IEEE History Center

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RUTGERS
THE STATE UNIVERSITY OF NEW JERSEY

STATIC FROM THE DIRECTOR

At its January 2007 Board Orientation, the IEEE Board of Directors identified nine long-term core values for IEEE. Three of these values are: Promoting public awareness and understanding of the engineering profession; a global focus; and collaboration and community building. At its June 2007 meeting, the Board further approved in concept six Outcome-Oriented Goals based on the Core Values. Two of these goals are: the public will increasingly value the role of IEEE and technical professions in enhancing the quality of life and the environment; and IEEE will operate as a model global association.

Promoting public awareness and understanding of the engineering profession (specifically in historical perspective) is arguably the core value of the IEEE History Committee and the IEEE History Center, along with a related obligation to help preserve that history so that future historians of technology will have an opportunity to continue to study and promote engineering history. The IEEE History Committee has asked IEEE History Center staff to prepare a plan to build an "IEEE Global History Network," which would incorporate the public awareness value into those of global focus and community building. Such a network would enable interested IEEE members and other appropriate persons to join the IEEE History Committee in its efforts to preserve, research and promote the history of engineering and technology by making known to others the results of their research, sharing best practices, learning of opportunities for resources and support, and publicizing their activities. The History Center could then leverage its limited resources by serving as the hub of this network

All of our current constituents—IEEE History Committee members and IEEE History Center staff; other IEEE staff whose functioning can be enhanced by participation; officers of the Trustees of the IEEE History Center; representatives of IEEE organizational units; individual IEEE members interested in history; representatives of other organizations interested in history of science and technology; individual professional historians of technology (including educators, museum staff); and others with an avocational interest in the history of technology—will be invited to participate in this enterprise.

In the previous issue of this newsletter, I mentioned the plans to redesign our web presence with wiki-based capability. This site will serve as the infrastructure of the network. Our successful international conference and our collaboration with ICOHTEC and with the IEEE Region 8 History Committee—reported in this issue—show other ways that we will be expanding our global cooperation. I look forward to keeping you posted on the global network and to inviting you to participate as the program takes shape and grows. As always, it is you, our supporters and subscribers to our newsletter, who make programs like this possible with your generosity. Let me take this opportunity to thank you for your support, and to wish you and yours a happy and healthy holiday season and new year.

ACTIVITIES

ICOHTEC HISTORY OF TECHNOLOGY CONFERENCE

The Center's Senior Research Historian Frederik Nebeker participated in the annual conference of ICOHTEC, the mainly European history-of-technology society. "Fashioning Technology: Design from Imagination to Practice" was the theme of this year's conference, held in Copenhagen, Denmark, from 14 to 19 August, and a great many of the presentations furthered the aim of bringing the study of technology history and the study of design history closer together.

ICOHTEC 2008

Nebeker presented a paper entitled "Industrial design and the emergence of the consumer-electronics industry". In the 1920s the first two important consumer-electronics products, the radio and the electronic phonograph, were introduced, and it was also in that decade that a profession of industrial design was established, as Norman Bel Geddes, Henry Dreyfuss, and Walter Dorwin Teague, among others, opened design studios. In the 1920s and 1930s the market for radios and phonographs grew, there were important technological changes, such as the invention of the electrodynamic loudspeaker, there were important new materials, notably plastics, and the radio became a favorite object of design for the new design professionals

History Activities in IEEE Region 8

IEEE volunteers in Region 8, which covers Europe, Middle East and Africa, support a History Activities Council (HAC), which has done much to promote the history of IEEE technologies. On 11 September 2007 Jacob Baal-Schem, HAC Chair, convened a meeting of the Council at the Technical University of Warsaw. The day before, also in Warsaw, there was a history session that was part of the Eurocon 2007 International Conference on "Computer as a Tool". At the session, organized by Jacob Baal-shem and Roland Saam, six papers were presented: Stefan

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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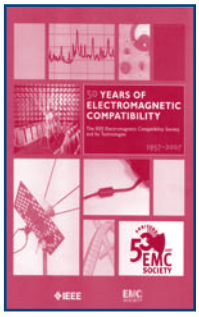
Hahn reviewed the history of applications of analytic signals; Peter C J Hill talked about some of Dennis Gabor's contributions to communication theory and signal processing; Jacob Baal-Schem described early work on electronics and computing in Israel; Alexander Mikerov talked about a transnational effort to promote the history of electrical engineering at universities; Marko Delimar described an early electric power system in Croatia, and Hans Schmitt and Roland Saam told how Paul Julius Reuter used carrier pigeons to link two telegraph networks.

At the HAC meeting, attended by representatives from the United Kingdom, Germany, Russia, Croatia, and Israel, Baal-Schem reported on, among other things, the Region 8 HAC Website (**www.ieee.org/r8** --> Membership activities --> History activities), which was established in the spring of 2007 by Thomas Watteyne. He also discussed plans for HISTELCON 2008, a history conference organized by HAC to be held in Paris 11-12 September 2008. Senior Research Historian Frederik Nebeker made three presentations: one on the IEEE History Center, one on how to carry out an oral-history program, and one on an example of research in local history. The HAC is interested in continuing its efforts to collect oral histories by having IEEE volunteers arrange for and conduct interviews. Alexander Mikerov proposed organizing a history session for EUROCON 2009. The first Call for Papers for HISTELCON 2008 is now available; see the IEEE Region 8 History Committee web page (**http://ewh.ieee.org/reg/8/cms/index.php?option=com_content&task=view&id=115&Itemid=104**)

History Center Staff Supports the Fiftieth Anniversary of the IEEE Electromagnetic Compatibility Society



Since the late 19th century, electric circuits and electrical devices have gradually spread throughout the workplace and the home, as well as in public places. In the last few decades, electronic devices have become ubiquitous in mobile phones, computers, cameras, automobiles, aircraft, and so on, and annual sales of integrated circuits number in the billions. Since all of these electrical and electronic circuits radiate some electromagnetic energy and all of them have some susceptibility to ambient electromagnetic waves, there has been an urgent need for engineers able to insure the compatibility of the myriad of devices. The IEEE Electromagnetic Compatibility Society (EMC-S), through all its activities in research, education, and standards, has worked to meet this need.

In 2007 the IEEE (EMC-S) is celebrating its fiftieth anniversary in 2007. Dan Hoolihan heads the EMC-S anniversary committee. The IEEE History Center has worked with the Society to research, document, and publicize the history of the Society and the history of its technical field. Ten oral history interviews, of pioneers in electromagnetic compatibility, have been conducted. Interviewees were Eugene Cory, Tomas Jiri Dvorak, Joseph Fischer, Milton Kant, Warren Kesselman, James P. McNaul, Ralph Showers, Chester Smith, Leonard Thomas, Sr., and Anthony Zimbalatti. Using these interviews, as well as published articles and unpublished materials, staff of the History Center wrote the text of an anniversary booklet, pictured above.

IEEE SEEKING NEW INITIATIVE PROPOSALS

The New Initiatives Committee (NIC) of the IEEE Board of Directors is seeking proposals for IEEE New Initiatives as part of its two new programs: Rolling Submissions and Seed Grants. The NIC encourages wide dissemination of the program guidelines across the enterprise, and the NIC looks forward to receiving promising proposals. The committee began meeting monthly, in August, to review proposals. There is money available for the immediate funding of proposals approved during the balance of the 2007 fiscal year. Details of the new programs and the forms associated with them can be found on the IEEE New Initiatives web page located at: **http://www.ieee.org/web/aboutus/initiatives/index.html**

About the new programs

Rolling Submissions: The Rolling Submissions process (RSP) accepts proposals at any point in time with a decision to fund being rendered, in most instances, within 90 days of submission. Minimum funding requirement for RSP initiatives is US $100,000 all of which should be expended during the first 12 months of the initiative. A brief project proposal form, which outlines the project, how it supports IEEE's strategic direction, estimated funding required and the project's goals and desired outcomes, is required. If this short proposal is supported by the NIC, the project leader will be asked to develop a full project plan for approval by the NIC.

Seed Grants: The Seed Grant process (SGP) is designed to encourage any individual or group in the IEEE to innovate and be creative in the development of new programs, services, or activities that have the potential to move IEEE towards achieving its strategic objectives. Seed grants proposals may request up to US $25,000. Decisions on Seed Grants are made by the NIC within 45 days, and funding is immediate. If approved, these projects must be completed within one year.

Submitting a Proposal: Completed proposals should be submitted by email to **newinitiatives@ieee.org**. Questions regarding any aspect of the New Initiatives program should be directed to Lew Terman (**l.terman@ieee.org**), John Keaton (**j.c.keaton@ieee.org**) or Matt Loeb (**m.loeb@ieee.org**).

2007-2008 GRADUATE ASSISTANTS

The IEEE History Center is very pleased to welcome back two of its graduate assistants (GAs) and welcome 3 new GAs from last year, Meagan Schenkelberg and Ji-Hye Shin.

Meagan Schenkelberg

Meagan Schenkelberg received her bachelors degrees in English and History at Mount Mercy College in Iowa, moving east to Villanova University for her masters in European history. Starting her second year as a history doctoral student at Rutgers, she is majoring in Early Modern Europe – with a focus on England – and minoring in Women's and Gender history. She is particularly interested in 17th-century England, and is currently working on a project about the introduction of actresses to the English public stage in the 1660s and its social and political implications. Meagan has presented conference papers on the use of politics in Aphra Behn's *The Rover,* but also on the American woman's suffrage movement by examining the alumnae newsletters of Bryn Mawr College.

Ji-Hye Shin

Ji-Hye Shin is a Ph.D. history student at Rutgers University. She was born in the Republic of Korea and attended Yonsei University in Seoul, Korea, as an undergraduate and graduate student. She received her MA in international studies with a concentration on American Studies. At Rutgers, she studies US immigration history. Her dissertation will examine the processes of racial and ethnic formation in the nineteenth and twentieth century United States with particular interests in immigrant communities.

Graduate Assistants who are new this year:

Bridget Gurtler

Christopher Hayes

Christopher Hayes is a third-year Ph.D. student majoring in U.S. history and minoring in African-American history. His areas of interest are late-twentieth century black radicalism, particularly the Black Liberation Army, as well as imprisoned black radicals and the freedom movements they formed while held captive.

Vanessa Holden

Vanessa Holden is currently a third year graduate student in the Rutgers History Department. Her interests are African American History, Women's History, and antebellum slave rebellion. She is looking forward to honing her web design skills while working on supplemental material for the faculty at the center.

Yvette Florio Lane

Yvette Florio Lane is a second year doctoral student in the Rutgers History Department. Yvette holds an MA in European History from Monmouth University, where she completed a master's thesis on the social and cultural impact of rayon in Germany during the Weimar Republic. For her dissertation, she will continue her research on synthetic textiles and their role in the changing identities of Germans over the course of the short twentieth century. Yvette's primary areas of research include material culture, gender and technology, and modern Germany. She is interested in the ways in which technologies become sites of contestation through changing political regimes.

CONFERENCE ON THE HISTORY OF POWER

The 2007 IEEE Conference on the History of Electric Power, the seventh international conference organized by the IEEE History Center since 1990, was held in August at the New Jersey Institute of Technology (NJIT) in Newark, New Jersey, U.S.A. The Department of Electrical and Computer Engineering of NJIT's Newark College of Engineering served as a technical co-sponsor, as did the IEEE Power Engineering Society and the IEEE North Jersey Section. Financial support was received from the FirstEnergy Foundation and PSE&G. More than 100 attendees heard thirty participants from ten countries present a wide range of papers on the history of electric power. Conference attendees also made a visit to the Thomas Edison house and estate at Glenmont, New Jersey, U.S.A. The conference proceedings are in preparation.

Bernard Carlson of University of Virginia

History Committee Chair Richard Gowen presenting to the Conference

Hal Wallace of the Smithsonian answers questions

Edison's Home at Glenmont

Thomas Edison's cars, including an electric car, at Glenmont

EMBS HISTORY COMMITTEE IN LYON

by Ron Leder

For the first time the IEEE Engineering in Medicine and Biology Society History Committee had an exhibit at the EMBC in Lyon France. The display included several biomedical instruments and apparatus from antiquity to the late 19th century. Featured was the work of veterinarian August Chauveau and physiologist Etienne Marey and their physiological instruments including a an original projecting kymograph. Also displayed was the first high speed camera for recording animal motion. There was an original polygraph, several pneumatic amplifiers, and a device for continuous recording of NREM REM sleep cycling based on blood redistribution and balance, using 18th century technology. In all there were at least 20 functional antique devices.

EMBS History Committee members Andre Dittmar, Ron Leder, and Max Valentinuzzi were present to explain the exhibit of antique biomedical instruments and artifacts to many interested EMBS members.

The exhibit was supported by other EMBS History Committee members and the IEEE History Center. In addition to the exhibit two historical tours were offered:

The home museums of Claude Bernanrd and André-Marie Ampère, and medical museums of Lyon.

The EMBS History Committee will begin to participate in history activities of Region 8 Europe where there is an IEEE history coordinator. Eurocon September 07 in Warsaw

continued on next page

Poland had a special session on the history of electrotechnology in Region 8. Histelcon is planned for September 08 in Paris and the EMBS history committee has been invited to participate.
Jesus Requena, is the newest and youngest member of the EMBS history committee; he is a Ph.D. student/researcher at Universidad Rey Juan Carlos (Fuenlabrada, Spain)

Peter Wiesner of IEEE special projects organized IEEE.tv video footage of conference highlights inlcuding the history exhibit so look for the history exhibit clip on IEEE.tv conference highlights in a few months.

The EMBS History committee is planning to have a continued presence in the society with a special session at the annual conference in cooperation with the IEEE History Center and other organizations interested in the history of science and medicine; 2009 is the 125th anniversary of IEEE and with the conference in Minneapolis an event is planned with the Baaken Museum.

Our vision and mission below:

Vision: Make BME history accessible to professionals and to the general public for the greater good af all. Preserving the legacy, helping to invent the future, service to the public.

Mission: Organize BME history resources, cooperation with the IEEE History Center and related external history of science and technology organizations, maintain a global history contact directory to create a self sustaining history program in EMBS

REMINISCENCES

THE INVENTION OF A SUPERCONDUCTING INTEGRATED CIRCUIT

by John Bremer

Should my grandson ask what I did when I first got out of college, I would say that "50 years ago this summer I invented the integrated circuit!" "Wow, grampy, that's cool. But why aren't you famous?" "It's because I used the wrong technology - superconductivity instead of semiconductivity." As we approach the fifty year mark of semiconductor integrated circuits, it may be of general interest to hear one engineer's story of another kind of integrated circuit.

It begins with me a year out of MIT in the summer of 1956; I was working with analog computers at GE's General Engineering Lab in Schenectady, New York, U.S.A. and looking for something new to do. A senior engineer showed me Dudley Buck's cryotron article; Buck had noted the change of a superconductor to a normal conductor with the application of a magnetic field, and invented a switching device called the cryotron to use this effect. This greatly interested me. I knew that GE's Research Lab could liquefy helium, needed for the very low temperatures at which cryotrons operated.

So began three years of great fun, sometimes as a bootleg project and occasionally with some funding. In October 1956, I first duplicated Buck's wirewound devices: flip-flops and memories. During 1957, I changed the materials to the much more tractable tin and lead. The next improvement was to make the gate a cylindrical thin film to get more resistance and therefore more speed. As people joined and left the project, experimental progress was slow, plagued with contact resistance and insulation breakdown.

It was clear that digital computers would need great quantities of switching and memory devices. Using germanium transistors seemed difficult. They had to be made and tested one at a time, with great numbers of rejects. They then had to have their little wires stuck into a circuit board and soldered up. The circuit boards had to connect with other circuit boards and connect to memories also made of little individual devices.

I think many saw that some devices would have to be invented so that the interconnections could be made at the same time as the devices. The back rooms of AIEE-IRE conferences were full of ideas. Tunnel diodes, magnetic amplifiers, pneumatics, and other semiconductors beside germanium were considered. So cryotrons didn't seem so bizarre, despite the need for really low temperatures. Cryotrons offered significant possibilities. They were made of amorphous metals, easily deposited (no need for crystalline structures or diffusions). The same metals could be used for interconnections. Switching characteristics seemed consistent, the devices had gain, they had independent terminal pairs (like relays). Could they be made essentially two-dimensional, so both the switching and memory devices could be made together with all the interconnections?

I knew that the gate could be a flat strip just as well as a cylinder, and it became clear that the control "coil" could also be flat, lying on top of the gate. On 27 July 1957, I ordered some flat controls from GE's printing company, made with ordinary photolithography.

So there was my invention in the summer of 1957: a computer device suitable for either logic or memory, where the interconnections could be made with the same materials and the same fabricating processes as the devices themselves, on some sort of flat substrate. In fact, an integrated circuit! I published some papers about this. I got the controls in September, but it wasn't until December of 1958 that devices with a gain greater than one were made. Of course, it is possible somebody else was there before my invention (or extension of Buck's invention if you will). Researchers at IBM and Arthur D. Little were working on superconducting devices for logic and memory including cryotrons, and so maybe were others. We assembled a team to build a demonstration computer.

The demonstration computer was put together towards the end of 1962, but very little worked. It had five arrays, the AU plus memories and more control circuits. Another one in April of 1963 worked better (I have it in my study), and a third in July was perfect. Was this the first integrated circuit computer?

An intriguing feature of cryotrons is that if you push current into one of two (or more) parallel paths, it will stay there - superconductivity really does mean zero resistance. Thus memory is inherent in any circuit; all of us in the field felt we should take advantage of this. In Sunnyvale we designed content-addressed memories and got some working in 1963. A 17-word by 36-bit array had some 2000 devices!

As a side story for those who think personal computing is new, we had personal terminals in our offices (and placed in a few homes). In 1962 I could send and receive mail messages with colleagues in Phoenix, launch scientific calculations and get the results almost instantly, do simple word processing, and wrote a little AI program for fine-tuning expense reports.

Realizing that Fairchild or others would eventually get Jean Hoerni's planar silicon transistor – which, unlike cryotons, worked at room temperature -- to work in large arrays, I could see the end of cryotrons. I left Sunnyvale in 1965 to pursue other interests, logic and systems design for GE in Phoenix. Yet as I said in a retrospective some years later, if cryotrons worked at room temperature they'd be found all over by now!

Although "my" technology didn't win and I'm not famous, it's gratifying to realize that the basic scheme I worked out with my colleagues is still used, fifty years later, by the semiconductor integrated circuit industry. The numbers are hugely different, but it is still the vapor and chemical deposition of a few layers on a flat substrate, each patterned by photolithography to make an array of functioning devices at the same time as their interconnections. Connections off the array are made at the edges. Protective layers keep out contaminants. I'm not implying that others borrowed our work but rather that the design choices we made were also obvious to them.

This is a personal history. I have not mentioned the names of my many co-workers, to whom I apologize and owe thanks. It would be interesting to me to hear the stories of

EE IN THE MOVIES

THE TELEGRAPH

Telegraph Operating room, Chicago, 1901, courtesy Smithsonian Institution

In the 1830s and 1840s inventors in quite a few countries developed electrical-telegraph systems, among them Karl Friedrich Gauss and Wilhelm Weber in Germany, William F. Cooke and Charles Wheatstone in England, and Samuel F.B. Morse in the United States. By 1850 many countries had functioning systems, and the early invention of automatic repeaters, or telegraph relays, permitted almost instantaneous communication over great distances. The social consequences of the new technology were profound and manifold, so it is not surprising that countless movies involve the telegraph.

The 1939 movie "Gunga Din" shows some early telegraph apparatus in colonial India. In the 1952 movie "High Noon" we see a telegraph relay in operation in the Old West, and in the 1992 Merchant-Ivory movie "Howards End" we see a recording telegraph and an alphabetic-dial telegraph in turn-of-the-century England.

The telegraph changed the way armies operated. Indeed, it was the telegraph that made it possible to control a military force dispersed over a large area. In the U.S. Civil War the North constructed some 15,000 miles of telegraph line, and President Lincoln relied on the telegraph for communicating with his generals. The 1927 Buster Keaton movie "The General" and the

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1930 movie "Abraham Lincoln" show the use of the telegraph in the Civil War. We see the telegraph used in World War I in "Lawrence of Arabia" (1962), "Gallipoli" (1981), and other movies.

The telegraph changed diplomacy, allowing, as it did, national leaders to communicate in real time between capital cities. In some cases misunderstandings were avoided, but in some cases, because telegraphic communications led to rapid, and sometimes unconsidered, decision-making, it may have contributed to the outbreak of war. The historian Stephen Kern has argued that the latter happened in July and August of 1914, and we see some of the fevered exchange of telegrams of those months in the movie "Nicholas and Alexandra" (1971).

Also for civil order within a country, the telegraph played a large role. In "Gangs of New York" (2002) we see police use of the telegraph during draft riots in New York City in 1863 and rioters cutting telegraph lines. In "Western Union" (1941) outlaws try to prevent the company from connecting Omaha and Salt Lake City. Other Westerns, such as "Stagecoach" (1939), "Santa Fe Trail" (1940), and "Fort Apache" (1948), show telegraph lines being cut.

In many countries, including the United States, there was a symbiosis of the railroad and the telegraph. Telegraph companies signed contracts with railroads, which agreed to help construct the lines and to maintain them. In return the railroads received free service on their telegraph lines. "Fiddler on the Roof" (1971) shows a telegraph line along a railroad in Russia. Also, telegraph offices were often located in railroad stations, as we can see in many movies, such as "High Noon" (1952) and "The Story of Vernon and Irene Castle" (1939).

As always, we would be grateful for reports from readers of other interesting movie scenes that involve electric power. You may contact us at **ieee-history@ieee.org**

PROGRAMS OF SUPPORT FROM THE IEEE HISTORY CENTER

The IEEE History Center offers two programs of support annually for scholars pursuing the history of electrical engineering and computing: An internship for an advanced undergraduate, graduate student, or recent Ph.D., and a dissertation fellowship for an advanced graduate student or recent Ph.D. The internship and the dissertation fellowship are funded by the IEEE Life Members Committee. The internship requires residence at the IEEE History Center, on the Rutgers University Campus in New Brunswick, New Jersey, U.S.A; there is no residency requirement for the dissertation fellowship.

IEEE FELLOWSHIP IN ELECTRICAL HISTORY

The IEEE Fellowship in Electrical History supports 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 up to one year of post-doctoral research for a scholar in this field who has received his or her Ph.D. within the past three years. This award is supported by the IEEE Life Members Committee. The stipend is $17,000, with a research budget of up to $3,000.

Candidates with undergraduate degrees in engineering, the sciences, or the humanities are eligible for the fellowship. For pre-doctoral applicants, however, the award is conditional upon acceptance of the candidate into an appropriate graduate program in history at a school of recognized standing. In addition, pre-doctoral recipients may not hold or subsequently receive other fellowships, but they may earn up to $5,000 for work that is directly related to their graduate studies. Pre-doctoral fellows must pursue full-time graduate work and evidence of satisfactory academic performance is required. These restrictions do not apply to post-doctoral applicants.

The Fellow is selected on the basis of the candidate's potential for pursuing research in, and contributing to, electrical history. Application forms are available on-line at **http://www.ieee.org/web/aboutus/history_center/about/fellowship.html**. The deadline for completed applications is 15 February 2008. This completed application packet should be sent to the Chairman, IEEE Fellowship in Electrical History Committee, IEEE History Center, Rutgers, The State University of New Jersey, 39 Union Street, New Brunswick, NJ 08901-8538. Applicants will be notified of the results by 1 June 2008.

The IEEE Fellowship in Electrical Engineering History is administered by the IEEE History Committee and supported by the IEEE Life Members Committee.

IEEE HISTORY CENTER INTERNSHIP

Scholars at the beginning of their career studying the history of electrical technology and computing are invited to contact the Center to be considered for a paid Internship at the Center's offices on the Rutgers University campus in New Brunswick, New Jersey.

The intern program seeks to provide research experience for graduate students in the history of electrical and computer technologies, while enlisting the help of promising young scholars for the Center's projects. The Intern generally works full-time for two months at the History Center on a

Center project that is connected to his or her own area of interest. This time is usually during the summer, but other arrangements will be considered. Interns are also encouraged to consult with the Center's staff and its associates, and guided to research resources in the area. The internship is designed for those near the beginning or middle of their graduate careers, but advanced undergraduates, advanced graduates, and, on rare occasions, recent Ph.D.s will also be considered. Special consideration is often given to scholars from outside the United States who might not otherwise have an opportunity to visit historical resources in this country.

The stipend paid to the intern is US$3,500, but additional funds may be available to defray travel costs, depending on the intern's circumstances. This internship is supported by the IEEE Life Members Committee.

There is no formal application form. To apply, please mail a curriculum vitae showing your studies in electrical history along with a cover letter describing the sort of project you would be interested in doing (see contact information below). The deadline for contacting the IEEE History Center is 1 March 2008.

IEEE and Rutgers are AA/EO employers. Women and minorities are encouraged to apply for all positions. The IEEE History Center is cosponsored by the Institute of Electrical and Electronics Engineers, Inc. (IEEE)—the world's largest professional technical society—, and Rutgers—the State University of New Jersey. The mission of the Center is to preserve, research, and promote the legacy of electrical engineering and computing. The Center can be contacted at: IEEE History Center, Rutgers University, 39 Union Street, New Brunswick, NJ 08901-8538, **ieee-history@ieee.org, http://www.ieee.org/web/aboutus/history_center/index.html**

RESEARCH ASSISTANCE FROM THE BAKKEN

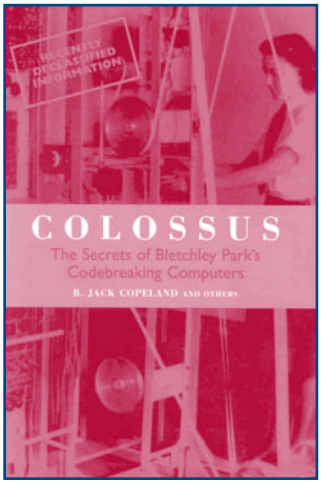
The Bakken Library and Museum in Minneapolis offers two kinds of assistance for the purpose of facilitating research in its collection of books, journals, manuscripts, prints, and instruments: Visiting Research Fellowships and Research Travel Grants.Visiting Research Fellowships up to a maximum of $1,500 are to be used to help to defray the expenses of travel, subsistence, and other direct costs of conducting research at The Bakken. The minimum period of residence is two weeks. Preference is given to researchers who are interested in collaborating for a day or two during their research visit with The Bakken on exhibits or other programs. The next deadline is February 15, 2008 for fellowships to be used in 2008. Research Travel Grants up to a maximum of $500 (domestic) and $750 (foreign) are to be used to help to defray the expenses of travel, subsistence, and other direct costs of conducting research at The Bakken. The minimum period of residence is one week. Application may be made at any time during the calendar year. For more details and application guidelines, please contact: Elizabeth Ihrig, Librarian, The Bakken Library and Museum, 3537 Zenith Avenue So., Minneapolis, MN., 55416, tel 612-926-3878 ext. 227, fax (612) 927-7265, e-mail **Ihrig@thebakken.org www.thebakken.org**

BIBLIOGRAPHY

COPELAND, JACK and others, *Colossus: The Secrets of Bletchley Park's Codebreaking Computers*, Oxford University Press, 2006

For decades after World War II, the achievements of the British and Polish codebreakers at Bletchley Park were kept secret. Winston Churchill's command that no part of Colossus larger than a man's fist remain may have preserved British secrecy, but it certainly hampered the British computer industry. (Nor was the order completely obeyed; two of the eleven Colossus machines survived and were used by the Government Code and Cipher School until 1959 or 1960.) Colossus was the world's first large-scale electronic digital computer. However, because of the secrecy, the American ENIAC for many years was mistakenly given that accolade.

Not until the 1970s, with the publication of several books, did the history of Bletchley begin to be told. In 1983, Thomas Flowers, Colossus' designer, had received clearance from the British government to publish an account of the hardware, but had still been forbidden to disclose any of the functions which Colossus had performed. Many people were initially confused by the differences between the Enigma and Tunny cipher machines and erroneously believed that Colossus had been used against Enigma.



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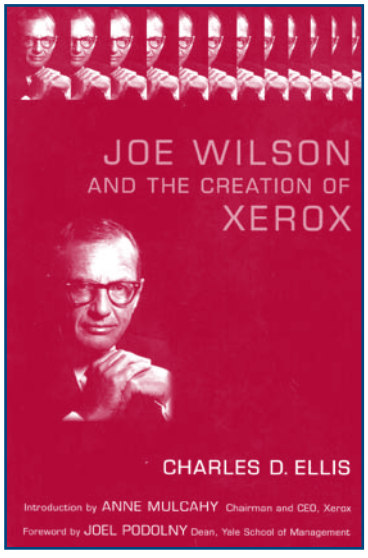
Finally in 2000, the British government declassified the 500-page General Report on Tunny, parts of which are published for the first time in Copeland's book.

Colossus is the book that any reader interested in cryptology and/or Britsh codebreaking has been eagerly waiting for. It combines detailed descriptions of the hardware by engineers such as Flowers, Bolam, Fensom et al, of the mathematics of codebreaking by Good, Michie, Newman, and Tutte, and of the operation of the machines by Caughey, Currie, and Du Boisson. These first person accounts by people whose names are breathed with awe in the cryptological world, are rivetting and full of important details, for which the historian is indebted to Copeland for preserving in this volume. The account by William Tutte of how he deduced the structure of the German Tunny encryption machine, and how he used "rectangling" to solve the daily wheel settings, is just one of the many accounts which take the reader into the heart of the daily work of codebreaking. The flavor of daily and personal life at Bletchley Park is also captured, emphasizing the unhierarchical structure and the intellectual stimulation which contributed so much to the success of "Station X."

For readers who want to go even deeper in the world of frequency counts, wheel settings, depths, psi wheels and chi wheels, and cribs, there are excellent technical appendices to explore.

Available from Oxford University Press, **www.oup.com**, $36.00, hardcover, ISBN 0-19-284055-X, xvi + 462 pages, 58 illus., index, appendices.

ELLIS, CHARLES D., *Joe Wilson and the Creation of Xerox*, Wiley, 2006



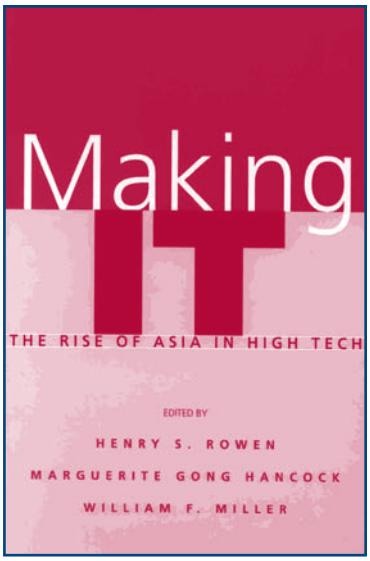
The history of technology is often written as business or corporate history, and – given that the field of history of technology is small and not well-funded – we may have to be content with that in order to capture much that would otherwise be lost. A corporate history covering important technologies, especially when written by an author who understands the technologies themselves, is better than no history at all.

Ellis shows that he has researched the technology of xerography itself, and understands how the particular details of bringing the 914 copier, with its 1200 parts, from design to production worked, and the way small details (a new type of paint, isolating a cooling fan's vibration) could be the difference between success and failure. One of the interesting details he tells us is the search for the right material to clean the selenium drum (a particular kind of rabbit's fur, later replicated syntheticly because there weren't enough of that type of rabbit to provide it).

The writing style often waxes hagiographic and overly-enthusiastic, with adjectives repeated for emphasis ("He looked forward – far, far forward", "...committed to his vision...", "...enjoyed so very many successes.") and there is no lack of of corpobuzzspeak to remind us that this is -- after all -- business history ("..on message...", "...reaching out to...").

Available from Wiley, Hoboken, NJ 07030 USA **www.wiley.com**, $27.95; hardcover. ISBN 0-471-99835-8, 396 pages, 9 B&W photos, index.

ROWEN, HENRY S., HANCOCK, MARGUERITE GONG, and MILLER, WILLIAM F. (editors), Making IT: *The Rise of Asia in High Tech*, Stanford University Press, 2007



It is a given that the world economy has become much larger and much more interconnected in the past 35 years, that technological innovation is a key factor in that growth and interconnectivity, and that Asia has come to challenge America as the driving force in that economy and particularly in technology. How did this come about?

The Stanford Project on Regions of Innovation and Entrepreneurship at Stanford University (SPRIE) has been studying this subject for almost twenty years. This volume brings together a number of experts from the U.S. and Asia from business/management academia, government, and private think-tanks. It focuses on "Information Technology," which the editors define to include computer hardware, computer software (products and services), and communications technologies. These technologies arguably underlie the full range of high-tech industry, including biotechnology, space technology, and consumer technology. Geographically, the work centers on several regions in Japan, Seoul, two regions

in China (Beijing, Hsinchu), Singapore, and Bangalore, arguing that these are the most successful high-tech regions in Asia. The time covered is generally the past thirdy years, although the editors gave the individual authors some leeway in defining time, space and industry to fit local conditions.

After a comprehensive introduction by senior editor Henry S. Rowen, the various contributors do an outstanding job of framing the developments in their particular regions, each article carefully researched and well documented. There are then three summary chapters trying to find common themes—in the role of government, in the role of venture capital, and in the role of universities and technology transfer—in the various regions, and tying them back to Silicon Valley. Finally, there are concluding remarks by the three editors. In them, they try to sum up the similarities that led to the rise of "Asia" in high-tech as an entity, and also the differences that have placed the various regions in various positions, and which will help to determine which regions/nations dominate the next thirty-five years. We will not "spoil" their conclusions, as readers of our newsletter are recommended to read this book for themselves.

Available from Stanford University Press, 1450 Page Mill Road, Palo Alto, CA 94304-1124, Phone: (650) 723-9434, Fax: (650) 725-3457, **info@www.sup.org, www.sup.org**, ISBN 978-0804753852, $65.00 (cloth), ISBN 978-0804753869, $30.00 (paper). xviii + 388 pages.

SPECIAL WAY TO SUPPORT THE IEEE HISTORY CENTER

By: Karen Galuchie, IEEE Development Office

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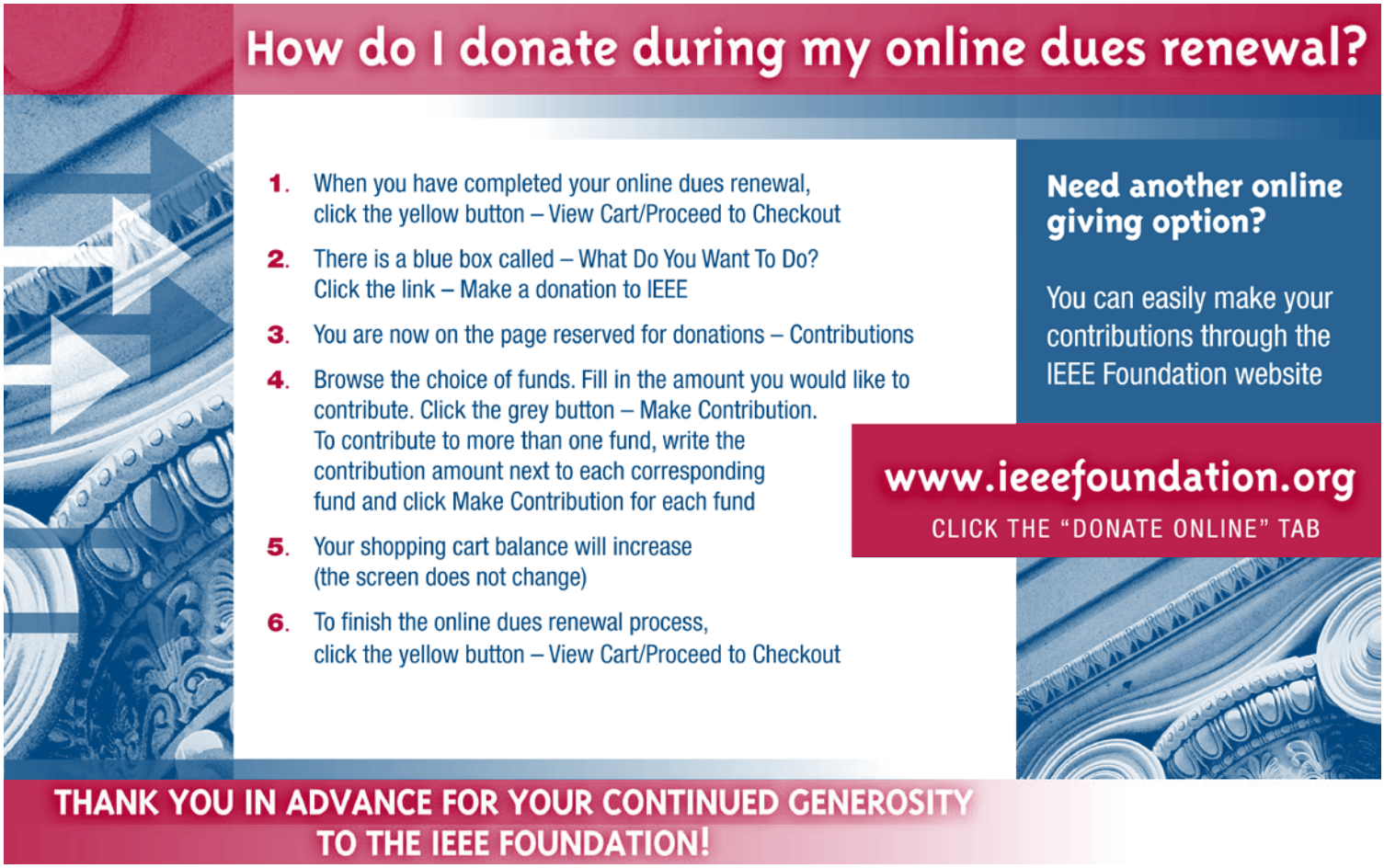

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