Center for the History of Electrical Engineering

Newsletter No. 39 Summer 1995

Calculating the Weather: Meteorology in the 20th Century

Frederik Nebeker, Research Historian at the Center, has just published the book *Calculating the Weather: Meteorology in the 20th Century* (Academic Press, 1995), which examines the impact of the computer on both theory and practice in meteorology.

Early in this century three distinct traditions were apparent in meteorology: an empirical tradition of gathering data and making inferences therefrom, a theoretical tradition of explaining atmospheric motions by means of the laws of physics, and a practical tradition of predicting the weather. In 1903 Vilhelm Bjerknes, a Norwegian physicist-turned-meteorologist began advocating a calculational approach to weather forecasting, believing it possible

A NEW BOOK BY RESEARCH HISTORIAN FREDERIK NEBEKER

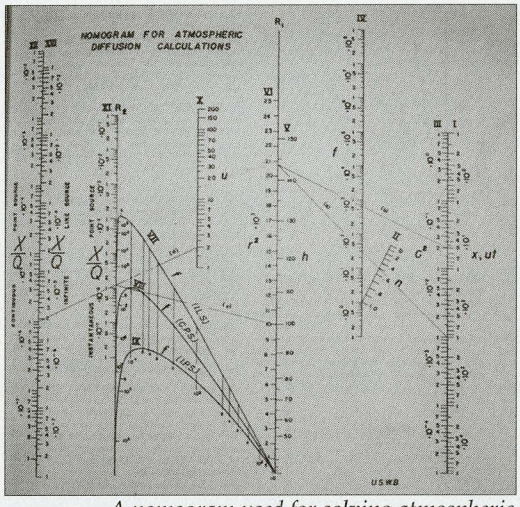
to bring together the full range of observation and the full range of theory to predict the weather. Bjerknes's program, which if successful would have united the three traditions, gained the attention and applause of meteorologists everywhere, but progress was slow.

The first person to make a full trial of Bjerknes's program was the English scientist Lewis Fry Richardson. While working as a scientist in industry, Richardson discovered an arithmetical method of solving partial differential equations. He devised, during and shortly after World War I, an algorithmic scheme of weather prediction based on the method. Richardson tested the scheme, taking six weeks to calculate a six-hour advance in the weather. The results were egregious. Richardson's work, which was widely noticed, convinced meteorologists that a computational approach to weather prediction was completely impractical.

In the interwar period meteorology became established throughout the Western world as an academic discipline and as a full-fledged profession. There was a movement toward an increased use of algorithms and therefore toward the increased use of calculating aids, such as numerical tables, slide-rules, graphical aids, and punched-card machines.

An electronic calculator, the ENIAC, was completed just as World War II ended, and at that time John von Neumann began making plans to build, at the Institute for Advanced Study in Princeton, a much more powerful and versatile machine devoted to the advancement of the mathematical sciences. An important objective for von Neumann was to demonstrate, with a particular scientific problem, the revolutionary potential of the computer. He chose for this purpose weather prediction and in 1946 established the Meteorology Project at the Institute. The Project had a slow start and the Institute computer took longer to build than was expected, but by 1956, when the Project ended, von Neumann's expectations had been fulfilled: it had been shown that a physics-based algorithm could be used to predict large-scale atmospheric motions as accurately as human forecasters could, and it had been shown that computer technology could carry out such algorithms fast enough and reliably enough for the forecasts to be useful.

In the 1950s and '60s the computer became a standard tool in meteorology, and most other calculating aids were abandoned. By 1970 much data-handling and much data-analysis were done by computer, theorists used computer modeling and numerical experimentation as principal modes of investigation, and in the industrialized countries most weather services used computers in making forecasts.



A nomogram used for solving atmospheric diffusion equations

Great advances were made in the empirical, theoretical, and practical traditions through

Continued on page 6

New Microelectronics History Project

The Smithsonian Institution has recently received a major grant to establish the Lemelson Center for the study of invention and innovation. Joyce Bedi, for many years the Center's Curator, has been appointed as the Lemelson Center historian. As one of its first activities, our Center has contracted with the Lemelson Center to do a joint study on invention and innovation in microelectronics. We will conduct oral history interviews with leading inventors and innovators, develop leads on collections of artifacts and archival materials for deposit at the Smithsonian, and work with Lemelson Center staff on a possible conference on invention and innovation in microelectronics. Bernard Finn and Robert Rosenberg will be advisors to the project.

STAFF NOTES

European Travel

In June the Center's director, William Aspray, traveled to France and Germany. In France he gave an invited lecture on the American computer industry in the 1970s as context for a symposium sponsored by the French Ministry of Industry on the French-Dutch-German joint computer venture known as Unidata. In Paderborn he consulted with the management and curatorial staff on the development of exhibits and programs in the new Heinz Nixdorf Museum-Forum, a world-class computer history museum soon to open. (Look for a detailed description of the museum in this newsletter which we will print closer to the opening date.)

Summer Intern

This summer, the Center is hosting Veronica Wilson as its summer intern. Wilson, who is a Ph.D. student in the Rutgers History Department, has worked during the '94-'95 year at the Center as a graduate assistant. During that time, she contributed most heavily to our oral history program, with the difficult tasks of editing transcripts and writing abstracts. This summer, she will continue with this work, helping us to meet our goal of making our oral history collection available to the research community over the Internet. The summer intern program is made possible by the generous support of the IEEE Life Members.

Center Archival Database

Center Curator Andrew Goldstein has recently published a paper in a special issue of the journal *Science and Technology Libraries* (volume 14, no. 4, cover date Summer 1994). The paper, entitled "Notes Concerning the Design and Implementation of a Comprehensive, Integrated Electronic Information Retrieval System for Small Archives" describes a computer database system that the Center has designed for its own use on a popular personal computer platform. The article not only introduces archivists in the area of science and technology to the principles of such a system, but it also acquaints them with the Center and its collection. The article is the first in a three-paper series Goldstein will publish where he will introduce certain effective cataloging techniques.

Center Staff Changes

There have been a number of changes in the staff at the history center over the past few months.

Departures: **Hugh Slotten** has completed his three-year term as Postdoctoral Scholar and has accepted a new junior faculty position in the history department at George Mason University. In the last issue of our newsletter, we indicated that Dr. Slotten would be replaced by **Jane Morley**, who would join us in the fall to begin her three-year term as Postdoc. Unfortunately, for personal reasons, Ms. Morley has had to withdraw her acceptance of our position. We are very disappointed by this turn of events and hope that some time in the future that there will be an opportunity for her to join us. Recently, **Loren Butler**, who was one of our two Research Historians, submitted her resignation. Dr. Butler will begin a teaching appointment in the History and Sociology of Science Department at the University of Pennsylvania in the fall. We wish all of these people the very best success in their new positions.

Arrivals: Our new Postdoctoral Scholar, beginning in September, will be **Janet Abbate**. Dr. Abbate received her B.A. degree in American history and literature from Harvard University and M.A. and Ph.D. degrees from the University of Pennsylvania in American civilization. Her doctoral dissertation, written under the direction of Thomas Hughes, was a history of the ARPANET and Internet. She has since held a fellowship in technology policy at the Center for Science and International Affairs, Kennedy School of Government, Harvard University. She is the co-editor of the forthcoming *Standards Policy for Information Infrastructure*. Her dissertation is being considered for publication by MIT Press.

Our new Research Historian, also joining the staff in September, is **David Morton**. Mr. Morton holds the B.A. degree in history from the University of Georgia, the M.S. degree in history from Auburn University, and is an advanced Ph.D. candidate in history of technology at Georgia Institute of Technology. His dissertation, under the direction of Bruce Sinclair and James Brittain, is on the history of magnetic recording. He has already published articles on Edwin Armstrong and the history of FM radio, the commercialization of FM radio, Amos Joel and the history of telephone switching, and John Herbert Orr and the magnetic recording industry. Mr. Morton is currently the holder of the IEEE Fellowship in Electrical History and a National Science Foundation fellowship.

Internal changes: **Andrew Goldstein**, who currently holds the position of Curator, has been promoted to Manager. He will continue to have curatorial responsibility for the archives and exhibits programs, but will also take on many of the day-to-day management responsibilities in operating the center. **William Aspray**, currently the Director, has had his position reclassified to the higher title of Staff Director. He will continue to have overall responsibility for the Center, but he will spend less time on daily administration and more time on strategic planning, fundraising, and research.

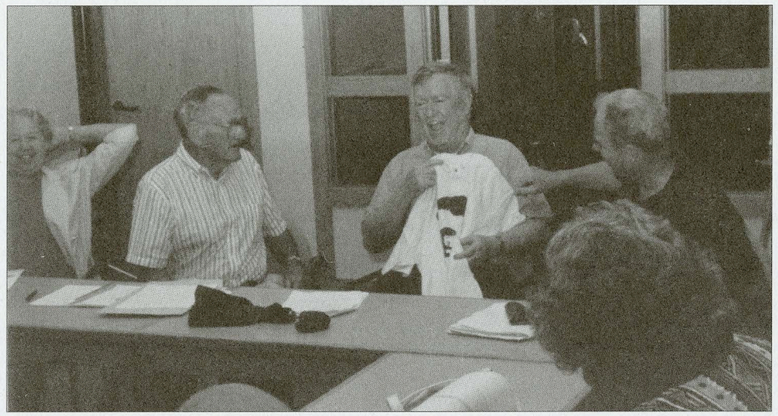
The Newsletter reports on the activities of the Center and on new resources and projects in electrical history. It is published three times each year by the Center for the History of Electrical Engineering.

CHEE
Rutgers University
39 Union Street
New Brunswick NJ 08903
Telephone: (908) 932-1066
Fax: (908) 932-1193
e-mail: history@ieee.org

IEEE Professional History Conference

The Center held its first Professional History Conference, at Williams College from August 1 to 4. Twenty-five professional historians of electrical technology, representing five countries and including a number of members of the Center staff and the IEEE History Committee, convened to hear position papers on historiographic and methodological problems faced by the historian of electrical technology and to discuss these issues at length.

The conference was organized by William Aspray, the Center's director, and Oskar Blumtritt, curator of telecommunications at the Deutsches Museum in Munich. Administrative support was provided by Center staff member Nichole Brownlee and members of the Williams College conference services department.

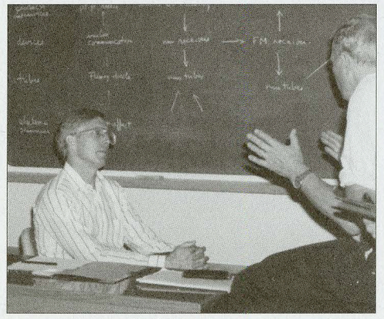


Jim Brittain receives Tesla T-shirt

The list of participants and the program are given below. On the final day, there was a surprise celebration to honor the contributions to the Center and to the IEEE by James Brittain. Dr. Brittain, a Fellow of the IEEE, has served on the History Committee for twenty years—including two stints as chairman, was important in the founding of the Center, and provided historical contributions and editorial leadership to the IEEE Proceedings and other IEEE publications.

Attendees:

Abbate, Janet (IEEE)
Akera, Atsushi (U. of Pennsylvania)
Aspray, William (IEEE)
Barnes, Sue (Marymount Manhattan C.)
Beaver, Donald (Williams C.)
Bissell, Chris (Open U.)
Blumtritt, Oskar (Deutsches Museum)
Brittain, James (Georgia Tech)
Carlson, Bernie (U. of Virginia)
Ceruzzi, Paul (National Air and Space Museum, Smithsonian)
Finn, Bernard (National Museum of American History, Smithsonian)
Fridlund, Mats (Royal Institute of Technology, Stockholm)
Goldstein, Andrew (IEEE)
Hochheiser, Sheldon (AT&T Archives)
Launius, Roger (NASA History Office)
Merrill, John (Naval Underwater Warfare Center)
Mindell, David (MIT)
Morton, David (IEEE)
Nebeker, Frederik (IEEE)
Rudenberg, H. Gunther (Harvard Coll. of Hist. Scientific Instruments)
Seidel, Robert (Babbage Institute, U. of Minnesota)
Seidenberg, Phillip (Georgia Tech)
Shapiro, Stuart (Open U.)
Singer, Bayla (independent scholar)
Todd, Ed (U. of New Haven)
Williams, Michael (U. of Calgary)



Frederik Nebeker and Bernard Finn

Conference Program

Welcoming Remarks
William Aspray, Oskar Blumtritt

Special Session on History of Computing
Sue Barnes, *The History and Development of the Graphical User Interface*
Stuart Shapiro, *Strange Bedfellows: Combining History and Ethnography of Computing*
David Mindell, *Historiographic Issues of Computing and Control*

Knowledge Transformation in Electrical Engineering
Bernard Carlson, *Lessons from the Invention of the Telephone*

Oral History and Biography: Historiographic Problems of Contemporary History
William Aspray, *Experiences at the Babbage Institute and IEEE*

Historical Theory
Oskar Blumtritt, *New Historical Theories and their Role in Scholarship on the History of Electrical Engineering*

Artifacts as Historical Sources
Bernard Finn, *Reading Artifacts*

Industry and the State
Mats Fridlund, *The "Tough Love" of Joint Public-Private R&D: The Importance of Producer-User Relationships in the Development of New Technologies*

New Technology and Economic Growth
Frederik Nebeker, *The Case of the Electronics Industry to 1939*

Local and Regional History
James Brittain, *The Dalton Project*

History of Electrical Technology Worldwide
William Aspray, *Conducting History in and About Japan*

Closing Session
A general discussion about future conferences and general needs of professional historians of electrical technology.

BIBLIOGRAPHY

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

Norbert Gilson, *Konzepte von Elektrizitätsversorgung und Elektrizitätswirtschaft: Die Entstehung eines neuen Fachgebietes der Technikwissenschaften zwischen 1880 und 1945* [Concepts of Electric-Power Supply and Economics: The Emergence of a New Science between 1880 and 1945]. Stuttgart: Verlag für Geschichte der Naturwissenschaften und der Technik, 1994. 475 pp.

In the first decades of the electric-power industry there emerged certain concepts, such as diversity of load, differential rates, reserve capacity, and load-factor, that allowed managers to organize more efficient power systems. Beginning in about 1910 these and other concepts contributed to a new subject of electric-power economics, developed in large part through the work of Georg Klingenberg, and in the mid 1920s German technical universities began teaching the subject. This book describes its emergence in the context of the development of electric-power supply. It argues that the new subject was shaped to justify centralized power-generation rather than as a means of exploring alternative ways of supplying electric power.

This handsomely produced book is the publication of Gilson's 1993 dissertation (Rhenish-Westphalian Technical University at Aachen), and its extensive documentation makes it extremely valuable to historians. The text itself is fully referenced, and there follows an appendix containing 161 pages of charts and graphs and 23 pages of biographical sketches (all carefully referenced) and an extensive listing of published and unpublished sources.

David Packard, *The HP Way: How Bill Hewlett and I Built Our Company* New York: Harper Collins, 1995. 212 pp.

Many of our readers will be interested in examining this autobiography of one of the great entrepreneurs and industry leaders in the electronics field. The early chapters of the book focus on Packard's personal life, up through the early years of the founding of the Hewlett-Packard Company. The later chapters focus much more on the company than on the man. The book is written in an easy-to-read, generally engaging style, that attempts to give the essence of Packard's and the company's philosophy. If one wants to know some general information about Packard and his corporate philosophy, this book should serve very well.

While most of the main product lines and many of the main issues in operating the business are discussed, the academic reader may be disappointed. The book does not give much detail, even in case studies, about business decisions or practice; and while general issues such as managing growth, generating operating capital, or setting technological priorities, get addressed, the level of detail is not sufficient to allow one to understand the company's practices very well. While there is a chronology in an appendix and virtually all the events listed there receive some mention in the text, the book does not serve well as a history of the company.

Other Books

Abramson, Albert, *Zworykin: Pioneer of Television*. Champaign, IL: University of Illinois Press, 1995.

Chadeau, Emmanuel, *L'Ambition Technologique: Naissance D'Ariane*. Paris: l'Institut d'Histoire de l'Industrie, 1995.

Davies, John, *Broadcasting and the BBC in Wales*. Cardiff, UK: University of Wales Press, 1994.

Feldenkirchen, Wilfried, *Werner von Siemens, Inventor and International Entrepreneur*. Columbus, OH: Ohio State University Press, 1994.

Fischer, Wolfram, ed., *Die Geschichte der Stromversorgung*. Frankfurt a.M.: Verlags- und Wirt-schaftsgesellschaft der Elektrizitätswerke m.b.H.-VWEW, 1992.

Freeman, Eva C., ed., *MIT Lincoln Laboratory: Technology in the National Interest*. Lexington, MA: MIT Lincoln Laboratory, 1995.

Hofman, James R., *André-Marie Ampère*. Oxford: Blackwell, 1995.

Holmevik, Jan Rune, *Educating the Machine: A Study in the History of Computing and the Construction of the SIMULA Programming Language*. Rapport nr. 22, Senter for Teknologi og Samfunn, Dragvoll, Norway, 1994.

Jordan, John M. *Machine Age Ideology: Social Engineering and American Liberalism, 1911-1939*. Chapel Hill, NC: University of North Carolina Press, 1994.

Krige, John and Arturo Russo (with the assistance of Lorenza Sebasta), *Europe in Space, 1960-1973*. Noordwijk: European Space Agency, 1994.

Lebow, Irwin, *Information Highways & Byways: From the Telegraph to the 21st Century*. Piscataway, NJ: IEEE Press, 1995.

Matelski, Marilyn, *Vatican Radio: Propagation by the Airwaves*. Westport, CT: Praeger, 1995.

Meurling, John, and Richard Jeans, *The Mobile Telephone Book: The Invention of the Mobile Telephone Industry*. London: CommunicationsWeek International, 1994.

Okamura, Sogo, ed., *History of Electron Tubes*. Tokyo: Ohmsha (distributed in North America and Europe by IOS Press: Amsterdam, Oxford, Washington DC), 1994.

Ramunni, Girolamo (with the collaboration of Michel Savio), *1894-1994: Cent Ans d'Histoire de l'Ecole Supérieure d'Electricité*. Paris: Supélec, 1995.

Ritchie, Michael, *Please Stand By: A Prehistory of Television*. Woodstock, NY: Overlook Press, 1994.

Rosheim, Mark E., *Robot Evolution: The Development of Anthrobotics*. New York: John Wiley & Sons, 1994.

Rutland, David, *Why Computers are Computers: The SWAC and the PC*. Philomath, OR: Wren Publishers, 1995.

Schiffer, Michael Brian, *Taking Charge: The Electric Automobile in America*. Washington, DC: Smithsonian Institution Press, 1994.

van den Ende, Jan, *The Turn of the Tide: Computerization in Dutch society, 1900-1965*. Delft: Delft University Press, 1994.

van Oost, Ellen, *Nieuwe Functies, Nieuwe Verschillen: Genderprocessen in de Constructie van de Nieuwe Automatisiringsfuncties, 1955-1970*. Delft: Eubron, 1994.

BIBLIOGRAPHY

Articles

Adam, John A., "Wilson Greatbatch." *IEEE Spectrum* 32, no. 3 (March 1995): 56-61.

Aitken, Hugh G.J., "Allocating the Spectrum: The Origins of Radio Regulation." *Technology and Culture* 35, no. 4 (October 1994): 686-716.

Anthony, Frank M., "High Heat Load Optics [Lasers]: An Historical Overview." *Optical Engineering* 34, no. 2 (February 1995): 313-320.

Bashilov, I.P., "Georgii L'vovich Shnirman: Designer of Fast-Response Instrments." *Physics-Uspekhi* 37, no. 7 (1994): 705-709.

Bosch, Berthold, "Der Werdegang des Transistors 1929-1994: Bekanntes und weniger Bekanntes." *Festkolloquium aus Anlass des 65. Geburtstages von Magnifizenz Prof. Dr. Eberhart Köhler, Ilmenau, Germany*, 17 Nov., 1994.

Botelho, Antonio, "The Industrial Policy That Never Was: French Semiconductor Policy, 1945-1966." *History and Technology* 11 (1994): 165-180.

Braun, Hans-Joachim, "'I Sing the Body Electric': der Einfluss von Elektroakustik und Elektronik auf das Musikschaffen in 20. Jahrhundert." *Technikgeschichte* 61 (1994): 353-373.

Buck, George, and Steve Hunka, "Development of the IBM 1500 Computer-Assisted Instructional System." *IEEE Annals of the History of Computing* 17, no. 1 (1995): 19-31.

Cooke, Gilmore G., "Electrical Engineering Connections [Leslie Perry and the Sao Paulo Tramway, Light, and Power Company]." *IEEE Transactions on Industry Applications* 31, no. 3 (May/June 1995): 442-444.

Divall, Colin, "Professional Organisation, Employers and the Education of Engineers for Management: A Comparison of Mechanical, Electrical and Chemical Engineers in Britain, 1897-1977." *Minerva* 32, no. 3 (Autumn 1994): 241-266.

Erker, Paul, "The Challenge of a New Technology: Transistor Research and Business Strategy at Siemens and Phillips." *History and Technology* 11 (1994): 131-143.

Geddes, L.A., "The First Stimulators: Reviewing the History of Electrical Stimulation and the Devices Crucial to its Development." *IEEE Engineering in Medicine and Biology* 13, no. 4 (August/September 1994): 532-542.

Headrick, Daniel R., "Shortwave Radio and its Impact on International Telecommunications Between the Wars." *History and Technology* 11 (1994): 21-32.

Hecht, Gabrielle, "Political Designs: Nuclear Reactors and National Policy in Postwar France." *Technology and Culture* 35, no. 4 (October 1994): 657-685.

Heide, Lars, "Punched-Card and Computer Applications in Denmark, 1911-1970." *History and Technology* 11 (1994): 77-100.

Hellige, Hans Dieter, "From Sage via Arpanet to Ethernet: Stages in Computer Communications Concepts Between 1950 and 1980." *History and Technology* 11 (1994): 49-76.

Hong, Sungook, "Efficiency and Authority in the 'Open Versus Closed' Transformer Controversy." *Annals of Science* 52 (1995): 49-76.

Hong, Sungook, "Forging Scientific Electrical Engineering: John Ambrose Fleming and the Ferranti Effect." *Isis* 86 (1995): 30-51.

Hong, Sungook, "Marconi and the Maxwellians: The Origins of Wireless Telegraphy Revisited." *Technology and Culture* 35, no. 4 (October 1994): 717-749.

Kim, Dong-Won, "J.J. Thomson and the Emergence of the Cavendish School, 1885-1990." *British Journal for the History of Science* 28 (1995): 191-226.

Kline, Ronald R., "World War II: A Watershed in Electrical Engineering Education." *IEEE Technology and Society Magazine* 13 (Summer 1994): 17-23.

Kunkle, Gregory C., "Technology in the Seemless Web: 'Success' and 'Failure' in the History of the Electron Microscope." *Technology and Culture* 36, no. 1 (January, 1995): 80-103.

Lee, John A.N., and Golde Holtzman, "50 Years After Breaking the Codes: Interviews with Two of the Bletchley Park Scientists." *IEEE Annals of the History of Computing* 17, no. 1 (1995): 32-43.

Lipartito, Kenneth, "When Women Were Switches: Technology, Work, and Gender in the Telephone Industry, 1890-1920." *The American Historical Review* 99, no. 4 (October 1994): 1075-1111.

Parkinson, Bradford W., "History and Operation of NAVSTAR, the Global Positioning System." *IEEE Transactions on Aerospace and Electronics Systems* 30, no. 4 (October 1994): 1145-1161.


October 23, 1923 U. S. PATENT OFFICE.

Ser. No. 181,572. (CLASS 21, ELECTRICAL APPARATUS, MACHINES, AND SUPPLIES.) SHEIP AND VANDEGRIFT, INC., Philadelphia, Pa. Filed June 5, 1923

Particular description of goods: Radio Amplifier Horns.

Claims use since Nov. 9, 1922.

Paul, Floyd, and Alan Douglas. "Music Master Horns." *The Old Timer's Bulletin* 33, no. 3 (August 1992): 20-22.

Robotti, Nadia, "J.J. Thomson at the Cavendish Laboratory: The History of an Electric Charge Measurement." *Annals of Science* 52 (1995): 265-284.

Roth, Nancy, "Controversies and Cures: The Electrical Medicine of J.G. Schaffer." *Medtronic News* 22, no. 1 (1994): 71-73.

Schröter, Harm G., "Innovation, Mentalität und Technologische Entwicklung: Vorreiterrolle und Servicedefizite der deutschen Reichspost in der Fernmeldetechnik 1920-1939." *Technikgeschichte* 61 (1994): 11-34.

Small, James S., "Engineering, Technology and Design: The Post-Second World War Development of Electronic Analogue Computers." *History and Technology* 11 (1994): 33-48.

Stout, Thomas M. and Theodore J. Williams, "Pioneering Work in the Field

BIBLIOGRAPHY

of Computer Process Control." *IEEE Annals of the History of Computing* 17, no. 1 (1995): 6-18.

Wood, Lamont, "The Man Who Invented the PC." *American Heritage of Invention & Technology* 10, no. 2 (Fall 1994): 64.

Worthy, James C., "Control Data Corporation: The Norris Era." *IEEE Annals of the History of Computing* 17, no. 1 (1995): 47-53.

Yates, JoAnne, "Co-evolution of Information-Processing Technology and Use: Interaction Between the Life Insurance and Tabulating Industries." *Business History Review* 67, (Spring 1993): 1-51.

Also Available:

• Making Waves

Cellnet and Motorola have released a booklet and videotape entitled "Making Waves" based on the 1994/95 IEE Faraday Lecture of the same name. The purpose of the booklet is to introduce pupils in the 14 to 16 age range to radio and, in particular, to its use in the fast-growing field of mobile communications. It covers the evolution of radio chronologically, starting with pioneering experiments by Michael Faraday which predicted the existence of electromagnetic waves, and the first practical demonstrations of radio by Lodge, Marconi, and others 100 years ago. Also, it offers the personal stories of two young engineers as they explain how they became interested in engineering and the satisfaction it gives them. Schools are free to copy sections of the booklet for classroom use. For more information, contact IEE, Savoy Place, London, WC1 12R, U.K.

• AT&T History

The May/June 1995 number of *AT&T Technical Journal* (volume 74, no. 3) is a special issue entitled "The Evolution of the AT&T Network: The 1B Processor Challenge." The issue features eight historical articles focusing on the 1B, including "The AT&T Switching Evolution Challenge", "The Evolution of Switch Intelligence: An AT&T Network Perspective", and "1B Processor Deployment: Leading the Way to Flawless Execution."

Koch Wins Life Member Paper Prize

Each year the Society for the History of Technology (SHOT) presents an award for the best paper on the history of electrical technology published during the preceding year. The award is sponsored by the IEEE Life Member Fund and administered by the Center. The award for 1994, presented in October at the SHOT meeting in Lowell, Massachusetts, went to Ellen Koch for her article "In the image of science? Negotiating the development of diagnostic ultrasound in the cultures of surgery and radiology" (*Technology and Culture*, vol. 34 (1993), pp. 858-893).

In the article, which is a major contribution to the history of medical technology, Koch analyzes the development of two different approaches to using ultrasound to diagnose disease and the reception each received from the medical community. The approach of Douglass Howry and colleagues used ultrasound to create an image of soft tissues in the body in the way that x-rays showed solid features. The approach of John Julian Wild and colleagues, on the other hand, measured the acoustic energy in ultrasonic scans as a way to identify cancerous growths. Initially Howry's approach, being closer to existing practices, found a more favorable reception, but within a few years Wild's work found itself in the mainstream of medical research.

Seitz on German Microwaves

Frederick Seitz, President Emeritus of The Rockefeller University, has recently been researching the career of Hans E. Hollmann (1899-1960), a pioneer German researcher whose work with high frequency techniques led him to an early recognition of the effectiveness of crystal rectifiers in microwave technology. Seitz has recently completed an English translation of a biographical note on Hollmann that appeared in 1959 in the German journal *Hochfrequenztechnik und Elektroakustik*. The article, originally written by Professor H. Frühauf stresses not only Hollmann's contributions to electronics and electromedicine, but also his rejection of the National Socialist and Communist regimes that prevailed during his research career. For more information, contact the Center.

Calculating the Weather

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the facilitation of computation. The importance of forecasting models gave direction to data gathering and to theorizing, as the observational meteorologists and the theorists often had an eye to the use of their results in such models. Quite generally, climatologists, dynamical meteorologists, and forecasters came to use similar computer models. Indeed, computing power made possible so many new connections between the traditions that they may be said to have merged. At the same time, the use of the computer led to the discovery of so-called "chaotic systems" and thence to the recognition that there may well be fundamental limits to predicting the weather.

The book *Calculating the Weather* is available from Academic Press by telephone at 800 321-5068 or fax at 800 336-7377.

IEEE Life Members Fellowship Available

Applications will be accepted beginning in October for the 1996-97 Fellowship in the History of 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, 1996. Application forms may be obtained from the Center for the History of Electrical Engineering.

MUSEUMS

Computer Museum

The Computer Museum in Boston Massachusetts has announced that the University of Southwestern Louisiana has donated an extensive repository of microprogramming artifacts and documentation to its historical collection. The USL Computer Science Department Professor Dr. Bruce D. Shriver formed the collection to serve as an international resource for technology developers and historians. Beginning with a core donation of reports and memorabilia, the collection has grown to encompass a wide variety of significant artifacts and personal and published documents. The collection covers 40 years of microprogramming research and development, pursued in academic and industrial laboratories throughout Europe, Asia, and North America. It includes hundreds of papers and conference proceedings on the theoretical and practical considerations of microcoding, as well as photographs, specifications, components, and microcode relating to the development of many significant computer systems. For more information, or to call the Museum's attention to other microcoding-related collections, contact Brian Wallace, The Computer Museum, 300 Congress Street, Boston, MA 02210.

Marconi Exhibit

A new exhibit catalog entitled "Radio: From Marconi to the Music of the Universe" has been prepared by Giuliano Pancaldi of the University of Bologna. Produced by the International Center for the History of Universities and Science at the University of Bologna, the book grew out of an exhibition set up to celebrate the centenary of the experiments Marconi carried out in 1895 near his native Bologna. The full-color pictures trace the story of the wireless revolution: from the recently uncovered notebooks of young Guglielmo Marconi, to the primitive apparatus used to send the first wireless messages across the Atlantic, to the views of distant galaxies captured by radio telescopes today. The book, which has both Italian and English versions of the exhibit's text, is a lavish production designed by Giovanni Anceschi, from the Faculty of Architecture at Milan Polytechnic. For more information about the book, or the exhibit, which will tour the world before being dismounted in 1996, contact CIS, University of Bologna, via Zamboni 31, 40126 Bologna, Italy, email: MU8BOV11@ICINECA.CINECA.IT

Canadian Museums

Two museums in Canada preserve communications heritage.

• The Canadian Forces Communications and Electronics Museum in Kingston, Ontario, was founded in December 1961 as an archive for the history of Canadian military signaling. Formerly known as the Royal Canadian Signals Museum, today the museum displays the history of the integrated Canadian Forces Communications and Electronics Branch and its founding elements, as well as aspects of the military's impact on industrial electronics. With exhibits that range from satellites and modern technology to early radio, electronics captured during World War II, a replica of a training classroom, and mementos documenting the many trials and accomplishments of those who wore the Canadian "Jimmy", the museum addresses a wide array of topics. In particular, exhibits such as the one on the NWT&Y, Canada's original communications in the far north, reveal the contribution to peacetime communications development in Canada that was stimulated by this branch of the military. For more information, contact C&E Museum, CFB Kingston, Ontario, K7K 5L0, Canada, tel. 613 541-5395.

• Also in Ontario is the Hammond Radio Museum. With more than 1000 antique radios, and a selection of radio components including tubes, microphones, and antennas, the Hammond Museum is billed as the largest collection of radio artifacts in Canada. The artifacts are all from the personal collection of Fred Hammond, the radio devotee who maintains the collection. The collection concentrates on radio equipment from the 1920s and 30s, but also includes rare items such as a 1930 model television and a 1900 Marconi wireless telegraph. For more information, contact the Hammond Radio Museum, 95 Curtis Road, Guelph, ON, N1K 1E1, Canada, tel. 519 822-2960.

New Home for Perham Foundation

The Perham Foundation Electronics Museum, long without a physical home since separating from the Foothills Community College, has announced that it will soon open it doors again on the campus of the San Jose Historical Museum in Kelly Park, California. The SJHM is offering space to the Perham Foundation to erect a three-story, 16,000 sq. ft. building to house its collections, library, radio stations and offices. The projected cost of the new building and exhibits is close to $3 million, with a planned grand opening sometime in 1996. The developments have occasioned a new membership drive for this museum dedicated to electronics history on America's west coast. For more information, contact Miracles in Trust, The Perham Foundation Electronics Museum, 101 First St., Suite 394, Los Altos, CA 94022, tel. 408 734-4453.

Edison Museum

A museum in Beaumont, Texas houses the largest collection of Edison artifacts west of the Mississippi. The Edison Plaza Museum, operated by Gulf States Utilities Company, uses Edisonia, such as chemical bottles found in his home in Port Huron, Michigan and artifacts connected to his development of the incandescent light, the phonograph, and other inventions, to set the stage for its past-present-future exhibit on electrical technology. The work of Edison, who installed the first central generating station in New York City in 1882, introduces visitors to the household electricity generation and distribution system and advanced researches such as solar energy and superconductors. For more information, contact Jill Street, Edison Plaza Museum, 350 Pine St., P.O. Box 3652, Beaumont, TX 77704, tel. 409 839-3089.

Book Sale

The IEEE Press is holding a warehouse sale, offering opportunities for IEEE members to purchase History Center titles at discounts as deep as 67%.

Title	List price	Sale price
The Evolution of Electrical Engineering: A Personal Perspective	$29.95	$10
Sparks of Genius	$34.95	$15
Technological Competitiveness	$49.95	$19
Engineers as Executives	$29.95	$19

All IEEE members should look for notice of the sale in the September issue of The Institute. To order, call 1(800) 678-IEEE, 1(908) 981-0060 outside USA.

Phyllis Hall

Organizationally, the Center is part of the IEEE Publications Division, headed by Staff Executive Phyllis Hall. In this capacity, and as acting IEEE General Manager for part of the past year, Ms. Hall has provided caring support and strong leadership to the Center. As the capstone of her publishing career, Ms. Hall has spent the past five years helping to bring IEEE's publications activities into the electronic age. The Center staff joins with the IEEE History Committee in thanking Ms. Hall most warmly for her effective and dedicated service and in wishing her well as she begins her next career after retirement in September. We welcome Anthony Ferraro, who replaces Ms. Hall at the head of the Publications Division. Both Ms. Hall and Mr. Ferraro have strong commercial backgrounds in traditional and electronic publishing.

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.

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Center for the History of Electrical Engineering
Institute of Electrical and Electronics Engineers
445 Hoes Lane, P.O. Box 1331
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