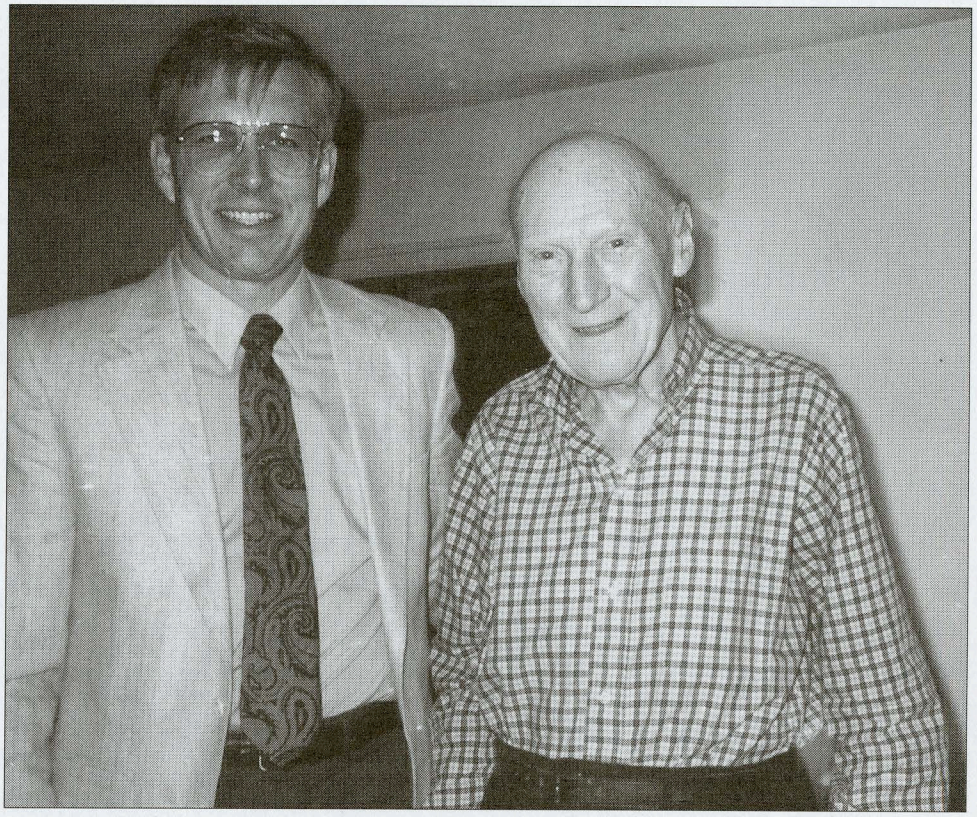
# Center for the History of Electrical Engineering

*Newsletter No. 36 Summer 1994*


# The First President's View

Ernst Weber is known to several generations of AIEE, IRE, and IEEE members for his assiduous volunteer activities, including service as the first IEEE president following the merger of the two predecessor societies in 1963. He is also one of the most distinguished electrical engineers of the 20th century. Born in Vienna in 1901, he pursued a dual education, earning in the mid-1920s both a Ph.D. in physics from the humanistic university in Vienna and a Sc.D. in electrical engineering from the technical university. After five years as research engineer for the Siemens-Schuckert company in Vienna and Berlin, Weber accepted a faculty position at the Polytechnic Institute of Brooklyn (now Polytechnic University) in 1930. There he distinguished himself as a researcher in microwave theory and techniques. During World War II he established a company to manufacture microwave attenuators and other devices. The company thrived—annual sales reached $5 million in the mid-1950s—but Weber found the management of it too great a distraction from his principal interests, research and education, so the company was sold, providing Polytechnic with its first substantial endowment. After the war, Weber established the Microwave Research Institute at Polytechnic, which became a worldwide center for microwave research. (In 1986 it was renamed the Weber Research Institute in his honor.) Weber served as President of Polytechnic from 1957 to 1969. He lives today in retirement in Tryon, North Carolina.



*Frederik Nebeker and Ernst Weber*

Several years ago Weber completed a manuscript telling the story of the rise of electrical engineering. The manuscript was extensively revised by Frederik Nebeker, Research Historian at the IEEE History Center. Nebeker, who was already well acquainted with Weber, having written about his career both in an article for *Proceedings of the IEEE* and in a chapter of the book *Sparks of Genius*, worked with him to add autobiographical chapters to the manuscript. A grant from the IEEE Foundation paid for a substantial portion of the rewriting.

The resulting book, *The Evolution of Electrical Engineering: A Personal Perspective*, which has just been published by IEEE Press, is a concise, well-illustrated account of the rise of the profession. It begins by describing how Weber came to be an electrical engineer, then sketches, in the bulk of the book, how electrical engineering became the mature field he encountered in the 1920s, and ends with a short account of Weber's career as an engineer and educator. In a substantial afterword to the book, Anthony B. Giordano writes about Weber from his perspective as student, colleague, and friend.

The book is available from IEEE Press (Order Number PP0420-0), tel. 1-800-678-IEEE.

## New Partners

We are delighted to welcome four IEEE Societies to the Partnership Program sponsored by the Friends Fund. The Control Systems, Magnetics, Power Engineering, and Signal Processing Societies have each recently made major pledges to support the activities of the Center through donations to the Friends Fund. This brings the number of Societies in the Partnership Program to seven and the total number of sponsors to twenty-two. We are grateful to all the organizations and individuals who support our efforts in this way.

# STAFF NOTES

## IEE-IEEE Exhibit

The IEEE and the Institution of Electrical Engineers (IEE) have recently been exchanging information and planning collaborative efforts in the historical and archives areas. The first major collaborative project is an historical exhibit on transatlantic communications, from sailing ships to satellites. IEE has taken the lead on this exhibit, with support from IEEE. The exhibit will be displayed in the lobby of the IEE building on Savoy Place in London from August 15 through September 29, 1994. A similar version of the exhibit will be shown at the IEEE Operations Center in Piscataway, New Jersey in January and February 1995. More information about the exhibition in the United States will be given in the next issue of our newsletter.

## Summer Intern

This summer, the Center is hosting Ross Hamilton as its 1994 summer intern. Hamilton is a first-year Ph.D. student at the University of Warwick studying the history of the British small computer industry under computer historian Martin Campbell-Kelly. Hamilton, who holds a B.Sc. in computer science (Warwick, '93), will spend most of his time assisting the Center staff with work on the Power and Control project and the editing of oral histories. He is also using his time in America to work on his own research by consulting resources not available to him in England.

The summer intern program seeks to provide research experience for graduate students in the history of electrical technology, while enlisting the help of promising young scholars for the Center's projects. The Center often sponsors non-US students as interns in order to promote global interest in the history of electrical technology.

## History in Translation

Center Director William Aspray's book, *John von Neumann and the Origins of Modern Computing* (MIT Press, 1990) is now available in Spanish and will soon be available in Japanese translation. The publishers are, respectively, Editoria Gedisa and McGraw Hill of Japan.

## 1995-96 Fellowship in Electrical History

Applications are currently being accepted for the 1995-6 Fellowship in Electrical History. Funded by a grant from the IEEE Life Member Fund, the Fellowship 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 or the sciences as well as those having degrees in the humanities are invited to apply. The deadline for receipt of applications is 1 February 1994, and three copies of the entire application package must accompany the original. Application forms are available from the Center.

## 1994-95 Fellow

The 1994-95 IEEE Fellowship in Electrical History has been awarded to Ross Basset. Mr. Bassett is writing a doctoral dissertation in the history of science program at Princeton University on the history of metal oxide semiconductors. He holds a bachelor's degree in electrical engineering from the University of Pennsylvania and a master's degree in history from Cornell University. Between obtaining these degrees, Basset worked at IBM as a staff engineer for eight years. With his dissertation, Basset will draw out the broad themes of technological change as illustrated by the development of large scale integration techniques.

## New Position for Ellis

The Center's Assistant to the Director, Michael Ann Ellis, has received a promotion to a new position within IEEE, working in the IEEE Financial Services department. We appreciate her dedication and hard work for the Center over the past three-and-one-half years and wish her well in her new post.

## New e-mail Address

The center has a new internet addess. You may contact the Center by sending e-mail to: history@ieee.org

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

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## *Talking Audiovisual History...*

***What is the nature of the Center's audiovisual history program?***

Since its inception, the Center has been collecting oral histories with distinguished electrical engineers and engineering managers. This activity has increased significantly over the past five years. In the past year, we have begun a program of videotaping to supplement our oral history program. Currently we hold approximately 215 oral histories and a few video histories.

***What is the purpose of this program?***

Oral history is an important additional source of historical data, supplementing the traditional historical sources such as artifacts, published and unpublished documents. Interviews are particularly good for learning about an individual's personal views on some important event or development, and for better understanding the role of motivations and personalities in key events. We are using oral history as a tool in our Power and Control project, i.e. in writing our survey history of electrical technology since 1850. Moreover, many engineers and students like to hear what the leaders of their profession have to say about the key events with which they were associated. Interviews can also fill in gaps in the historical record and help to resolve contradictory evidence. In our video histories we try to avoid "talking heads" but instead have knowledgable people display and explain historical artifacts.

***What is the form of the final product?***

All of the audio interviews are transcribed, edited by both staff and interviewee, and approved by the interviewee before being made publicly available. Researchers insist upon transcripts because listening to tapes takes too much time, and interviewees appreciate the opportunity to enhance their interviews with corrections and emendations before they are made publicly available. The IEEE Foundation Life Member Committee has provided a generous grant to enable us to complete transcription of our backlog of interviews and make them more accessible. We are still in the process of formulating our procedures for handling video interviews.

***How are these interviews made available to researchers?***

Any interview that is in its completed form, as described above, is accessible to any researcher or interested party. Interviews are available in several different formats. Sometimes a group of related interviews, such as those with workers at the MIT Radiation Laboratory or those from our Engineers as Executives project, are grouped together and published in a book by the Center or by the IEEE Press. Every finished interview is available in paper or floppy disk format for a nominal charge from the Center. We are in the process of placing the finished interviews on the internet, where they will be accessible 24 hours a day. However, we are still working out some problems about format and our computer server, so access will be somewhat limited for the next few months. By the end of 1995, however, we anticipate that all finished interviews will be available on the internet.

***What are your plans for the future?***

We are hoping to increase the international representation in the program. One way to do that is to work in closer contact with professional societies around the world. This May we conducted 19 interviews in Japan, which were only possible because of the efforts of a number of members of the IEE Japan. We have also been discussing oral history projects with members of the IEE in the United Kingdom and the VDE in Germany. These initial efforts we hope will serve as models of cooperation with other national professional societies.

## Two New Milestones

### Poulson Arc Transmitter

On the afternoon of Saturday 28 May 1994, at the Lyngby Radio Station just north of Copenhagen, the Danish IEEE Section held a dedication ceremony for an IEEE Electrical Engineering Milestone in honor of a path-breaking radio transmitter. IEEE President-Elect James T. Cain represented the IEEE Executive Committee at the ceremony, which was held in conjunction with the IEEE Region 8 meeting in Copenhagen.

In the early days of wireless, messages were encoded in dots and dashes and sent by spark transmitters. Conveying voice or music by radio required a continuous-wave (CW) transmitter, and the first successful CW transmitter was the invention of the Danish engineer Valdemar Poulsen. Poulsen was already known for another invention, the Telegraphone, the world's first functional magnetic recorder, patented in 1899.

Poulsen's invention of the arc transmitter built upon the work of the English engineer William Duddell, who had discovered how to make a resonant circuit using a carbon-arc lamp. Duddell's "musical arc" operated at audio frequencies, and Duddell himself concluded that it was impossible to make the arc oscillate at radio frequencies. In 1902, however, Poulsen succeeded in doing just that—by modifying the electrodes, placing the arc in an atmosphere of hydrocarbon vapor or pure hydrogen, and adding a transverse magnetic field.

Poulsen's transmitter was used worldwide in the second and third decades of the century until it was displaced by transmitters that employed the vacuum tube as a generator of continuous waves.

### KDKA

When Frank Conrad, a Westinghouse engineer, returned to his amateur-radio hobby that he had set aside during World War I, he used a vacuum-tube continuous-wave transmitter. This meant he could send speech and music, rather than the Morse code to which he had previously been limited. He played records over the air and built up a large following among amateurs. In 1920 Harry P. Davis, a Westinghouse vice president, decided that Conrad's transmissions were an excellent way to stimulate the sale of radio equipment, and on 16 October Westinghouse asked the Department of Commerce for a special licence to begin regular broadcasting. Thus was born Station KDKA, whose first transmission, broadcast on a wavelength of 360 meters at 100 watts on the evening of 2 November, reported returns of the Presidential election between Warren G. Harding and James M. Cox. Within a year seven other licensed stations followed KDKA's lead, and within two years there were almost five hundred stations in the United States; by the end of the decade most U.S. homes contained a radio receiver.

On Friday 17 June an IEEE Electrical Engineering Milestone plaque was dedicated to honor the pioneering broadcasting station KDKA. The IEEE Pittsburgh Section nominated the achievement and conducted the dedication ceremony. The IEEE Executive Committee was represented by Past-President Martha Sloan. Milestones Coordinator, Charles R. Wright, also spoke at the ceremony. The plaque citation called attention to the role played by Davis and Conrad as well as the significance of amature radio in the establishment of regular radio broadcasting.

# Museums

## Communications Museum

A large collection of electrical communication technologies is available for visitors to examine and explore at the National Museum of Communications in Irving, Texas. A "touch-and-feel" museum, the National Museum of Communications encourages patrons to handle many of its exhibits, providing a memorable exposure to a wide variety of communications technologies. Founded in 1979 as the Texas Broadcast Museum, the National Museum of Communications continues to maintain radio and television technologies as the core of its collection. the centerpiece of the museum is the control panel used by the "Voice of America" radio station from the mid-1950s until 1988. There are also recreations of a 1930s radio studio and a 1960s television studio. Other electrical communications technologies on display include video recorders, microphones, telephones, teletypes, computers, phonographs, and tape recorders. The museum's library collection, which contains thousands of albums, magazines and radio transcripts, is available to scholars doing research on the history of telecommunications.

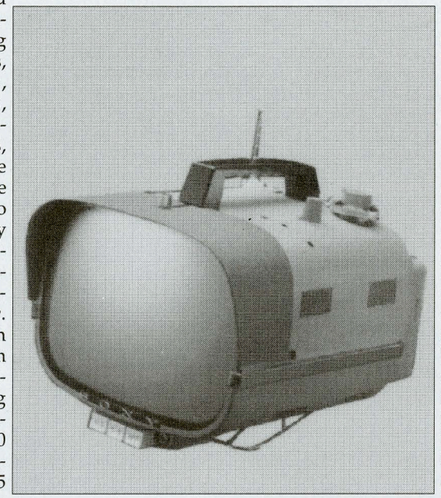
## Cryptology Museum

An interesting look at electric encryption technologies is available at the National Cryptologic Museum, an historical exhibit sponsored by the National Security Agency. Located at NSA Headquarters in Ft. Meade, MD, the National Cryptologic Museum is the first first officially sanctioned Department of Defense-level military museum. It features in its collection several famous coding machines, such as the German "Enigma" from World War II, a 1930s-vintage Hebern machine, and the machine used by Americans to read the Japanese "Purple" cipher. Other museum attractions include non-electronic cryptography artifacts, such as old code books, texts, training aids, and devices. The museum also includes a library for historical research with a Freedom of Information Act reading room on the premises available for use by prior appointment. For more information, contact DIRNSA, Attn: E32 (Museum), Ft. George G. Meade MD 20755-6000, tel. (301) 688-5849.

## Museums in Japan

We are pleased to report on three Japanese museums that may be of interest to our readers. We advise you to make advance arrangements before visiting these musuems.

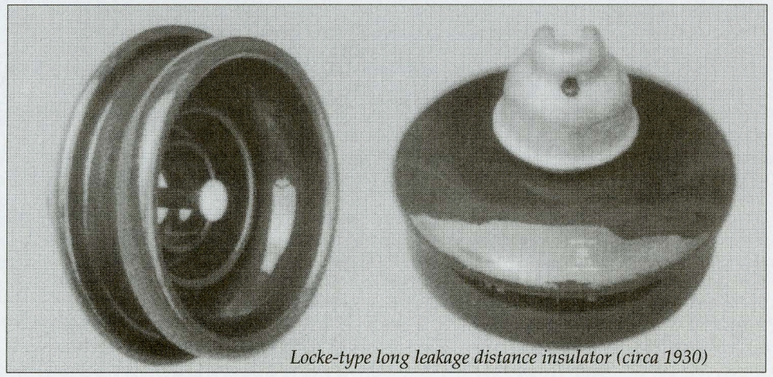
•Sony maintains an exhibit recounting the company's historic role in the development of consumer and commercial products, including radios, televisions, videocassettes, compact disks, camcorders, digital tape recorders, and satellite broadcasting. The display area also includes a display of current products and a demonstration of high-definition theater. Headsets with tour information in several languages, including English, are available. Open 10:00 AM-4:30 PM business days. 6-7-35 Kita-Shinagawa, Shinagawa-ku, Tokyo. Telephone (03) 5448-2649.



*World's first transistor television (manufactured by Sony)*

•NGK Insulators, Ltd., one of the world's leading manufacturers of electrical insulators, operates an insulator museum on the premises of the NGK High Voltage Laboratory approximately 20 km outside Nagoya. This important aspect of the history of electric power has been carefully preserved and interpreted by Dr. Tetsuo Fujimura, currently Counsellor of NGK Industries and Professor at Chubu University. For more information about visiting the museum, contact the Overseas Division of NGK Insulators, Ltd., Shinmaru Building 2F, 1-5-1 Marunouchi, Chiyoda-ku, Tokyo. Telephone (03) 3284-8810. Fax (03) 3284-8888.

•The Agency of Industrial Science and Technology maintains a Preservation Hall of Research Instruments. For more than a century, the Japanese government has been supporting research in industrial science and technology, including a long history of research in electrical power and more recently electronics and computer engineering. The Preservation Hall holds many of the original prototypes and test equipment developed in these government laboratories. The museum in located on a campus with other government research facilities in Tsukuba City. Telephone (02) 9854-2130.



*Locke-type long leakage distance insulator (circa 1930)*





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

**Schiffer, Michael Brian**, *The Portable Radio in American Life*. Tucson and London: University of Arizona Press, 1991. xvii + 259 pp., with illustrations.

Anthropologist Michael Schiffer uses his archaeological skills and insights to reveal the rich, complex history of an important consumer product. By placing the portable radio within a historical narrative that begins with visionary predictions of a technological "democratization" of music, Schiffer demonstrates that portable radios existed in the collective imagination long before they were within the grasp of engineers or inventors. He describes in detail efforts during the 1920s and 1930s to produce and market "portable" radios compact enough to take along outdoors. Technological problems beset these devices, as did consumers' insufficient interest in constant accessibility to their radios. Conditions changed with the start of WWII, and Schiffer shows how new small tubes and a keen interest in radio broadcasts led to increased demand for small radios in the post-war years, even before the introduction of the famous Regency pocket transistor radio in December of 1954.

Pocket radios grew in popularity through the 1950s, and Schiffer displays numerous examples of tube and transistor radios of various shapes, sizes, and styles. Transistor radios first out-sold tube radios in the U.S. in 1957 — the year Sony marketed the first Japanese transistor radio, and a year that saw the proliferation of rock music radio stations catering to a huge teenage market. Schiffer examines the fortuitous convergence of technology, demography and marketing that produced an enormous boom in transistor radio sales lasting into the 1960s. Sharply critical of earlier "cryptohistories" that have misrepresented the conditions of Japanese success with this early consumer electronics product, Schiffer seeks to draw lessons for the future from a more careful rendition of developments of the past. Thought-provoking as well as entertaining, *The Portable Radio in American Life* will interest engineers, radio buffs, historians, and the general public.

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Keith Thrower, the Chairman of the IEE Technical History Committee and the IEE Archives Committee, has recently published a new book, *The History of the British Radio Valve to 1940*. Copies of the book are available for £3 from G.C. Arnold Partners, 9 Wetherby Close, Broadstone, Dorset, BH18 8JB, England.

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A new edition of Burch and DePasquale's classic *The History of Electrocardiography* has recently been published. The book, which is 309 pages with 175 illustrations, has a new 40-page introduction written by Joel Howell, M.D., Ph.D., which discusses development in electrocardiography since the publication of the first edition in 1964. For more information, please contact Norman Publishing, 720 Market St., Third Floor, San Francisco CA 94102, tel. (415) 781-6402

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## Special Issues

The Society of American Motion Picture Engineers has published a special issue of the *SAMPE Journal* (Jan/Feb, 1994) commemorating the society's 50th anniversary. Forty pages of the issue are dedicated to such topics as "First SAMPE Chairman", "The Early Years", "SAMPE Presidents", and "Operations of the Society."

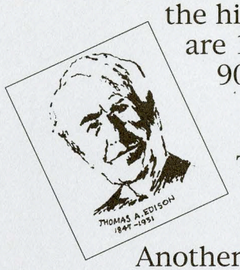
The *Microelectronics Journal* also has a special issue (February 1994) to mark its 25th anniversary. The issue has over 30 pages of special articles, including "25 Years in GaAs ICs", "Quarter Century of Microelectronics in Japan", and "A Quarter Century of Microelectronics: What Happened in Analog Electronics and What is Ahead?" The issue includes an article by Gordon E. Moore, the Chairman of the Intel Corporation.

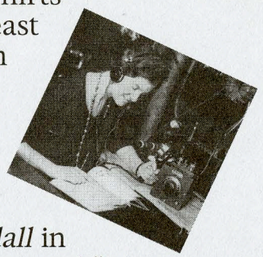




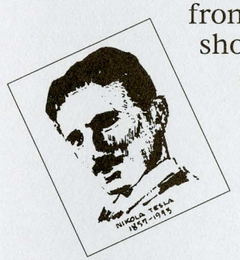
# *New!* Historical T-shirts from IEEE!

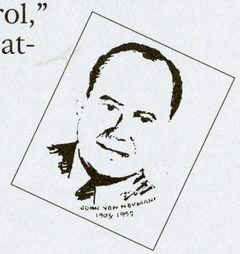
Now you can buy five T-shirts and one sweatshirt expressing your interest in the history of electrical technology. All the T-shirts are 100% cotton, and the sweatshirts are at least 90% cotton—all in thick, durable fabric from quality manufacturers.



Three of the shirts display line drawings of IEEE Founders: *Thomas Edison, Nikola Tesla,* and *John von Neumann.* Another T-shirt shows radio pioneer *Eunice Randall* in front of her gear. A fifth T-shirt, labeled "I'm in control," shows *Black's* historic feedback circuit. And our sweatshirt (99% Genius) plays on a famous aphorism of *Edison.* Available in L, XL, or XXL. IEEE member discounts and bulk discounts available.

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*Please mail to: IEEE Center for the History of Electrical Engineering, Rutgers University, 39 Union St., New Brunswick NJ 08903*

## Computer History On-line

An encyclopedia of computer history published on floppy disk is available from Lexikon Services, an electronic publishing company. The encyclopedia has over 1,300 articles, with information on more than 300 different computers, 200 computer languages, and hundreds of individuals, companies, and technologies. It contains information on a wide variety of areas in computer history, including early non-US computers, from countries such as Russia, Germany, Japan, Sweden, United Kingdom, Italy, and Norway. The encyclopedia works on any IBM-compatible personal computer and requires no special software to run. It comes with full text-search capability, on-screen help, and an install program. It requires under 2.5 megabytes of memory. The cost for the encyclopedia is $19.95. Registered users will receive free updates for one year. For more information, please contact Lexikon Services, 3241 Boulder Creek Way, Antelope CA 95842, tel. (800) 414-4286.

## Babbage Book

The IEEE Press, in conjunction with the Rutgers University Press, has just printed *Charles Babbage: Passages from the Life of a Philosopher*. This autobiography, first published in 1864, is hailed as the mischievous memoirs of the pioneer of the computer. Edited by esteemed historian of computing Martin Campbell-Kelly, who has added a new introduction to the text, the book includes chapters such as "Recollections of LaPlace, Biot and Humboldt", "Picking Locks and Deciphering", "Theatrical Experience", "Religion", and "Hints for Travellers", as well as technical sections on Babbage's difference and analytic engines. The book, in paperback, is available through IEEE, order number PP 04051. Call 1-800-678-IEEE.

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***GE History...*** A book that gives the 110 year history of General Electric's factory at Fort Wayne, Indiana has recently been published by Clovis E. Linkous. Thoroughly researched, the book give a detailed account of the plant, which 29 years after its construction was absorbed into the General Electric empire to become a major facility for the company. It contains detailed information about thousands of Ft. Wayne personalities, including much new material about James John Wood and Marmaduke Slattery, two pioneers in the electric power field. The book, which is 560 pages with 141 illustrations, costs $30. For more information, contact Clovis Linkous, 2929 Woodstock Ct., Fort Wayne IN 46815.

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