

# IEEE CENTER FOR THE HISTORY OF ELECTRICAL ENGINEERING

Newsletter

Number 3 June 1983

## Microelectronics History Project Begins with Collection Effort

The most exciting and revolutionary technology of our time is the subject of an ambitious history project being undertaken by the IEEE and the Smithsonian Institution's National Museum of American History. The Microelectronics History Project is an effort to document—through artifacts, archives, and oral history—the development of the technology of solid-state electronics, from the simple crystal components of the pre-transistor era to the

Chairman and General Manager of the Conference, Richard J. Backe, requested Dr. Bruno O. Weinschel, 1978 IEEE Vice-President for Professional Activities, to lead an IEEE-industry effort to contribute to such a collection.

Dr. Weinschel has organized a small group of prominent industry leaders to provide the Project guidance and access to the technical resources necessary for creating

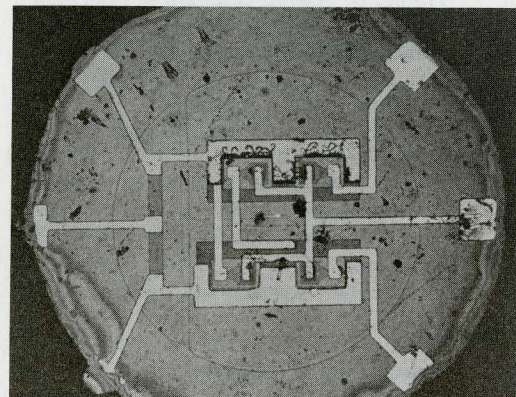
based at the Smithsonian. The intern, Bruce Hevly of the Johns Hopkins University History of Science Department, has been working closely with the Smithsonian's Curator of Electricity, Dr. Bernard S. Finn, the museum's Specialist in Electronics, Elliot Sivowitch, and the IEEE's Robert Friedel to develop a strategy for identifying and locating the devices and components that have been most important in the growth of microelectronics.

Though phenomena that we would recognize as solid-state electronics were observed as early as the nineteenth century, and found useful application in early devices like the crystal radio detector, the Project identifies the beginning of technologically significant efforts in modern solid-state electronics as the experiments that were begun at Bell Laboratories just prior to World War II.

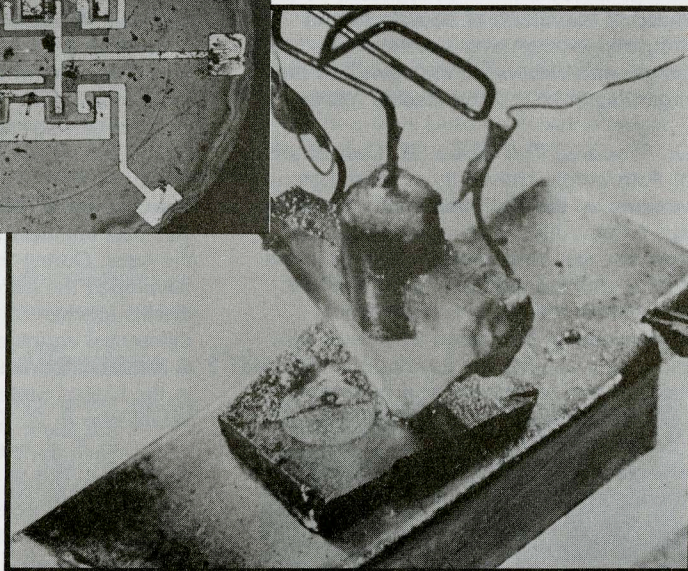
These experiments, most closely identified with William Shockley, yielded primitive versions of solid-state amplifiers and field effect transistors. This work was the foundation for Bell Laboratories' development of the point-contact and junction transistors in the years after the war.

The project is concerned with identifying and locating not only examples of such early devices and their later variations, but also the instruments associated with important advances in materials and fabrication techniques, such as the germanium and silicon crystal apparatus associated with the work of Gordon Teal and the step-and-repeat camera first developed at the Diamond Ordnance Fuse Laboratory, now so closely linked with the fabrication of integrated circuits.

While any project concerned with such recent developments can run into difficulties due to the proximity of the events being chronicled, the rapid progress of microelectronics presents compelling reasons for making the effort to preserve the most important artifacts of that progress before more time passes. Similarly, it is hoped that funding will be found to follow this first, artifact-oriented phase of the Project with intensive archival and oral history efforts to identify and preserve the documents and recollections that will provide a complete resource for the history of this revolutionary technology.



*Fairchild placed the first commercial monolithic integrated circuit on the market in 1961*



*The point-contact transistor was developed in 1947 by Walter Brattain, John Bardeen and William Shockley at Bell Labs in New York City*

an appropriate historical collection. These leaders include J. Fred Bucy of Texas Instruments, Dr. John S. Mayo of Bell Laboratories, Dr. Robert Noyce of Intel Corporation, Dr. William Webster of RCA, and Dr. Roland Schmitt of General Electric. Each of these have, in turn, appointed coordinators responsible for overseeing the Project's efforts within their own firms.

Additional support for the Project from the IEEE Life Member Fund has permitted the appointment of a full-time summer intern,

large-scale integrated circuits that have become such essential features of the "high technology" of the late twentieth century.

The first phase of the project was initiated by the IEEE Technology Policy Conference, which is now actively organizing its 1984 meeting, scheduled for 22 and 23 February in Washington, D.C. The Washington venue of the Conference suggested the organization of a joint project with the Smithsonian, directed toward developing a national collection of historical artifacts in microelectronics.

Fairchild

Bell Laboratories

## IEEE History Guide Compiled

As part of the continuing preparations for the IEEE's one-hundredth anniversary celebration in 1984, the Center has put together a Centennial *History Guide*. One of the goals of the Centennial is to encourage electrical engineers to reflect upon the history of their profession and to investigate that history on their own. The *History Guide* is designed to aid in achieving that goal.

The *Guide* has three main sections. The

first consists of basic information about the history of the IEEE and its predecessors, the American Institute of Electrical Engineers and the Institute of Radio Engineers. The second section discusses various historical activities in which Institute entities or individuals might participate. These include: writing the history of an IEEE section or society; writing papers on specific historical topics; and compiling inventories of local sites of electrical engineering significance. The final section

of the *Guide* is a list of resources to which engineers can turn to learn more about the history of their profession, including books, articles, museums, films, and historical organizations. Of special interest here are the more than two-hundred historical articles, most of them written by engineers, that the IEEE itself has published since 1963.

The seventy-two page *History Guide* is part of the IEEE *Centennial Activities Guide* published by the Centennial Task Force, and will be sent to all IEEE sections, chapters, and branches. A limited number of copies are also available directly from the Center.

## Fellowship Awarded

The 1983-84 IEEE Fellowship in Electrical Engineering History has been awarded to Larry Owens, a Ph.D. candidate in the History of Science program at Princeton University. Dr. Owens brings to his work a varied academic background that includes an undergraduate degree in philosophy and a doctorate in biochemistry. He is completing a dissertation on the early career of electrical engineer Vannevar Bush. Bush played a major role in mobilizing science during World War II and was a prime mover in the development of post-war science policy. Owens's study will concentrate on Bush's pre-war career. Bush joined the faculty of MIT in 1919 and was instrumental in shaping the school's electrical engineering curriculum between the wars. During this period he also developed the Differential Analyzer, an electro-mechanical device for solving differential equations, which was the largest and most important computer to be in use in the United States before the end of World War II. Dr. Owens will present a paper on Bush and the Differential Analyzer at this year's meeting of the Society for the History of Technology in October.

Supported by the IEEE Life Members Fund, the IEEE Fellowship in Electrical Engineering History provides a stipend of \$8,500 and allocates up to \$2,000 in additional funds to pay academic tuition and fees. The Fellowship is generally awarded to support full-time research for a doctoral dissertation, and a complete description of proposed research is an important part of the application. Applications for the 1984-85 Fellowship are now open and should be received by the Center for the History of Electrical Engineering by February 1, 1984. Forms and further information are available from the Center.

## WORK IN PROGRESS

Note: It is hoped that one of the major functions of this *Newsletter* will be to exchange information about the research that is currently being pursued in electrical history. For our reports to be truly useful, they will have to be based on information sent to us by active researchers. We hope that readers will not hesitate to send their contributions.

Dr. Kenneth A. Connor (Associate Professor, Electrical, Computer and Systems Engineering Department, Rensselaer Polytechnic Institute) is preparing a history of the electrical engineering department at RPI.

Karle S. Packard, Jr. (Eaton Corp.) is preparing a dissertation for the State University of New York at Stony Brook on the history of microwave technology, its scientific basis, and its practical applications. His research focuses on the relations among science, technology, and mathematics in both intellectual and sociological contexts, and on the role of various institutions in technological development. Mr. Packard is a member of the IEEE History Committee.

Dr. Mark H. Rose (Department of Social Sciences, Michigan Technological University) is researching energy choices and social and technological change in Denver and Kansas City, 1900-1940. He is assessing the role of central gas and electric operations in bringing about a broad decentralization of businesses and households and a reshaping of their interior environments. In addition, he is studying the effects of household and industrial location and service requirements on gas and electric technologies and the organization of gas and electric utilities.

Dr. Woodruff T. Sullivan, III (Department of Astronomy, University of Washington) is working on the first volume of a projected two-volume history of radio astronomy from the first unsuccessful attempts in the 1890s until the explosive growth of the mid-1960s. His study is based upon approximately 250 taped interviews with those who shaped the development of the field, as well as archival and manuscript sources. The study emphasizes (a) the interaction between science and technology as radio astronomy developed; and (b) the character and motivations of the people who founded the field and/or subsequently contributed to its maturation.

### The Institute of Electrical and Electronics Engineers

#### IEEE History Committee - 1983

Harold Chestnut, *Chairman*  
Thomas J. Aprille, Jr.  
James E. Brittain  
Donald G. Fink  
Bernard S. Finn

F.A. Furfari  
Howard B. Hamilton  
Edward W. Herold  
Reinhard K. Hellmann  
David A. Hounshell

David H. Jacobsohn  
Winthrop M. Leeds  
Nathaniel B. Nichols  
Karle S. Packard, Jr.  
L.W. Von Tersch

#### Center for the History of Electrical Engineering

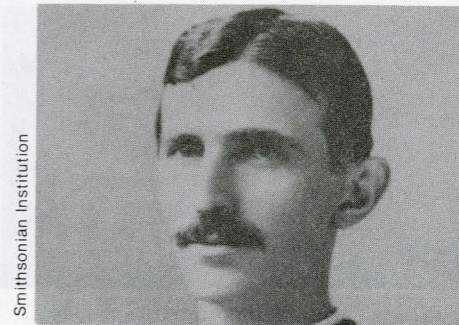
Robert D. Friedel, *Director*  
Robert H. Casey, *Assistant Historian*  
Joyce E. Bedi, *Photographic Curator*  
Ronald R. Kline, *Newsletter Publications Editor*  
Address: 345 East 47th Street, New York, NY 10017  
Telephone: (212) 705-7501

## ELECTRICAL INVENTORS' STAMPS

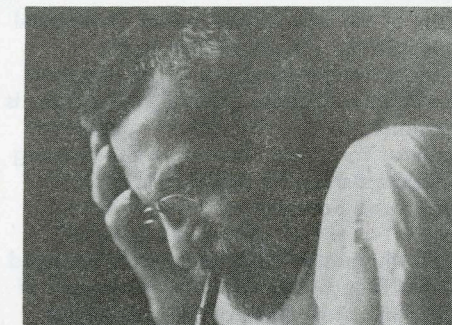
During the IEEE United States Activities Board meeting in Denver on 9 June, the U.S. Postal Service unveiled its design for a block of four American inventors' stamps honoring the electrical engineering profession. The stamps feature Nikola Tesla, Charles Steinmetz, Edwin Armstrong, and Philo Farnsworth, all electrical engineers.

Tesla invented the induction motor in 1888 as part of his development of alternating current electric power systems. Steinmetz applied advanced mathematics to electrical engineering and is especially remembered for formulating the law of hysteresis in 1889, which made it possible to reduce efficiency losses in electrical apparatus. Armstrong made numerous contributions in the field of radio, inventing the regenerative circuit, the superheterodyne receiver, the super-regenerative circuit, and frequency modulation (FM) between 1912 and 1933. In 1928, Farnsworth demonstrated the first all-electronic television system.

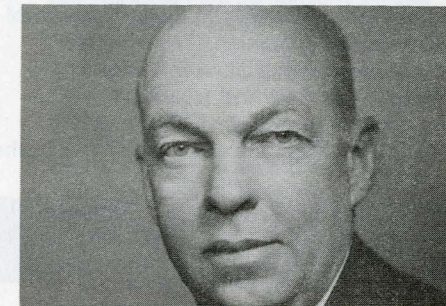
The stamps will be formally issued on 21 September 1983 at the U.S. Patent Office, Arlington, Virginia. In conjunction with the issuing ceremonies, the IEEE History Committee, with the assistance of the Smithsonian Institution's National Museum of American History, is sponsoring a symposium, entitled "The Inventor's Environment," to be held at the Smithsonian on the afternoon of 21



Smithsonian Institution



Smithsonian Institution



Clockwise from upper left: Nikola Tesla, Charles Steinmetz, Philo Farnsworth, Edwin Armstrong

September. By focusing on "the inventor's environment," the symposium will direct attention to the different settings in which important innovations are developed, how these settings have affected technological creativity, and how the conditions for invention have (and have not) changed in the course of the 20th century.

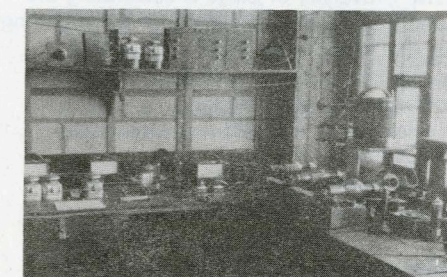
Two historians, James Brittain of Georgia

Tech and Ronald R. Kline of the University of Wisconsin, will develop these themes through formal presentations dealing with the figures they have studied, while a panel of four distinguished engineer-inventors will react to these presentations from the perspective of their own experiences, providing a clearer picture of how technical creativity is both fostered and hampered by the environment of the working engineer.

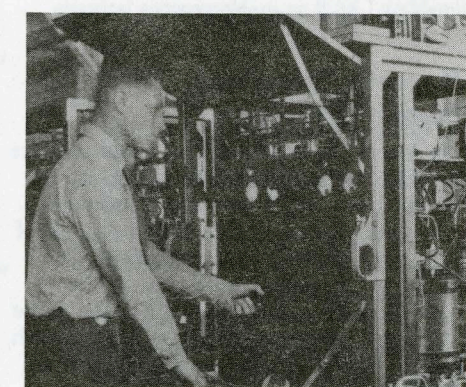
## Photographic Collections a Priority

The diverse historical projects under way for the IEEE Centennial have made the development of the IEEE's historical photograph collections a top priority of the Center. While some photographs have survived from the records of the AIEE and the IRE, the lack of any systematic collection and preservation effort has meant that many historic pictures have disappeared over the years. The Center now employs a full-time photographic curator to organize the collection on hand and to develop a collections strategy for augmenting holdings in the most useful areas.

One of the most important sources of photographs is in the collections of older members of the Institute. As an example, one of the first contributions to the holdings of the Center was from the collection of Edmund A. Laport (LF IEEE), who documented his half-century as a radio



Bench set-up for the development of circuitry and components for the U.S. Army Signal Corps Type BC-127 radio telephone/telegraph transmitter, the first ever to use the master-oscillator, power amplifier technique and thoriated filament power tubes, Building 77, General Electric Company, Schenectady, N.Y. April 1923. By Edmund Laport under direction I.F. Byrnes.



1924 Photograph of Edmund A. Laport, with a production model of the BC-127 transmitter at the Westinghouse plant at Springfield, Mass. From the Laport Collection.

engineer with an extraordinary photographic record of the men and instruments that marked the advances of radio technology.

The Center invites others who compiled such collections to let us know what they have.

## NEW YORK'S MEDIA MUSEUMS

J.E. Bedi

One of the most familiar facets of electrical engineering is its application to the communication media of radio, television, and motion pictures. The history of these is documented by two unique organizations in New York—the Museum of Broadcasting and the Astoria Motion Picture and Television Foundation.

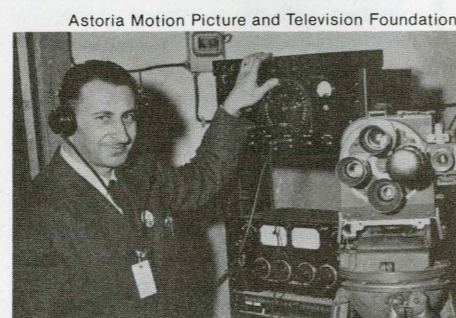
The Museum of Broadcasting was founded in 1975 by William S. Paley, Chairman of CBS Inc., to collect, preserve, interpret and exhibit radio and television programs. Professional broadcasters, students, scholars and the general public all take advantage of the Museum's collections which are in cassette form and number approximately 10,000 radio and 7,000 television programs. The subjects of recent



"exhibits" held in the Museum's theatre have included retrospectives of the television shows of "Sid Caesar: Master of Comedy," "Toscanini: The Television Concerts," and "Hanna-Barbera: 25 Years," the radio and television performances of Bob (Elliott) and Ray (Goulding), and the radio broadcasts of the

BBC External Services. The Museum also presents seminars and lectures which have included two seminars on comedy given by Steve Allen. The Museum of Broadcasting is located at 1 East 53rd Street (New York, NY 10022), and is open Tuesday through Saturday, 12 noon to 5 p.m.

The history, technology and art of motion pictures and television is the concern of the Astoria Motion Picture and Television Foundation. The Foundation was created in 1977 to reopen the Astoria Studio for feature film production. Now that the Studio is operating independently, the Foundation is focusing its energies on designing the exhibition space and building the permanent collection of the Museum of Motion Pictures and Television, scheduled to be open by 1986 in one of the original Studio buildings at Astoria, Queens. Collection efforts have yielded cameras and other apparatus, photographs, annotated scripts and papers, set models, costumes, and set and costume designs, in order to document the history of film and television production history. Recent acquisitions have included television news cameras and sound recorders from NBC, experimental and prototypical television equipment from the collection of sound engineer Herb Edelman, and papers, films and apparatus from the estate of Floyd A. Ramsdell, an inventor of 3-D.



Astoria Motion Picture and Television Foundation  
**Herbert K. Edelman inspecting cameras for the Signal Corps during World War II at the Army Pictorial Center, Astoria**

The new Museum will house a 200-seat auditorium, exhibition and storage space, classrooms, preservation workshops, screening rooms, library and gift shop. Many interactive exhibits that will allow visitors such creative opportunities as designing animation sequences or editing a film, as well as extensive gallery space for changing exhibitions are planned. In addition, the Foundation also sponsors outside exhibitions ("Lights, Camera, Action: Behind the Scenes at New York's Silent Studios" is scheduled to open in November at the New York Historical Society), lectures, film screenings, publications, including its newsletter *Newsreel*, an oral history program, a community filmmaking center, and industry-related conferences and seminars. For further information, contact Astoria Motion Picture and Television Foundation, 34-31 35th Street, Astoria, NY, 11106.

## NEW PUBLICATIONS

The Newsletter's "Publications" section is prepared by Ronald R. Kline of the University of Wisconsin - Madison and Robert Casey of the Center staff, with assistance from Prof. Thomas Higgins, also of the University of Wisconsin.

### Books

Sanford P. Bordeau. *Volts to Hertz. . . . The Rise of Electricity*. Minneapolis: Burgess Publishing, 1982. 308 pages, illustrated.

This book traces the development of electrical science by focusing on the achievements of sixteen men who gave their names to various electrical and magnetic units. The author traces three hundred and fifty years of electrical history, beginning with the work of William Gilbert in the sixteenth century and ending with a discussion of the contributions of Nikola Tesla. Sanford Bordeau, who retired from Electric Machinery Mfg. Company in 1965, is a Senior Member of the IEEE.

Thomas P. Hughes. *Networks of Power: Electrification in Western Society, 1880-1930*. Baltimore: Johns Hopkins University Press, 1983. 496 pages, illustrated.

A comparative study of the development of modern electric power systems. Hughes describes the work of men like Edison, Tesla, Charles Merz, and Oskar von Miller, and the development of the institutions that laid the foundation for the electric industry. He uses case studies of three major cities—Chicago, London, Berlin—and three regions—the Ruhr, the Lehigh valley, and Tyneside—to explain how social, political, and economic factors combined with technology to create different, and not always successful, electric power supply systems. Thomas Hughes is professor of the history of modern science and technology at the University of Pennsylvania.

Woodruff T. Sullivan, III. *Classics in Radio Astronomy*. Hingham, MA: Reidel/Kluwer Boston, 1982. 337 pages.

An analysis of 37 key papers which chart the development of radio astronomy from 1896 to 1954. The majority of the articles are from the period 1946-1952, years which saw discoveries such as radio bursts from the sun, the first discrete sources and their optical identifications, and the 21-cm line of neutral hydrogen. The author introduces each paper with an extensive historical and scientific commentary. Woodruff T. Sullivan is Associate Professor of Astronomy at the University of Washington.

A. E. Joel, Jr., et al. *A History of Engineering and Science in the Bell System: Switching Technology (1925-1975)*. Holmdel, NJ: Bell Telephone Laboratories, 1982. 639 pages, illustrated.

This is the third in a series of histories documenting the evolution of Bell System technology. The first volume, *The Early Years (1875-1925)*, summarizes the first fifty years of

telecommunications development. The second volume, *National Service in War and Peace (1925-1975)*, discusses the Bell System's contributions to national defense before, during, and after World War II. This third volume focuses on the automatic switching systems required by the ever-growing volume of telephone traffic. The author describes in detail the evolution of these systems: the step-by-step systems, in which switches were directly controlled by the telephone dial; increasingly complex electro-mechanical relay systems; stored program digital switching, based on the post-war advances in solid state electronics; and further development of digital techniques, which make possible the integration of telephone service with other voice, data, and video systems. *Switching Technology's* usefulness as a reference book is enhanced by a thorough index, a chronology of developments, and complete footnotes at the end of each chapter. Amos E. Joel, Jr. is a distinguished designer of telephone switching systems. He was employed by Bell Laboratories for 42 years, and in 1976 shared the IEEE's Alexander Graham Bell Medal for exceptional contributions to the advancement of telecommunications.

Harry Wulforst. *Breakthrough to the Computer Age*. New York: Scribners, 1982. 185 pages, illustrated.

This is a popular history of the early years of electronic computing. The author focuses on the development of ENIAC at the Moore School of Electrical Engineering at the University of Pennsylvania, and follows J. Presper Eckert's and John W. Mauchly's subsequent efforts to develop commercially successful computers. Wulforst ends his story with the sale of three UNIVAC's to the Census Bureau and the development of the IBM 701 in the early 1950s. Along the way are brief discussions of John von Neumann's work at the Institute for Advanced Study at Princeton; the Colossus computer used by the British in their wartime code-breaking operation; Vannevar Bush's Differential Analyzer; and the work of Konrad Zuse in Germany. Harry Wulforst is a former director of public information at Sperry-Univac and now works as a management consultant and freelance science writer.

Robert Sobel. *ITT: The Management of Opportunity*. New York: Times Books, 1982. 421 pages, illustrated.

This book is an institutional history of one of the most familiar yet least understood of American corporations. The author chronicles the development of ITT by focusing on the careers of two men: Colonel Sothenes Behn and Harold Geneen. Behn founded the company in 1920 and attempted to form an international telephone network, a sort of worldwide AT&T. The Depression and World War II thwarted this aim, and the company came to concentrate on manufacture of telecommunications equipment. Geneen arrived in 1959 and transformed the company into a vast, controversial conglomerate. Sobel concludes with a discussion of ITT's current president, Rand Araskog, who is in the process of applying his own stamp to the company. Robert Sobel is a professor of

business history at New College of Hofstra University and a financial columnist for *Newsday*.

Robert D. Barnett, et al. *The Industrial Archaeology of the Electrical Development Company Generating Station at Niagara Falls*. Niagara Falls, Ontario: The Niagara Society for Industrial History, 1982. 63 pages, illustrated.

This book was funded by the Employment Development Branch of Employment and Immigration Canada—Summer Canada Programme. It begins with a brief history of the development of power at Niagara, and continues with descriptions of the various hydroelectric stations built at the Falls. The bulk of the book is a fairly thorough discussion of the design and construction of the Electric Development Company Station, popularly known as "Toronto Power." The text is illustrated with reprints of original engineering drawings and sketches and drawings done especially for the book. The authors include a short glossary and brief explanation of the fundamentals of hydroelectric engineering, as well as suggestions for further research on the various Niagara Falls stations.

Henry B. O. Davis. *Electrical and Electronic Technologies: A Chronology of Events and Inventors from 1900 to 1940*. Metuchen, NJ: Scarecrow Press, 1983. 208 pages.

This is a continuation of Davis's earlier work, *Electrical and Electronic Technologies: A Chronology of Events and Inventors to 1900*. It will be followed by a third volume covering the years 1940 to 1980. A chapter is devoted to each decade, and each chapter is prefaced with a summary of that decade's developments, thus setting the stage for the detailed chronology which follows. Henry B. O. Davis, now retired, was for many years employed as a physicist and electrical engineer. He is an IEEE Life Member.

### Articles

Bashe, Charles J. "The S[elective] S[equences] E[lectronic] C[alculator] in Historical Perspective," *Annals of the History of Computing*, 4 (1982), 296-312.

Busch, Jane. "Cooking Competition: Technology on the Domestic Market in the 1930s," *Technology and Culture*, 24 (1983), 222-245.

Cone, Bruce W. "A Historical Perspective of Federal Incentives to Stimulate Energy Production," *Energy*, 7 (1982), 51-60.

DeKosky, R. K. "William Crookes and the Quest for the Absolute Vacuum in the 1870s," *Annals of Science*, 40 (1983), 1-18.

"Development of Electrical and Power Engineering in the Soviet Socialist Republics," *Electrichestvo*, (December 1982), 1-21.

## BRIEFS

### Antique Generating Equipment Sought

The Orange County Historical Society is seeking, by gift or by purchase, the following items for a proposed permanent exhibit on small hydroelectric installations ca. 1890-1905: DC dynamos of 100 to 250 kilowatts capacity, meters, switches, rheostats, insulators, lamp sockets and fixtures, etc., for the construction of a switchboard. The installation will be non-generating, but the condition of all items should be good enough to allow authentic cosmetic restoration. Responses should be sent to:

M.P. Figliomeni, President  
Orange County Historical Society  
Clove Furnace Historic Site  
Arden, New York 10910

### Records Preserved, Name Retired

On March 31 of this year, at ceremonies at the Eleutherian Mills Historical Library, Wilmington, DE, Sperry Univac turned over to the library some 10,000 pounds of corporate records which document the beginning of the computer era. At the same time it was announced that the name "Univac" was being retired, and henceforth Sperry Univac would be known simply as Sperry.

Included in the Sperry collection are technical and legal documents relating to ENIAC, the original Eckert-Mauchly computer built in the 1940s. In addition the archives include records of Sperry predecessor companies such as E. Remington Typewriter, The Library Bureau, Kardex, Rodic Rubber, and Powers Accounting Machinery.

### IEEE Region 3 Activities

As part of its Centennial celebration, IEEE Region 3 is producing a compendium of historical information about the region. Robert S. Duggan, Region 3 Vice-Chairman, reports that this compendium will include personal recollections of past Region 3 directors; membership statistics charting the growth of the region over the years; a chronology of significant electrical engineering events that occurred in Region 3; a listing of Region 3 award winners; and an overall assessment of the past one hundred years by the current Region 3 director.

### Liege Centennial

The University of Liege is celebrating the one-hundredth anniversary of the founding of that school's electrical engineering program. Further information may be obtained by contacting:

Prof. A.H. Calvaer  
University of Liege  
Sart Tilman B28  
B4000 Liege, Belgium

### Science and Technology History Symposium

The Commission on Documentation, Division of History of Science, International Union of the History and Philosophy of Science, is sponsoring a Symposium in Edinburgh, Scotland, on 16-19 September 1983. Topics will include the organization, preservation and use of primary and secondary sources in the history of science and technology, with particular emphasis on comparing national approaches. The Chairman of the Commission is Nathan Reingold of the Smithsonian Institution, Washington, D.C.

**NEW PUBLICATIONS (cont.)**

Fischetti, Mark A. "E[lectrical] P[ower] R[esearch] I[nstitute]'s First Decade," *IEEE Spectrum*, 20, No. 4 (April 1983), 54-57.

Forrest, J.S. "Early Days of the [British Electrical] Grid," *Electronics and Power*, 28 (1982), 686-688.

von Gersdorff, Bernhard. "Emil Rathenauer Grunder der AEG," *Electrotechnische Zeitschrift*, 104 (1983), 323-325.

Green, Anthony. "C[omputer] A[ided] E[ngineering] in Historical Perspective," *Electronics and Power*, 29 (1983), 81.

Higgins, W. H. C., B. D. Holbrook, and J. W. Emlins. "Electrical Computers for Fire Control," *Annals of the History of Computing*, 4 (1982), 218-236.

Hulm, J.K. "Superconductivity Research in the Good Old Days," *IEEE Transactions on Magnetics*, MAG-19 (1983), 161-166.

Jones, M. E., W. C. Holton, and R. Stratton. "Semiconductors: The Key to Computational Plenty," *Proceedings of the IEEE*, 70 (1982), 1380-1409.

Jordan, D. W. "D. E. Hughes, Self-Induction and the Skin Effect," *Centaurus*, 26 (1982), 123-153.

Kansara, M. and N. S. Walkade. "Forty Years of Electric Power Development in Kenya," *Energy*, 8 (1983), 317-321.

Laithwaite, Eric. "Osborne Reynolds—An Electrical Visionary," *Electrical Review*, 211, No. 7 (September 10, 1982), 26-27.

Moralee, Dennis. "Power Engineering: The Early Struggle," *Electronics and Power*, 28 (1982), 21-27.

Pisl, Hermann and Friedrich Klotzbucher. "Entwicklung der Drehstromübertragung," *Elektrotechnische Zeitschrift*, 103 (1982), 877-879.

Randell, Brian. "From Analytical Engine to Electronic Digital Computer: The Contributions of Ludgate, Torres, and Bush," *Annals of the History of Computing*, 4 (1982), 327-341.

Reich, Leonard. "Irving Langmuir and the Pursuit of Science and Technology in the Corporate Environment," *Technology and Culture*, 24 (1983), 199-221.

Reynolds, Bruce J. "TELCOT: A Case Study of Electronic Marketing [of Cotton]," *Agriculture History*, 56 (1982), 83-98.

Robinson, Denis M. "British Microwave Radar 1939-41," *Proceedings of the American Philosophical Society*, 127 (1983), 26-31.

Starr, Chauncey. "The Electric Power Research Institute," *Science*, 219 (1983), 1190-1194.

Steward, Stanley. "Seventy Years of Enterprise and Achievement [of Bellins & Co.]," *Electrical Review*, 210, No. 11 (March 19, 1982), 40-41.

Steward, Stanley. "Sir Tom Callendar—The Father of the Electric Cable Industry," *Electrical Review*, 210, No. 15 (April 16, 1982), 52-53.

Steward, Stanley. "Electricity Nationalisation—From Hard Times to Great Expectations," *Electrical Review*, 211, No. 5 (August 20/27, 1982), 24-25.

Thiele, Ewald. "Geschichte und Aktivitäten des VDE-Bezirks Dusseldorf e.v.," *Electrotechnische Zeitschrift*, 103 (1982), 1014-1016.

Walsh Bill. "Pioneering Brighton Celebrates Century [of Electric Lighting]," *Electrical Review*, 210, No. 1 (January 8, 1982), 36-37.

Ware, Harold T. "Steelmaking & the Electric Arc Furnace," *The Locomotive* (Hartford Steam Boiler Inspection & Insurance Co.), Spring 1982, pp. 3-12.

Warren, C. A., B. McMillan, and B. D. Holbrook. "Military Systems Engineering and Research," *Annals of the History of Computing*, 4 (1982), 236-244.

Wettach, H. "Die Entwicklung der Osterreichischen Telephonie vor Historischen Hintergrund," *Electrotechnik und Maschinenbau*, 99, No. 2 (February 1982), 49-60.

Wise, George. "Ionists in Industry: Physical Chemistry at General Electric, 1900-1915," *Isis*, 74 (1983), 7-21.

**Annals of the History of Computing**

The April 1983 issue of the *Annals of the History of Computing* is devoted entirely to the "701," IBM's first commercial computer. Topics covered in the issue include: Planning, Architecture, Engineering, Programming, Application Testing, Sales and Customer Installation, and Customer Experiences.

*Annals* is published by the American Federation of Information Processing Societies (AFIPS), 1815 North Lynn Street—Suite 800, Arlington, VA 22209.

**IEEE Publications**

Since 1963 the technical Societies of the IEEE have published well over one hundred articles on specific topics in electrical engineering history. The upcoming IEEE Centennial has prompted several Societies to put together special issues of their publications, devoted in whole or in part to history. These publications are listed below. As details on editorial content become available, they will be published in the *Newsletter*.

- Circuits and Systems Society:  
*Transactions on Circuits and Systems*, January 1984, Special Centennial Issue.
- Communications Society:  
*Communications Magazine*, May 1984, Centennial Issue.
- Control Systems Society:  
*Control Systems Magazine*, December 1984, History of Control & Systems Engineering.
- Education Society:  
*Transactions on Education*, November 1984, History of Electrical Engineering Education.
- Electromagnetic Compatibility Society:  
*Transactions on Electromagnetic Compatibility*, August 1983, 25th Anniversary Issue.
- Electron Devices Society:  
*Transactions on Electron Devices*, November 1984, Centennial Special Issue.
- Microwave Theory and Techniques Society:  
*Transactions on Microwave Theory and Techniques*, May 1984, Centennial Issue.

Anyone interested in ordering any of these publications should write the IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854.

**The Institution of Electrical Engineers, U. K.**

The Institution of Electrical Engineers (IEE) has recently made available copies of the Proceedings of its tenth annual Weekend Meeting on the History of Electrical Engineering, held in July 1982. Among the papers reprinted are:

- Brown, C. N. "James Wimshurst, His Machine and its Antecedents."
- Gordon, Bob. "Degaussing (the Demagnetisation of Ships)."
- Lynch, A. C. "The Standard Resistors of 1865."
- Phillips, V. J. "Point-to-Point: A Method of Waveform Measurement."
- Pocock, Rowland F. "The Influence of the Spiritualist Movement on the Development of Radio During the Nineteenth Century."

**MEETINGS**

**Society for the History of Technology**

SHOT will hold its 26th Annual Meeting 20-23 October 1984 in Washington, D. C. The Jovians, the special interest group for the history of electrical technology, will meet for breakfast at 7:30 Saturday morning, 22 October. At 9:00 that same morning there will be a session entitled "Corporate Research in the Twentieth Century American Electrical Industry," at which the following papers will be presented:

- "Establishment of Industrial Research at General Electric and Bell Laboratories," Leonard Reich (Rutgers University)
- "The Corporate Laboratory as Entrepreneur: The RCA Experience," Margaret Graham (Boston University)
- "The Interaction of Technological Form and Commercial Operation: The Case of Automatic Switching at AT&T," Neil Wasserman (Winthrop Research Group)

Other papers of interest to *Newsletter* readers include:

- "The Computer Prescription: Research and Adoption in Medical Computing," Bonnie Kaplan (University of Chicago)
- "Technology is Not Enough: Failure of the Ballistocardiogram to Become an Accepted Clinical Tool," Joel D. Howell (University of Pennsylvania School of Medicine)

- "The Business Context of Innovation: Elihu Thomson and the Rise of the Thomson-Houston Electrical Company, 1881-1892," W. Bernard Carlson (Michigan Technological University)
- "Vannevar Bush and the Differential Analyzer: The Text and Context of an Early Computer," Larry Owens (Princeton University)

**The Institution of Electrical Engineers, U.K.**

The Science, Education and Technology Division of the IEE continues its active programs in the history of electrical engineering. The following meetings will be held at the IEE, Savoy Place, London:

- 5 October 1983, 5:30 PM  
"R. J. Van de Graaff and Electrostatic H. T. Generation," Professor F. Llewelyn Jones (University College Swansea)
- 5 December 1983, 6:00 PM  
"Christopher Strachey (1916-75): Life of a Computer Scientist," Dr. M. Campbell-Kelly (University of Warwick)
- 23 January 1984, 5:30 PM  
"From Electrical Quackery to the Gramophone: A Contemporary View of Electrical Engineering in the 1880s Provided by *The Electrician and Electrical Review*," Dr. P. Strange (Nottingham University)

**TVA STAMP**

The Tennessee Valley Authority, the largest producer of electricity in the United States, was created in 1933 when Franklin D. Roosevelt approved the act to establish "a corporation clothed with the power of government but possessed of the flexibility and initiative of private enterprise." Encompassing 40,910 square miles and parts of seven states, the TVA was charged with "planning for the proper use, conservation and development of the natural resources of the Tennessee River drainage basin and its adjoining territory for the general social and economic welfare of the Nation."



To commemorate the 50th anniversary of TVA, the U.S. Postal Service has issued a stamp featuring the Norris dam, the first hydroelectric dam in the TVA system. The dam, named for the TVA act author, Senator George Norris of Nebraska, began operation in 1936 and still serves a 2,900 square mile area of southwest Virginia and northeast Tennessee.

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 wish to be certain of receiving later issues, please take the time to fill out the form below and mail it to the Center (if you have not yet done so).

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IEEE grade (if applicable)    A \_\_\_\_\_ M \_\_\_\_\_ SM \_\_\_\_\_ LM \_\_\_\_\_ F \_\_\_\_\_ LF \_\_\_\_\_

## Faraday-Maxwell Exhibit Update

The New Jersey State Museum, Trenton, will be the last stop for "Lines & Waves," the Center's traveling exhibit on the achievements of James Clerk Maxwell and Michael Faraday. The exhibit first appeared at the IEEE's major eastern meeting, *Electro*, in April 1981. Under the auspices of the traveling exhibition program of the Association of Science-Technology Centers (ASTC), it has since appeared in nearly a dozen museums and science centers in the United States and Canada. The remaining tour schedule is:

- Bar Harbor Science Museum, Bar Harbor, ME, 16 July-28 August 1983
- Schenectady Museum, Schenectady, NY, 17 September-30 October 1983
- Midland Center for the Arts, Midland, MI, 19 November 1983-2 January 1984
- New Jersey State Museum, Trenton, NJ, 21 January -4 March 1984

In addition to the North American tour, "Lines and Waves" is also appearing in Europe. Prof. Pieter Eykoff of the Technical University, Eindhoven, The Netherlands, coordinated the production of a Dutch replica. This was displayed at Eindhoven, while a second copy was made and installed in the Technical Exhibition Center (TTC) of the Delft University of Technology. In November the latter replica will go into the University's Electrical Engineering Department and may travel to other sites in the Netherlands.

## EXHIBITIONS AND MUSEUMS

### Computer Museum

The Computer Museum, in Marlboro, Massachusetts, is scheduled to move to Boston in May 1984. The Museum's new home will be on Museum Wharf, sharing the building in which the Children's Museum now operates. The move will not only make the Computer Museum more accessible to the Boston area, but will also increase the Museum's space from 10,000 to 55,000 square feet.

The Computer Museum, which documents computing history through its exhibits, lecture series, and archives to cover the evolution of information processing from the abacus to the silicon chip, was the subject of a feature article in Newsletter Number 1. The Computer Museum (One Iron Way, Marlboro, MA 01752) is open Sunday through Friday from 1-6 p.m.

### Foothill Electronics Museum

The Foothill Electronics Museum, located in California's "Silicon Valley" (12345 El Monte Road, Los Altos Hills, CA 94022), documents the growth of the electronics industry in the San Francisco Bay area. The collection of the late Douglas Perham, which dates from a light bulb given to him by George Westinghouse at the 1893 World's Columbian Exposition in Chicago, forms the core of the museum's collections. These artifacts are incorporated in interactive exhibits demonstrating the basic laws of electricity and magnetism and of spark and arc wireless transmission, in historical displays of early radio broadcasting and receiving equipment, radio tubes, integrated circuits and various instruments, and in reconstructions of amateur and professional radio broadcasting stations.

### Centennial Poster Available

As another of its Centennial Activities, the Center, under the sponsorship of the IEEE Centennial Task Force, has published a poster entitled "A Century of Electrical Progress." The 56cm x 86cm (22" x 34") three-color timeline highlights some of the major events and personalities in the development of electrical engineering since the founding of the American Institute of Electrical Engineers in 1884.

The poster is the product of a cooperative effort involving a number of institutions and

individuals. Companies and museums throughout the United States were generous with their assistance in providing photographs, and it is hoped that the timeline will be only the first of a series of projects that will tap the resources and expertise that these institutions represent.

Posters may be ordered from the IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854. They are priced at \$3.00 each, plus a \$2.50 handling charge per order, prepaid. When ordering, specify product code CT-0115-6.



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