Edwin W. Giloy  
Anthony B. Giordano  
R.J. Gleason  
Erich Goldbohm  
Arthur Goldsmith  
Julian Goodstein  
Leo Gorin  
Robert O. Gosswiller  
Russel J. Grambsch  
James W. Grant  
Frank D. Gray  
Laurence F. Gray  
Warren L. Green  
Jerrier A. Haddad  
Sidney W. Hagerling  
Marion C. Halleck  
Guy S. Halter  
Jerome S. Hamerman  
Howard B. Hamilton  
Carl Hammer  
John A. Harr  
Kenneth R. Hartzell, Jr.  
Syuiti Hayasi  
Harold R. Heckendorn  
Philip S. Hedene  
Frank J. Heffernan  
Donald A. Helgeson  
Edward W. Herold  
Howard M. Hess  
Arthur W. Hesse  
G. Victor Hetherington  
William P. Heyse  
Charles A.  
Higginbotham  
William A.  
Higinbotham  
Akira Higuchi  
W. Scott Hill  
O.T. Hinton, Jr.  
John M. Hollywood  
Keith N. Hood  
David A. Hornby  
F.R. Hornby  
Alfred Hotvedt  
David A. Hounshell  
Donald W. Howe, Jr.  
Stephen B. Howlett  
Frederick B. Hoyle  
William A. Huber  
Dorsey F. Hughes  
Thomas P. Hughes  
Ernest W. Hutton  
IEEE New York Section

S. Iida  
Aaron J. Ihde  
Institution of Electrical  
Engineers  
Lawrence J. Israel  
Herbert W. Jackson  
William R. Jacox  
Walter M. Jeffers  
Donald R. Jenkins  
Sheldon C. Jenkins  
Floyd B. Jimerson  
Amos E. Joel, Jr.  
Orisa D. Johnson, Jr.  
Orville E. Johnson  
William H. Johnson  
Donald L. Johnston  
Edwin C. Jones, Sr.  
Robert B. Jones, Jr.  
Thomas L. Jones  
Adam A. Jorgensen  
Horace M. Joseph  
H. Charles Kaetel  
J.J. Kahgan  
Douglas R. Kanitz  
Richard B. Kaufman  
Benjamin T. Kawauchi  
Michael F. Kelcey  
Edward Keonjian  
Charles F. Kezer  
Richard H. Kimball, Jr.  
Francis H. King  
Ruth A. King  
Warren D. Kinsman  
Joseph H. Kirkpatrick  
Loren W. Kirkwood  
Ronald R. Kline  
Miroslav I. Klun  
Lester Kornblith, Jr.  
Otto Kornei  
Milan J. Krasnican  
Irwin J. Kresnicka  
Seymour Krevsky  
James M. Lafferty  
Robert D. Lambert, Jr.  
George J. Largess  
Arvid G. Larson  
Harry T. Larson  
Philip O. Lautz  
Harley Leach, Jr.  
Vincent Learned  
Louis C. Lechenger  
Jacques Lecours  
Frank P. Lee, Jr.  
Earl R. Leiby  
S. Blair Lent  
Lester B. Le Vesconte  
Harry J. Lewenstein  
William B. Lindsay  
Clovis E. Linkous  
Russell E. Linton  
Wen L. Liu  
William G. Longest  
Harold W. Lord  
Arthur V. Loughren  
Adolph Lovoff

- |                      |                         |                       |                         |                       |
|----------------------|-------------------------|-----------------------|-------------------------|-----------------------|
| Alvon F. Lowe        | Lyle C. Motley          | J. Clifford Riley     | Stephen O. Simpson      | Chester A. Tudbury    |
| H.D. Lüke            | George R. Mounce        | William H. Ritz       | Sylvester J. Sims       | Robert W. Turner      |
| James J. McBrearty   | Joseph E. Moxie         | George D. Robertson   | Bayla Singer            | Walter W. Turner      |
| Kenneth A. McCollom  | Vladimir Muljevic       | James G. Robinson     | Marvin Skoller          | Arthur Van Gelder     |
| John L. McKinley     | Milton S. Murphy        | Frank F. Robison, Jr. | John J. Slattery        | Gregory S. Vassell    |
| Ronald H. Macpherson | Christopher B.          | Robert G. Rockwell    | Cyril S. Smith          | Carol M. Veronda      |
| Carl J. Madsen       | Mushenski               | A.E. Rodriguez        | Malcolm K. Smith        | Herbert B. Voelcker   |
| Philip C. Magnusson  | Paul J. Nahin           | Harold F. Roempke     | H.D. Snively            | Glen Wade             |
| Matthew V. Mahoney   | Byron J. Nankervis      | H. Romans             | R.A. Soderman           | A. John Ward          |
| Ralph F. Manfreda    | Arthur E. Newlon        | John S. Root          | Euan F.C. Somerscales   | William W. Ward       |
| John A. Mann         | Clark Nichols           | Robert D. Ross        | Gailen Soule            | Clayton A. Washburn   |
| Albert P. Manzi      | Robert J. Nolte         | Jesse E. Roth         | South African Institute | Carleton L. Waugh     |
| Thomas E. Marburger  | Sogo Okamura            | Arthur E. Rothenberg  | of Electrical           | Charles H. Weaver     |
| Casimir G. Marconi   | Russell D. O'Neal       | George E. Roush       | Engineers Historical    | Frank Carlin Weimer   |
| Camille S. Marie     | Ernest J. Oplinger      | Harry W. Rubinstein   | Interest Group          | Stewart E. Wenzel     |
| Earl O. Martin       | Rodrigo Orozco          | Hugo Ruechardt        | Herman F. Spain         | Harold A. Wheeler     |
| Frank E. Martin      | Joseph A. O'Sullivan    | Frederick A. Russell  | Leon H. Sperow          | Maxwell White         |
| John E. Martin       | Hiroshi Ozaki           | James P. Rybak        | Charles J. Spiteri      | W. Willendrup         |
| Paul N. Martin       | Karle S. Packard, Jr.   | John D. Ryder         | Leland B. Sponholtz     | Murray D. Willer      |
| Gordon S. Marvin     | Peter E. Pashler        | Theodore S. Saad      | Martin Springel         | James C. Williams     |
| Frank L. Marx        | Anthony L. Passera      | Mary A. Sager         | Frank R. Stansel        | Walter B. Williams    |
| Philip E. Massie     | Harry Pastorinsky       | John B. Sallemi       | Harry E. Stockman       | Raymond H.            |
| Wolfgang Mathis      | John J. Paull           | Robert E. Samuelson   | Julius A. Stratton      | Williamson            |
| Irving S. Mayer      | L.J. Payzant            | John N. Sanders       | Charles B. Strickland   | Kenneth L. Wilson     |
| Carleton F. Maylott  | John D. Peebles         | William A. Savory     | Charles P. Stromp       | William L. Wittig     |
| Henry L.             | Arthur W. Peterson      | Leonard P. Schaefer   | Rudolf W. Stuber        | David R. Wood         |
| Messerschmidt        | Mircea E. Petrini       | Henry G. Schick       | Robert J. Sublett       | Harris O. Wood        |
| George F. Metcalf    | William H. Pindell, Jr. | Joseph A. Schindler   | Frederick G. Suffield   | Harold W. Wott        |
| Sidney Metzger       | E.R. Piore              | Theodore W. Schroeder | Khairy R. Sukhon        | Bernard E. Wrensch    |
| Harold Meyers        | Premier R. Porcello     | Ronald B. Schroer     | Hiroshi Suzuki          | Charles R. Wright     |
| Thomas E. Meyers     | Roy W. Prince           | Mark Schubin          | Warren L. Sykes         | Richard E. Wright     |
| David Middleton      | Bruce G. Prior          | Edward F. Schuster    | Yukimatsu Takeda        | Joseph H. Wujek       |
| John J. Mikos        | Robert C. Probasco      | Richard F. Schwartz   | Kuniaki Tanaka          | Arnold J. Wulfken     |
| A.S. Milinowski      | F. Proos                | Donald W. Schofield   | George J. Taylor        | Mitsuyoshi Yamamoto   |
| Don M. Miller        | William Lee Pryor, Jr.  | Dale H. Scott         | John W. Teker           | Raymond A. York       |
| Robert H. Miller     | George W. Pynn          | Roberto A.            | Leonard W. Thomas, Sr.  | David Young           |
| Frank C. Miramontes  | L.E. Record             | Sekimotto Pinillos    | Joseph D. Thompson      | Lada J. Zahora        |
| Dennison D. Mohler   | John O. Reid            | Samuel Sensiper       | William D. Tibbetts     | Conrad H. Zierdt, Jr. |
| George E. Moore      | Julian Reitman          | Oscar Shapiro         | Chester L. Todd         |                       |
| H. McVay Moore       | Chester T. Rice         | Jesse M. Shaver       | Edmund N. Todd          |                       |
| Christopher Morgan   | Mark A. Richards        | Edmund M. Sheppard    | Ben H. Tongue           |                       |
| James C. Morris      | Robert L. Richards      | Nathan Shuman         | John T. Torian          |                       |

The Newsletter of the IEEE Center for the History of Electrical Engineering is sent three times a year free of charge to engineers, historians, and others with an interest in the history of electrical science and technology. If you have not already done so, please complete the form below and return it to the Center to be certain of receiving future issues.

Name \_\_\_\_\_

Address \_\_\_\_\_

IEEE Membership No. (if applicable) \_\_\_\_\_

Please send information on becoming a Friend of the Center \_\_\_\_\_

## Exhibitions and Museums . . .

### Airways Equipment Museum

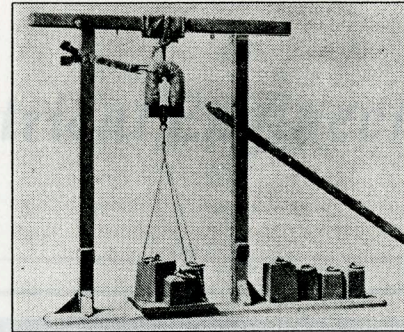
In 1970, the Australian Dept. of Civil Aviation decided to preserve for posterity examples of older airways equipment which had been replaced by modern installations. It was the realization that none of the Lorenz 33 MHz radio ranges or associated marker beacons had been preserved that prompted the Department to collect examples of this early generation of radio equipment before they were all disposed of as scrap metal. Such equipment includes the operator consoles, racks of control and audio equipment, transmitters and receivers, navigational aids, and associated test equipment, all of which was used in the operation of the Aeradio, Flight Service, and Air Traffic Control services.

By 1979, a considerable quantity of equipment had been collected from all parts of Australia and it was decided that this should be restored and displayed in a permanent museum at Essendon Airport, Melbourne. The Airways Equipment Museum at Essendon now occupies 900 square meters in the former Ansett Airlines

Repair Shop. Restoration of equipment is under the supervision of a radio technician with many years of installation experience, assisted by groups of two or three trainee technical officers and apprentices.

The museum's collection no doubt will attract chiefly those who have worked with the equipment or who have an interest in this technology. The scope of the museum will be broadened gradually to include working displays, and the history and operation of Air Traffic Control, Flight Service, and Aeradio will be shown. Selected items will be lent out for display in departmental offices and at airports to promote interest in the Department's historical activities. A reconstruction of an Aeradio station is also planned and this will be prefabricated to facilitate moving between capital city airport terminal buildings on a semi-permanent basis. Airline companies, AWA Ltd., and the Dept. of Civil Aviation Historical Society are assisting the museum.

Reprinted, with permission, from *History of Australian Science Newsletter*, no. 19 (July 1989).



Smithsonian Institution

Joseph Henry's electromagnet in its test frame.

### Spark!

A new exhibit in preparation at the Eli Whitney Museum in Hamden, CT, is focusing on simple ways to present classic experiments in electricity. Using historical apparatus and interactive devices, along with graphics and text, *Spark!* will illustrate electrical principles and devices dating from 1745 to 1880. Franklin's experiments with lightning rods, Volta's work on a constant source of current, and Faraday's demonstrations of induction and Henry's of electromagnetism are some of topics that will be discussed in the exhibit. Morse's telegraph, Edison's incandescent lamp, and Bell's telephone will also be included.

For more information on *Spark!* contact William F. Brown, Director, Eli Whitney Museum, P.O. Box 6099, Hamden, CT 06517 (203-777-1833).

Center for the History of Electrical Engineering  
Institute of Electrical and Electronics Engineers  
345 East 47th Street, New York, NY 10017

Non-Profit Org.  
U.S. Postage  
PAID  
IEEE  
Permit #52