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Preserving, Researching, and Promoting the Legacy of Electrical Engineering and Computing

STATIC FROM THE DIRECTOR

Happy new year, decade, century, millennium — however you are keeping score. It is also my pleasure to welcome you to the twentieth year of the IEEE History Center, and our tenth year at Rutgers University. 2000 looks to be a landmark year for the Center and for IEEE historical activities, overseen by the IEEE History Committee. Before updating you on those activities, let me take one more opportunity to thank you, our supporters, for making our work possible. Our roll of honor appears beginning on page 5. As you can see, the initiative to raise endowment funds from the IEEE Technical Societies, to be matched by the IEEE Foundation, continues to go well. But a significant part of our operating budget comes from individual donors like yourself, and for that we remain grateful. We hope we will continue to earn your support. In that vein, we regret to note the passing of Joseph F. Keithley, long-time supporter and Trustee of the IEEE History Center. His historical engineering work both within IEEE and on his own, following a distinguished engineering career, will leave a lasting impact. His final book, *The Story of Electrical and Magnetic Instruments from 500 B.C. to the 1940s* [reviewed in Newsletter 49] is a double legacy because it has scholarly importance and Keithley willed

the proceeds of sales to go to the IEEE History Center.

On the activities front, the Milestones program continues to grow in quantity, quality, and, importantly, geographic scope. At its November 1999 meeting, the IEEE Executive Committee approved three new Milestones, in Japan, Ireland, and the American state of Hawaii. All three will be dedicated this year. Another Japanese nomination is in the pipeline, and we have several promising proposals worldwide under consideration as well. Also in keeping with our international approach, we have just completed supporting and participating in a joint history workshop, held in Singapore, between the IEEE History Committee and the history committee of the IEEJ [see box to right].

As for the IEEE Technical Societies, our work with several of them is progressing well. We are wrapping up our projects for the IEEE Components, Packaging, and Manufacturing Technology Society and the IEEE Aerospace and Electronic Systems Society, and starting to move into high gear on the 2002 50th anniversary projects for the IEEE Electron Devices Society, the IEEE Communications Society, and the IEEE Engineering in Medicine and Biology Society. In fact, the EMBS, with help from us, has obtained a \$12,000 grant

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TO SINGAPORE FOR ELECTRICAL HISTORY



Prof. Nam describes historical activities in Korea for workshop attendees.

A great many people, including, we trust, the readers of this newsletter, believe that it is good for the profession of electrical engineering and computing to cultivate its history. This has certainly been the view of top volunteers of IEEE, and an IEEE History Committee has existed since the formation of the Institute in 1963. It is the view also of top volunteers of the Institute of Electrical Engineers of Japan (IEEJ), which has an active history committee. In 1995 the IEEJ History Committee organized and hosted a meeting between members of that committee and representatives of the IEEE History Committee and the IEEE History Center. Held in Maui on 7 and 8 December, the meeting was an opportunity to share experiences and exchange ideas about promoting the history of electrical technologies. From that meeting came the Maui Declaration, which contained three action items: to organize a follow-up meeting for continued discussion between representatives of IEEJ and IEEE, to seek to expand the participation at the follow-up meeting beyond these two professional societies, and to make the achievements of the Maui Meeting known to the public. The third action item was achieved through reports in newsletters and the publication in November 1996 of Record of the Maui Meeting. The first two action items were

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Staff Activities

Hochfelder at the American Historical Association

In January, David Hochfelder, our post-doctoral researcher, presented a paper at the American Historical Association's annual meeting in Chicago. The AHA meeting is the largest historical conference in the U.S. Hochfelder spoke about telegraphers' fiction and memoirs from

the late nineteenth century. This paper is part of his ongoing research and writing on the history of the telegraph in America before 1920.

Nebeker Articles in *IEEE Spectrum*

The February issue of *IEEE Spectrum* contains an article by History Center Senior

Researcher Frederik Nebeker, "Arriving at the Punched-Card System," pp. 58-59, and the April issue will contain a second article. *Spectrum* staff will be making a decision whether or not to carry further articles on the history of technology, based on reader response. If you like what you see, and would like to see more, respond to *IEEE Spectrum* and let them know. ♦

Things to See and Do

Museum of Flight

On his December trip to the West Coast to conduct interviews for the IEEE History Center's ongoing oral history collection pro-

gram, our postdoctoral researcher David Hochfelder visited the Museum of Flight near the Boeing plant in Seattle, WA. It is well worth the admission price of \$8. The museum contains aircraft from all eras of aviation history, from its first years at the turn of the 20th century to modern jet aircraft. Of particular interest is the SR-71 Blackbird, a Czech MiG, one of the last few surviving B-17s, and the Air Force One aboard which President Johnson took the oath of office in Dallas in November 1963. There are also several activities for children, including a mockup of Anakin Skywalker's pod racer from the most recent Star Wars movie and a simulated mission control center for space shuttle flights.

THE ELECTRIC STYLE: The Architecture of the Georgia Power Company

There is a historical photograph exhibit on display in the Georgia Power Arkwright Museum, 241 Ralph McGill Blvd, Atlanta, GA. Power plants, corporate headquarters, historic substations, local and district offices, transportation buildings, and vernacular architecture are included in the exhibit, as well as an early amusement park, baseball stadium, and Power Club Camp. Buildings and images date from 1891 to the present. The exhibit opened for visitors in January, 2000. Contact: Margaret Calhoun, Archives Director of the Georgia Power Company, at +1 404 506 2242. ♦

The newsletter reports on the activities of the Center and on new resources and projects in electrical and computer history. It is published three times each year by the IEEE History Center.

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SURF CITY

Recently the following site was brought to our attention: www.biography-center.com/. It contains thousands of biographies, and it guaranteed to be a great resource for researchers and students. Pass it on!

BBC Online (www.bbc.co.uk/home/today/) contains a great deal of history and is very enjoyable to surf around.

Information Age Learning Center (www.infoage.org/) is a site dedicated to the Marconi High-power Wireless Station, Evans Signal Laboratory, Bel-

mar, NJ. It contains a great deal of information and wonderful photographs. And if you are in New Jersey, it is worth a "road trip!"

The United States Patent and Trademark Office has a site dedicated to the young (and the young at heart!) called "Kids Page". It is divided by age, and also contains information for teachers and parents on invention ideas. Visit it at www.uspto.gov/web/offices/ac/ahrpa/opa/kids/index.html. ♦

Bibliography

GOODWILLIE, SUSAN, *Now Hear This: The Life of Hugh S. Knowles, Acoustical Engineer & Entrepreneur*. Washington, D.C.: The Francis Press, 1999.

This excellent publication chronicles the life of Hugh S. Knowles (LF). From his meager and violent beginnings as a youth living in Mexico during the Mexican Revolution to his death in 1988.

Born in Iowa in 1904, Knowles spent most of his youth in Mexico in the midst of the Revolution. Even during his youth he exhibited great abilities, which led to his graduation from high school at the age of fourteen. His stint in the Merchant Marines was a maturing experience, and the beginning of his career as an engineer. His college years almost proved to be too much, as he was talking a full course load each semester while holding down two jobs. He married Josephine, who proved to be his true soul mate and a remarkable woman herself. She toiled endlessly throughout her entire life to support the family and his companies. Her untimely death at an early age left Hugh and his children devastated.

As Hugh traveled through life, he had a sincere interest in not only technology, but also the people he dealt with. He was a perfectionist, who always insisted on overseeing the development of products manufactured by Knowles Electronics. He had a personable side to him, and was well respected by not only his peers, but other individuals that he encountered in life. His final years with wife Nancy were reflective.

The book nicely mixes personal/family history with technology, explaining Hugh's inventions in a manner understandable to the non-engineer. Susan Goodwillie gives us insight into Hugh's fascination with the invention of the transistor and his understanding of its importance and future applications.

Available from The Francis Press, Washington, D.C., +1-800-290-7502, fax: +1-202-244-6408, <http://www.francispress.com>, \$24.00, 6" x 9" hardcover, ISBN 0-9665051-2-3, 215 pages, (20 photos & index).

HARS, FLORIAN. *Ferdinand Braun (1850-1918): Ein wilhelminischer Physiker*. Berlin: Verlag für Geschichte der Naturwissenschaften und der Technik, 1999.

At the end of the 19th century, the science of physics, far from having completed its task, began growing rapidly in two quite different directions: toward more highly developed

theory and toward greater applicability to worldly problems. While Ernst Mach or Max Planck might be taken to represent the former, Ferdinand Braun might be taken to represent the latter. Three of Braun's achievements stand out. He made vital improvements to Marconi's system of wireless transmission, notably by separating the signal-generating (sparking) circuit and the antenna circuit (linking them inductively), which greatly increased the range of transmissions. (It was this work for which he received the Nobel Prize, jointly with Marconi, in 1909.) He discovered that certain crystals allow a flow of current in one direction only and thus could be used as detectors of radio signals. (This marked the beginning of solid-state electronics.) And he invented the cathode-ray tube, which greatly advanced instrumentation (in the form of the oscilloscope), made television possible, and provided the usual computer-interface of the latter 20th century.

As Florian Hars points out, it is remarkable that so important a person is so little known even to historians of science and technology. There exists only one previous biography, by Friedrich Kurylo, which was published in 1965 (an English version appearing in 1981). The obscurity of Braun may be explained in part by the dominance, within physics, of the first of the two directions named above and by the much greater attention given by academic historians to the history of science than to the history of technology. Hars' book, which gives a full and careful account of Braun's life and work based on primary sources, is therefore highly welcome.

The first chapter covers Braun's youth, education, and early work, which included important studies of electrical conductivity. In 1883 he obtained a professorship at Karlsruhe, and two years later he moved to Tübingen, where he worked for ten years, mainly in the fields of electrolysis and electrical measurement; these years are the subject of the second chapter. In 1895 Braun moved to Strassburg, where he became increasingly concerned with what would later be called electronics, and in 1897 he invented the cathode-ray oscilloscope in order to study rapidly varying electrical currents. His work at Strassburg is covered in the final three chapters. The fourth is devoted to his work on wireless telegraphy. Sources are indicated in footnotes. There are occasional illustrations (most often of experimental apparatus), an index, and a complete listing of Braun's publications.

Available from GNT-Verlag, Berlin, fax 05441 927127, <http://www.gnt-verlag.com>, 57.70 DM, paper, ISBN 3-928186-39-6, 272 pp., index.

HARPER, STEPHEN. *Capturing Enigma*. Stroud, England: Sutton Publishing, 1999.

Harper's exciting story of how the Royal Navy destroyer *HMS Petard* captured the German submarine U-559 in October, 1942, and with it, the Enigma code books which enabled Alan Turing's group at Bletchley Park to solve the "Triton" 4-rotor Enigma code within six weeks. In addition to being a thrilling sea story of *HMS Petard* and her exploits, *Capturing Enigma* contains a chapter on Bletchley Park, with some material on its codebreaking computers, and its methods.



The German Enigma coding machine

Available from Sutton Publishing, Stroud, England, 01903 828800, fax 01903 828801, BP 14.99, cloth, ISBN 0 7509 2316 4, 180 pp, illus., index

HECHT, GABRIELLE, *The Radiance of France: Nuclear Power and National Identity after World War II* Cambridge, Mass.: The MIT Press, 1998.

Gabrielle Hecht, an Associate Professor of history at the University of Michigan and former recipient of the IEEE Life Members Fellowship, has written a detailed study of the interactions between technology, engineering, public policy, and nationalism in the development of France's first generations of nuclear power technology. Hecht presents a history of nuclear power technology that not only explores the question, "what is French about French nuclear power," but also how French nuclear power development helped reshape what it meant to be French. Based on archival sources, published works, and a multitude of oral history interviews, *The Radiance of France* offers provocative suggestions for today's engineers. Technology, Hecht argues, is inseparable from politics and public policy, despite the efforts of some engineers to keep them separate. Acknowledging and even cultivating the links between technological development and political will might benefit both engineers and the public.

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Available from The MIT Press, Cambridge, MA, 800-356-0343, fax: +1 617-625-6660 <http://mitpress.mit.edu>, \$45.00, ISBN 0-262-08266-7, 453 pp., index, illus.

PACEY, ARNOLD, *Meaning in Technology*
MIT Press, Cambridge, 1999.

Pacey has set himself the task of defining “the goals of innovators, engineers, and other technologists in terms of conflicts among different forms of idealism,” and believes that “a person’s ideals and values in relation to technology are an outcome of her or his sense of the purpose and meaning of life.” Pacey argues that “tacit knowledge” and “context-based insight” must be brought to bear in order to create a genuinely beneficial technological advance. “Technology by itself is better appreciated if we pay attention to human responses,” Pacey writes, while posing the question: “What would technology be like if it were practiced by individuals with a

people-centered outlook?” In the fascinating chapter on Visual Thinking, Pacey discusses the object-centered versus people-centered personalities of inventors and technologists, and how the same object-centered traits which gave them the aptitude to solve technical problems also alienated them from the people who were expected to use those technological developments.

Although the comparison of technology and music in the first chapter seems tenuous, the rest of the book is an important examination of the vital question of the “why” of technology and its place in the human experience.

Available from The MIT Press, Cambridge, MA, 800-356-0343, fax: +1 617-625-6660 <http://mitpress.mit.edu>, \$27.50, cloth, ISBN 0-262-16182-6, 264 pp, 3 illus.

ANDERSON, LELAND I., ed., *Nikola Tesla: Guided Weapons & Computer Technology*, Breckenridge, Co.: Twenty First Century Books, 1998.

Leland Anderson, an IEEE member and long-time Tesla enthusiast, is the editor of this work that cites original documents extensively, notably the entire transcript of a patent court proceeding between Nikola Tesla and Reginald Fessenden, filed in 1900. The transcript, long unavailable to researchers, describes an obscure invention related to Tesla’s experiments on toy boats guided by tuned, inductive signals. As Anderson notes, the transcript reveals considerable information about Tesla’s activities in his New York and Colorado Springs laboratories, much of which is not available elsewhere. Anderson has added additional passages drawn from Tesla’s correspondence, as well as a discussion of the similarities between Tesla’s inventions and the modern concept of the “AND” gate used in logic circuits. With its wealth of new material, this book should be popular with the growing population of Tesla fanatics.

Available from Twenty First Century Books, P. O. Box 2001, Breckenridge, Colorado 80424, \$31.95 hardback, ISBN 0-9636012-5-3 ♦

Singapore Workshop

continued from page 1

achieved with the holding of a meeting on 24, 25, and 26 January 2000 in Singapore.

This meeting, called Maui II, was organized by Rik Nebeker and Mary Ann Hoffman of the IEEE History Center. The members of the IEEE History Committee in attendance were Yasuharu Suematsu (Chair), Fumio Arakawa, Keiichi Hohki, Takayuki Nagata, Yuji Okita, Hiroshi Suzuki, and Kuniaka Tanaka. From the IEEE History Committee were Martha Sloan (Chair), Bernard Finn, Emerson Pugh, Wallace Read, and Yuzo Takahashi. Mike Geselowitz and Rik Nebeker represented the IEEE History Center. Chen-Ching Liu represented the history committee of the IEEE Power Engineering Society. Four other professional societies were represented: the Institution of Professional Engineers New Zealand (IPENZ) by Jos Arrillaga; the Institution of Engineers Singapore (IES) by Yong Tian Chew; the Korean Institute of Electrical Engineers (KIEE) by Moon-Hyon (Monroe) Nam; and the British Institution of Electrical Engineers (IEE) by Lenore Symons.

The Maui II workshop began with reports on the historical activities of the professional societies represented. Especially valuable was the report from Lenore Symons, IEE Archivist, about the many historical activities of the IEE: publications (a book series and numerous articles); conferences, sessions, and individual lectures; exhibits; and the IEE Archives. The second session concerned oral history, biographical sources, and commemorative plaques. Wally Read described the IEEE Milestones program, and workshop attendees discussed how that program might become more international.

Archives and museums were the subjects of the third session. Noteworthy was the presentation by Keiichi Hohki on the content and organization of a new museum being built by the Tokyo Electric Power Company; the museum is scheduled to open in the fall of 2001. The fourth session was devoted to a subject that was hardly mentioned at the first Maui meeting four years earlier: Web-based history. Smithsonian curator Barney Finn and Center director Mike Geselowitz described several projects, not only ones for presenting electrical history through Websites, but also ones that use the Web to

gather information, documents, and images. The fifth and final session of the workshop concerned various collaborative projects. In addition, agreement was reached at this session on what is called the Singapore Declaration, which records the objectives of this meeting and the intention of the participants to continue their collaboration in promoting electrical history.

The workshop was held in conjunction with the IEEE Winter Power Meeting, and attendees of the workshop presented three historical sessions as part of the Power Meeting. The first of these, titled the Commemorative Session, featured speakers from four countries: Yasuharu Suematsu (Japan), Barney Finn (U.S.), Monroe Nam (Korea), and Wally Read (Canada). Rik Nebeker chaired a session on technology transfer; there were presentations by four speakers (Fumio Arakawa, Monroe Nam, Mike Geselowitz, and Emerson Pugh), followed by a panel discussion. The final session, chaired by Barney Finn, contained talks by Yuji Okita and Lenore Symons. “If anyone is interested in any part of these papers or presentations, please contact the History Center at history@ieee.org. ♦

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grow our endowment.*

The Center continues to work hard to preserve and research the legacy of electrical engineering and computing and to spread the word to engineers, students, journalists, decision makers, and the general public. Great progress has been made in achieving financial stability with the establishment of an endowment for the Center. While we are working at further building the endowment, we still depend heavily on operating funds from our two main sponsors, IEEE and Rutgers University, and on project grants and annual contributions from companies, foundations, IEEE entities, and people like you. We need your ongoing support to continue our work on collecting oral histories, publishing technical and popular articles, organizing conferences, designing exhibits, recognizing milestones in electrical and computer history, and working with the media to reach a broader audience. Contributions from individuals sends the clearest possible message to institutional donors that the Center's work is valued by people with an interest in deepening our understanding of the role of electrical and information technologies in shaping today's world.

We have two programs through which individuals and organizations can help support the Center's activities: The Friends Program and the Partnership Program. The Friends Program is for annual gifts of \$25 to \$2499. These gifts, unless otherwise specified, are divided about equally between the endowment and the Center's operating budget, and make the donor a

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SLICES OF HISTORY

Foibles of the Greats

Alessandro Volta (1745 - 1827) is one of the most important people in electrical history, as his 1799 discovery of a chemical means of generating electric current (the voltaic cell) set off the decades of electrical experimentation that culminated, before the end of the 19th century, in communications and power technologies that transformed societies. Volta, however, sometimes went too far in his investigations, as the following excerpt from an article in *IEEE Engineering in Medicine and Biology* (May/June 1999, p. 28) illustrates:

In 1800, Volta reported placing an electrode in each of his ears and connecting the two electrodes to a series stack of electrochemical cells, whose potential was later estimated at 50 V. He reported hearing "a sound like a boiling viscid fluid."

Though neither Volta nor anyone else seems to have followed up on this work, it is regarded as the first instance of inten-

tional excitation of the acoustic nerve by electricity.

Saving Conrad's Garage

Frank Conrad's garage-based experiments led directly to today's broadcasting industry. The National Museum of Broadcasting in Pittsburgh has been working for fourteen years to save the garage, and intends to restore the garage as well as purchase and restore the original Conrad house and open them to the public. The National Museum of Broadcasting is attempting to raise \$320,000 to save the property. For more information, see their website at: <http://trfn.clpgh.org/nmb>

Johnson Space Center Oral History Project. Contingent on funding, NASA will be hiring interns this summer. Anyone with questions about the project itself or intern responsibilities may e-mail or phone for more information. Any questions about employment details will have to come directly from NASA. Students in the history of technology are encouraged to contact:

Kevin M. Rusnak, Historian, Johnson Space Center Oral History Project, SIGNAL Corporation, 1301 Regents Park Drive, Suite 100, Houston, TX 77058, +1 281 461 1537

"On the Ball"

In the 1891, before timekeeping standards had been set or electronic signaling systems had been invented, serious railroad collisions often resulted from trains not being clear of sections of track at the right time. The commissioner in charge of United States railroads asked Webb C. Ball of Cleveland, Ohio to set a standard for railroad watches. The Ball Watch Company never manufactured watches, but helped formulate the specifications of watches used for the Railroad Service, and was the general time keeper for more than 125,000 miles of track in the U.S., Mexico, and Canada.

Being "on the ball" thus became North American slang for being punctual. ♦

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Static from the Director:

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from the United Engineering Foundation to support us in obtaining oral histories of non-IEEE members who are prominent in the bioengineering field. Our Sloan Project is also entering its final stages.

What, you may ask, will we do to occupy our time now that several projects are winding down? As reported last issue, we approached the IEEE Foundation for a grant to begin to construct an IEEE Virtual Museum, based on the outcomes of our June 1999 international workshop. The Foundation has responded with a two-year, \$230,000 grant for this purpose. Therefore, the single largest initiative of the IEEE History Center in 2000 and 2001 will be to begin work on the IEEE Virtual Museum. You will be hearing a great deal about this exciting project in future issues of the Newsletter, and also keep your eyes on our Website for updates. ♦



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