

IEEE History Center

ISSUE 78, July 2008

Static from the Director.....1

Center Activities.....2

Staff Notes.....4

Things to See And Do.....5

Relic Hunting.....6

EE in the Movies7

Reminiscences7

Bibliography9

Miscellaneous11

STATIC FROM THE DIRECTOR

As promised last issue, 2008 continues to be a banner year in the development of IEEE's historical activities. The contract between IEEE and Rutgers, the State University of New Jersey, that operates the IEEE History Center on Rutgers' New Brunswick campus, has been renewed for another five years. Our new web initiative, the IEEE Global History Network, is on target to be rolled out at IEEE Sections Congress 2008 (see page 3). Planning for our 2009 conference is also moving ahead. It will be tied into IEEE's 125th anniversary and will be the largest such conference that the Center has sponsored (see page 2).

The Milestones program also continues its record pace under the able direction of IEEE History Center staff Milestone Administrator Robert Colburn and IEEE History Committee volunteer Milestone Coordinator Carl Sulzberger. In fact, I have just returned from a trip to Japan generously hosted by the IEEE Japan Council History Committee, and ably arranged by long-time IEEE history volunteers Eiichi Ohno

and Eiju Matsumoto. The Japan Council has been perhaps the IEEE organizational unit most active in the Milestones program. My visit included tours of sites of already dedicated Milestones, Milestone nominations, Milestone proposals, and even sites of achievements that have not yet been proposed but which are being considered for proposal. The conclusion of my visit was a presentation on Milestones hosted by the IEEE Tokyo Section. It is our hope that once the IEEE Global History Network is operating, work by the IEEE Japan Council on Milestones—as well as various historical activities by other organizational units—will become more available to other IEEE members and units, exciting greater interest and promoting best practices.



Newspaper coverage of IEEE History Center Director Geselowitz in Japan

Finally, to assist in all of these activities we have welcomed still another new staff member (see page 4). But, as always, we the staff want to thank you, our dedicated volunteer supporters for your assistance, which really makes the work of all of us possible. We look forward to continuing to work with and for you to preserve, research and promote the proud legacy of IEEE and its technological fields.



IEEE History Center Director Michael Geselowitz at Kurobe Power Plant

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

Mailing address:
Rutgers University
39 Union Street
New Brunswick, NJ 08901-8538 USA
Telephone: +1 732 932 1066
Fax: +1 732 932 1193
Email: ieec-history@ieee.org
URL: www.ieee.org/history_center

IEEE History Committee 2008

Richard Gowen, Chair
Jacob Baal-Schem
Gustavo A. Bernal G.
Jonathan Coopersmith
Lori Ellen Hogan
Joseph A. Kalasky
Moshe Kam
Alexander B. Magoun
Eiichi Ohno
Emerson W. Pugh
Wallace S. Read
Magdalena Salazar-Palma
Carl L. Sulzberger
Phillip D. Summers
Harold Wallace

IEEE History Committee Staff

Michael Geselowitz, Staff Director
m.geselowitz@ieee.org
Frederik Nebeker, Senior Research Historian
f.nebeker@ieee.org
Sheldon Hochheiser, Archivist
s.hochheiser@ieee.org
John Vardalas, Outreach Historian
j.vardalas@ieee.org
Robert Colburn, Research Coordinator
r.colburn@ieee.org

THE 2009 IEEE CONFERENCE ON THE HISTORY OF TECHNICAL SOCIETIES

5–7 August 2009, Philadelphia, USA

In 2009 the IEEE History Committee and the IEEE History Center will hold the eighth in a series of historical conferences. The 2009 IEEE Conference on the History of Technical Societies will take place in Philadelphia from Wednesday 5 August through Friday 7 August 2009. The theme of the conference will be the history of professional technical associations, a theme chosen because 2009 will be the 125th anniversary of the IEEE. The location is appropriate because the IEEE, then the American Institute of Electrical Engineers, was founded in Philadelphia.

We will invite papers on the history of the engineering profession, particularly on the role of professional societies in engineering, and emphasis will be on the technical fields served by the IEEE. The historical papers will be presented in focused sessions over the

two-and-a-half days in two tracks, though there will be one or more plenary sessions. The papers written for the conference will be a valuable contribution to researching the history of engineering organizations, a topic that deserves more attention than it has received. In connection with the conference there will be an IEEE anniversary celebration at the Franklin Institute on Thursday 6 August from 6:00 pm until 11:00 pm.

Dr. Andrew L. Russell Awarded 2008-2009 IEEE Life Members' Fellowship in Electrical History

The IEEE History Center is pleased to announce that Andrew L. Russell, a historian of American technology and business has been awarded the 2008-2009 IEEE Life Members' Fellowship in Electrical History. In August 2008 he will begin teaching in the College of Arts and Letters at the Stevens Institute of Technology in Hoboken, New Jersey U.S.A.. He earned his MA in History from the University of Colorado and his Ph.D. from Johns Hopkins University. His dissertation, "Industrial Legislatures": Consensus Standardization in the Second

NEWSLETTER SUBMISSION BOX

The IEEE History Center Newsletter welcomes submissions of Letters to the Editor, as well as articles for its "Reminiscences" and "Relic Hunting" departments. "Reminiscences" are accounts of history of a technology from the point of view of someone who worked in the technical area or was closely connected to someone who was. They may be narrated either in the first person or third person. "Relic Hunting" are accounts of finding or tracking down tangible pieces of electrical history in interesting or unsuspected places (in situ and still operating is of particular interest). Length: 500-1200 words. Submit to ieec-history@ieee.org. Articles and letters to the editor may be edited for style or length.

THE IEEE HISTORY CENTER NEWSLETTER ADVERTISING RATES

The newsletter of the IEEE History Center is published three times per annum with a circulation of 4,800 of whom approximately 3,700 reside in the United States. The newsletter reaches engineers, retired engineers, researchers, archivists, and curators interested specifically in the history of electrical, electronics, and computing engineering, and the history of related technologies.

Cost Per Issue

Quarter Page	\$150
Half Page	\$200
Full Page	\$250

Please submit camera-ready copy via mail or email attachment to

ieec-history@ieee.org. Deadlines for receipt of ad copy are 2 February, 2 June, 2 October. For more information, contact Robert Colburn at r.colburn@ieee.org.

and Third Industrial Revolutions” was directed by Professor Stuart W. Leslie in the Department of the History of Science and Technology.



Dr. Russell has published articles in the *IEEE Annals of the History of Computing* (2006), *Standards Engineering: The Journal of the Standards Engineering Society* (2006), and *The Journal of the Communications Network* (2006). He has also published book chapters in Sherrie Bolin, ed., *The*

Standards Edge: Future Generations (2005) and *International Standardization as a Strategic Tool* (2006). Additionally, he has written articles for forthcoming issues of *Enterprises et Histoire and History of Technology*.

He is the recipient of numerous fellowships and awards, including the Charles Babbage Institute’s Adelle and Erwin Tomash Fellowship in the History of Information Processing as well as several grants from the Business History Conference and the Society for the History of Technology. In 2006 his paper “Industrial Legislatures: The American System of Standardization” won first prize in the World Standards Day Paper Competition, which was administered by the Standards Engineering Society and co-sponsored by the American National Standards Institute (ANSI) and the National Institute for Standards and Technology (NIST).

During the coming year he will be working to revise his doctoral dissertation into a book, tentatively titled *Toward an Open World: Hierarchies, Networks, and Global Communications*. The book traces the history of communication networks from the vantage point of standardization. In doing so it sheds new light on the transition from the hierarchical and proprietary closed world of the twentieth century to the networked and open world of the twenty-first century.

THE IEEE GLOBAL HISTORY NETWORK

Under the guidance of the IEEE History Committee, IEEE History Center staff are developing the IEEE Global History Network (GHN). The GHN will provide the premier global network of the history of IEEE-related technologies, professions, and industries, and will support the mission of IEEE’s historical activities to enhance the preservation, research, and dissemination of information about the history of electrical and informational sciences and technologies.

The GHN will integrate existing IEEE history resources with the capabilities of the web for collaboration. A wiki-based environment will enable individuals to share their experiences in “fostering technological innovation and excellence for the benefit of humanity.” There will be four major capabilities for IEEE Members to participate in the GHN:

- Share their experiences as an individual;
- Share their experiences as a member of a group in a corporation or organization (including IEEE organizational units)
- Share information about a particular technological innovation, products or service;
- Share comments on the GHN entries provided by others.
- Store and share other historical resources, e.g. archival material from IEEE’s OUs, and corporate R&D labs and design units, etc.

The wiki function will enable members to find value and enjoyment in participating, while the resulting content will increase the public’s awareness and understanding of the role of engineering and technology, and of IEEE, in the improvement of the quality of life for peoples throughout the world.

The prototype for the GHN will be complete in summer 2008, and beta-testing will start in Mid August. The site will be rolled out to the broader IEEE membership at IEEE Sections Congress 2008 in Quebec City, Canada, in September.

STAFF NOTES

SHELDON HOCHHEISER IS NEW IEEE HISTORY CENTER ARCHIVIST

The IEEE History Center is pleased to announce the appointment of Dr. Sheldon Hochheiser to the position of Archivist at the Center. Sheldon spent sixteen years as corporate historian for AT&T, acting as both subject matter expert on AT&T history and manager of the corporate archives. While at AT&T, he curated historical exhibits, completed oral histories with company executives, and explained AT&T history on television and radio. After leaving AT&T in 2004, he worked as a consulting historian, serving corporate and nonprofit clients in areas including oral history, archives, exhibit curation, and subject expertise.

Earlier, as corporate historian for the Rohm and Haas company, he wrote and published *Rohm and Haas: History of A Chemical Company* (University of Pennsylvania Press, 1986.). While serving as project historian at the Charles Babbage Institute, he co-authored *The High Technology Company: An Historical and Archival Research Guide*, (Charles Babbage Institute, 1989) which for many years was the Society of American Archivists' recommended book on its subject. He also served on the faculties of the University of Minnesota and Rensselaer Polytechnic Institute. Sheldon earned his Ph.D. in the History of Science at the University of Wisconsin—Madison, and his B.A. in history-chemistry at Reed College. His research interests include the history of telecommunications, the practice of science and technology in corporate America, and the problem of innovation in a monopoly.



At the History Center, Sheldon will assume responsibility for all of the archival aspects of the Center's programs, including oral histories, photoarchival material, and material relating to the institutional history of IEEE and its predecessor organizations. He will also participate in the ongoing efforts to transfer the Center's historical material to the new IEEE Global History Network currently under development.

THINGS TO SEE AND DO

**150TH ANNIVERSARY CELEBRATION:
THE 1858 TRANSATLANTIC TELEGRAPH CABLE**

The Institution of Engineering and Technology is offering a one day seminar on the history of transatlantic telecommunications. Organized by the History of Technology TPN jointly with the Manchester Local Network, it will be held on Tuesday 28 October 2008 at the Museum of Science and Industry, Manchester, England. The one-day seminar will mark the 150th anniversary of the first transatlantic telegraph cable in 1858, and will explore the history of transatlantic telecommunications. Among the topics expected to be addressed are:

The telegraph network in the United Kingdom, Ireland, Europe and the U.S.A. at the time of the first transatlantic cable, early HF radio between UK/Europe and the USA
4 and the supporting technology, the first telephone cable

TAT 1 and the supporting technology, the first satellite link TELSTAR and the supporting technology, and the first geostationary satellites and the growth of this method of transatlantic communication. The seminar will be followed by an evening lecture by Professor Nigel Linge on the 1858 cable and its significance to the development of global telecommunications. A full program and information on registering to attend this event will be published at a later date, but those wishing to register early can contact Anne Locker, IET Archivist, IET, Savoy Place, London, WC2R 0BL, alocker@theiet.org, Tel: 020 7344 8407. For more information on the IET History of Technology TPN, please visit <http://www.theiet.org/history>

**HISTOIRE? – Tout va tres bien!
Preparations for HISTELCON are going well**

By Jacob Baal-Schem
Region 8 History activities coordinator

HISTELCON 2008 – the IEEE Region 8 History of Electrotechnology Conference – will be held at the Cercle National des Armees in Paris, France, on 11-12 September 2008. The theme is “From Semaphore to cellular radio telecommunications”.

In total, fifty-six abstracts for presentations, from more than twenty countries have been received by the Technical Program Committee, chaired by Prof. Pierre-Eric Mounier-Kuhn of Sorbonne University and reviewed by the members of this Committee. This signifies that the announcement of the conference has interested many IEEE members, mainly in Region 8

but also in other countries, like Japan. Out of these, thirty-nine papers were accepted, thirty-one for oral presentation and eight as poster presentations. In addition to the lectures, a visit to the Branly Museum is planned, as well as a gala dinner aboard a boat on the Seine River.

The Conference is co-sponsored by the IEEE History Center and by the French National Society of Electrical and Electronics Engineers – SEE – and is financially supported by a grant from IEEE Foundation, in addition to the Region 8 support. The Conference Committee is co-chaired by Prof. Jean-Claude Boudenot of Thales Group and ISEP (Institut Supérieur d’Electronique Paris) and by Jacob Baal-Schem. The conference web site is: www.isep.fr/histelcon and the Secretariat address is: histelcon@ieee.org.

HISTELCON 2008 is the second history event in Region 8. It follows the History session at EUROCON 2007 in Warsaw, Poland and will be followed in turn by a History Session at EUROCON 2009 in St. Petersburg, Russia.

ADAPTIVE REUSE OF OLD POWER GENERATING PLANTS

The short article in the March 2008 issue of the History Center Newsletter, “New Use for Old Power Plants” on the former Pratt Street Power Station in Baltimore, Maryland, U.S.A. drew such enthusiastic reader responses that we would like to share them.

George Jacobi wrote to let us know of several interesting reuses. In Milwaukee, the Wisconsin Electric Power Company (now Wisconsin Energies) donated its retired East Wells Street Power Plant to the Milwaukee Repertory Company. After extensive interior renovations, the building opened for stage productions in 1987 as the appropriately-named Powerhouse Theater. The theater at 108 E Wells Street is part of a performance complex which includes the 19th century Pabst Theater and newer spaces for smaller performances. The Complex houses three theaters, the Quadracci Powerhouse Theater, considered the main stage, the Stiemke Theater, and the Stackner Cabaret, where concerts and musicals are performed.

A converted power plant in Chicago is the work space for a famous American sculptor, Richard Hunt. He works in metal and produces some very heavy sculpture, thus the overhead crane is very much in use. Hunt has built a foundry into the space as well, as well as some offices and workshops.

“When I landed in New York in early 1940, I stayed in the 22nd Street neighborhood above a fish restaurant.” Jacobi recalls. “The place had only DC, and it was not easy to find a fan and a radio for 110 volts DC. Later I visited the old Edison station which serviced the area. I remember the black switchboards with the heavy knife switches, and the entire 19th century hell’s kitchen atmosphere.”

Hans Schroeder also recalls the Milwaukee Electric Railway and Light Company power plant. “When I first came to Milwaukee (1948), the power station was still in operation, supplying 110vdc to a good part of downtown, including where I



Bankside Power Station now Tate Modern, London, (photograph by Michael Reeve, source: <http://en.wikipedia.org>)

lived, at the YMCA, then on 4th Street, across the street from the Boston Store.. The main office and facilities had ac, but they kept the residents’ rooms on the dc supply to prevent use of too many appliances by the residents. I used one of the 5-tube ac-dc radios there.”

Lanny Smith wrote to tell us that East Wells is notable for experimenting with grinding and injecting coal, and is considered the birthplace of pulverized coal technology.

Katherine Krick wrote to us about a restaurant in Iowa City, Iowa, U.S.A. known as Iowa River Power Company. This restaurant is in the building which formerly housed the gas and electric companies of Iowa City. The building was built on the site of a former flour mill in 1902 on the banks of the Iowa River.

Information about the power company is in the restaurant. The restaurant that now occupies the site has maintained most of the original architecture although the inner workings have been removed.

The former municipal power plant building of Fayetteville, Arkansas, U.S.A. is now "The Power House" restaurant.

The old Bankside Power Station on the south side of the Thames in London opened as the new home of the Tate Modern art museum in 2000 <http://www.tate.org.uk/modern/>. Designed by Sir Giles Gilbert Scott, who had designed the famous Battersea Power Station, Bankside began generating power in 1952. Although Battersea is the more visually famous of the two sibling power stations, having appeared in many movies ("Sabotage," "Help!" "Battle of Britain," "1984" "Richard III" et al), as well as in music videos, and on album covers, Bankside too has appeared in films, notably as the Tower of London in Ian McKellan's "Richard III." Although there have been a number of plans to adapt Battersea for alternative use as well, shortages of

funds and the more advanced state of dilapidation have so far brought these to naught.

Vassar College, Poughkeepsie, New York, U.S.A. has converted its mid-nineteenth century electric powerhouse to the Hallie Flanagan Davis Powerhouse Theatre. The power station, which was modernized in 1932, included a 450 horsepower DeLaval turbine, and four Stirling boiler units, also provided steam for heating sixty-six campus buildings.

Sydney, Australia has converted its old Ultimo power station, built in 1899-1902, into the Powerhouse Museum, www.powerhousemuseum.com, whose collections comprise Science and Technology, Decorative Arts and Design, Australian History and Society, and whose transportation collection – as befits a museum in a building which once provided power to the tram system – is especially fine. Four steam locomotives, and a Bleriot monoplane used to deliver the first Australian air-mail between Melbourne and Sydney, are of particular interest.

RELIC HUNTING

EDISON'S PEARL STREET DIRECT CURRENT DISTRIBUTION SYSTEM

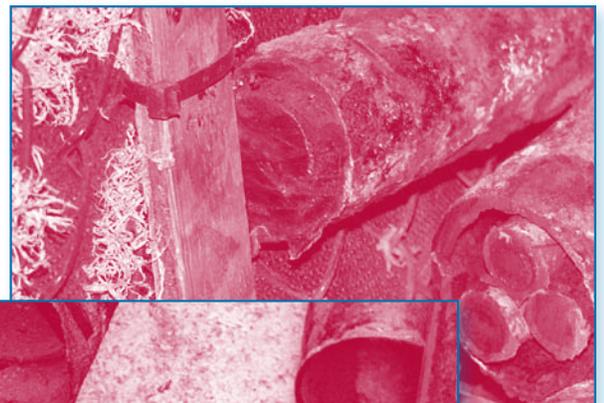
Transit systems may be an archeologist's best friend; Roman ruins in London, ancient ships in Rome, and Byzantine port structures and ships in Istanbul are but a few of the treasures brought to light in the course of excavating mass transit systems. The New York City Transit Authority, in the course of construction work at Fulton Street, just around the corner from Pearl Street, has uncovered parts of the Edison direct current feeder system extending from the Pearl Street station (1882). As one of the pivotal events in the history of electrification, the Pearl Street Station (the building no longer exists), and any artifacts associated with it are extremely special to all those interested in the history of electrical technologies. The History

Center is extremely grateful to Robert Lobenstein, General Superintendent of Power Operations for the New York City Transit Authority, for sending us these photographs from the excavations.

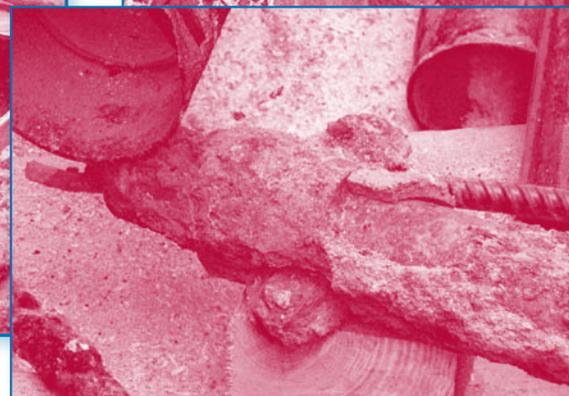
The IEEE History Center Newsletter welcomes submissions of articles and images from its readers for its "Relic Hunting" department. "Relic Hunting" are accounts of finding or tracking down tangible pieces of electrical or computing technology in interesting or unsuspected places (in situ and/or still operating is of particular interest). Length, flexible 500-1200 words. ieee-history@ieee.org



old Edison feeders suspended close to street



Edison 2-conductor feeder (top cable)



3-wire feeder connection

ELECTRICAL TECHNOLOGIES IN THE MOVIES: PUBLIC ADDRESS SYSTEMS

Before there were electronic public-address systems, there were megaphones. Many movies show this cone-shaped device, which amplifies sound acoustically. "Five Pennies" (1959) shows a singer in the 1920s using one, and military use of megaphones during World War II is seen in "From Here to Eternity" (1953) and in "Enemy at the Gates" (2001).

A much more powerful means of amplifying the human voice emerged in the course of the 1920s through the use of a microphone, an electron-tube amplifier, and an electrodynamic loudspeaker. Since then, public-address systems, with these three components, have been important in a wide variety of social contexts.

From the 1920s on, politicians have made great use of PA systems. The movie "O Brother, Where Art Thou?" (2000) shows a PA system for political campaigning in 1930s Mississippi. In the same decade, Fascists in Italy and Nazis in Germany made effective use of PA systems, as depicted, respectively, in "The Garden of the Finzi-Contini" (1970) and Charlie Chaplin's "The Great Dictator" (1940). In "The Battle of Algiers" (1966) insurgents take over a PA system in the casbah that the French authorities were using, and "Electric Shadows" (2004) shows how Chinese Communists in the 1970s made use of a town's PA system to control people's lives.

The military has made extensive use of sound amplification, as seen in numerous movies, including "Enemy at the Gates" (2001), showing Stalingrad in 1942, "Seven Years in Tibet", showing Tibet in the 1940s, "Pork Chop Hill" (1959), showing Korea in the early 1950s, and "Apocalypse Now" (1979), showing Vietnam in 1969.

PA systems have been important in places of entertainment, such as sports arenas, fairs, and dances, as depicted in "Pride of the Yankees" (1942), "State Fair" (1945), and "Grease" (1978)

respectively. "Dirty Dancing" (1987) shows frequent use of a PA system at a Catskills resort in the 1960s, "The Deer Hunter" (1978) has a PA system at a wedding, and "Almost Famous" (2000) shows the sound system at a rock concert. Filmmakers often underline the use of a PA system by including some feedback howl. This happens in "Annie Hall" (1977), "Animal House" (1978), "The Red Violin" (1998), and many other movies.

An amplification system can confer power. In "Wizard of Oz" (1939), the volume of the Wizard's voice is a large part of his impressiveness. In "Meet John Doe" (1941) the main character is helpless when his microphone is cut off. In "Chorus Line" (1985), the director, played by Michael Douglas, sits in the dark using a PA system that gives him a powerful and threatening voice. In "Strictly Ballroom" (1992) people fight over control of the PA system at a dance competition. And in "The Wedding Singer" (1998), the title character says, when provoked by someone in the audience, "Well I have a microphone and you don't... so you will listen to every damn word I have to say!"



Alfred N. Goldsmith using a public-address system in opening the World Radio Congress

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

REMINISCENCES

FIRST PHOTOLITHOGRAPHIC TRANSISTOR FABRICATION

By Jay W. Lathrop

I began my professional career at the National Bureau of Standard's Tube Laboratory in 1952. It was in this laboratory that NBS had developed proximity fuses for bombs, rockets, and mortars during WWII. A year or so after I joined the labora-

tory it became a separate entity, the Diamond Ordnance Fuze Laboratory, under the Defense Department. Soon after that, management realized that fuses could be miniaturized to fit on many of the smaller projectiles if transistors, rather than tubes, were used. But to develop transistorized fuses it would be necessary for DOFL to have its own supply of transistors for

experimentation. My supervisor, T.M. Liimatainen, assigned me the task.

DIY transistor fabrication was a wonderful way to learn about semiconductors, a subject only beginning to be taught in college. My colleague, James R. Nall, and I began by ordering some germanium metal from a chemical supply house. No one thought at that time that silicon transistors would be practical. Then, with the help of several skilled machinists and glassblowers, we set about constructing the necessary equipment. Among the items built were zone refiner, crystal puller (1" diameter), slicing saw, diffusion furnace, vacuum deposition equipment, and alloy furnace. Our goal was to fabricate a pnp, diffused base, alloyed emitter transistor.

N-type impurities were diffused into a p-type germanium collector substrate to form the base layer and then a vacuum deposited aluminum contact alloyed into this layer to form the emitter. This was followed by alloying an n-doped gold contact to make ohmic contact to the base. The top of the transistor then had base and emitter contacts on the surface. Etching away the surrounding base material defined the collector area and left the top contacts sitting on a raised mesa, hence the term "mesa" transistor. Soldering the back of the collector to a metal tab completed the transistor. As we got down to considering the final device topography, we began to realize the difficulty of working with dimensions the order of a thousandth of an inch, huge by today's standards, but beyond any capability that we had.

A technique was needed to form the small aluminum and gold contacts and to etch the mesas reliably. In addition, because we wanted to incorporate the transistor into a ceramic circuit wafer containing capacitors and resistors, we needed also to be able to define the vacuum-deposited leads that would connect the emitter and base contacts to the circuit. We had heard of a liquid photosensitive coating made by Kodak which was being used to etch rivet holes in aircraft wings. We ordered some of the material, called a photosensitive resist, spread it on a wafer and found that we could indeed expose it selectively to create not only protected but also unprotected regions. The trick would be to expose resist in patterns which could be carefully aligned to the substrate.

It was not possible at that time to fabricate masks of sufficient resolution, so we decided to project patterns using a microscope in reverse. A trinocular microscope was procured that normally would be used to photographic images of subjects viewed through the binocular eyepieces. Where the cam-

era would normally have been, a pattern, such as an enlarged opaque contact area, was placed. Illuminating the pattern projected its greatly-reduced image on the slice. With a red filter in place it was possible to view the projected image on the slice

without exposing the resist and align it to the slice by using a micromanipulator stage. When the slice and contact pattern had been aligned, the resist could be exposed by removing the filter for a few seconds. The process could then be repeated as often as required. Subsequent development of the pattern, etching, and alloying followed standard fabrication procedures.

We built a number of state-of-the-art transistors using this technique and incorporated them in thin ceramic flip-flop circuits using a layer of resist to insulate the connecting leads from the substrate rather than an oxide layer as was done in the silicon integrated circuits developed 18 months later. We published the technique(1), which we called "photolithographic fabrication" and received a patent(2) on it.

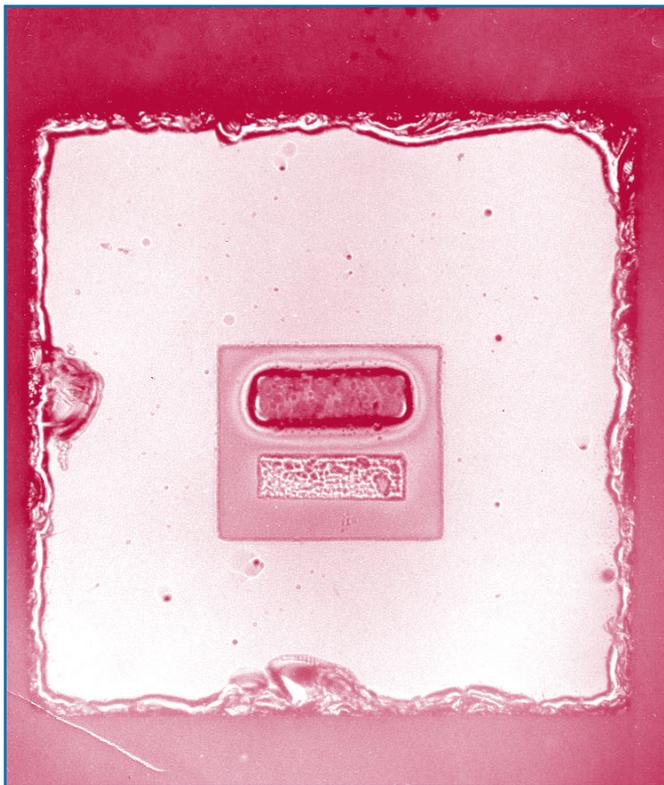
(Because the technique had been developed

jointly, we flipped a coin to see whose name would be first on the paper and whose first on the patent.) To my knowledge this was the first use of the term "photolithography" in connection with semiconductor device fabrication. The press picked up the term and it has been in use ever since. It is a misnomer, of course, because it is really a photoetching process instead of a photolithographic process, but somehow photolithography rolls off the tongue more easily than photoetching.

(1) Nall, J.R. and Lathrop, J.W., "Photolithographic Fabrication Techniques for Transistors which are an Integral Part of a Printed Circuit," Late News Paper at IRE-PGED Conference, Washington, DC, October 1957

(2) "Semiconductor Construction," USA, 2,890,395 (Lathrop, J.W. and Nall, J.R.)

The IEEE History Center Newsletter welcomes submissions of articles and images from its readers for its "Reminiscences" department. "Reminiscences" are accounts of the history of an electrical or computing technology from the point of view of someone who worked in that technical area or was closely connected to someone who did. They may be narrated either in the first or third person. Length 500-1500 words. ieee-history@ieee.org



Finished Transistor 45cm die

BIBLIOGRAPHY

BOYD, H. MICHAEL, *The American Electrical Engineering Occupation: Profession, Professionalization, Power and Status*, Boyd Associates, 2007.

**The American Electrical
Engineering
Occupation:
Profession, Professionalization,
Power and Status**

H. Michael Boyd, PhD

There has been a great deal of concern lately, particularly in the American context, about the paucity of young people drawn to careers in engineering. Possible factors include better financial opportunities in other fields, a perceived lack of status for the engineer as opposed to other professionals, and a cultural rejection of engineering practice by certain subgroups of society. Now H. Michael Boyd, a leading authority on human resources management, has done a great service by publishing his doctoral dissertation, originally submitted to the Department of Sociology and Anthropology at Northeastern University, which deals with the social history of the electrical engineering profession in the 20th century.

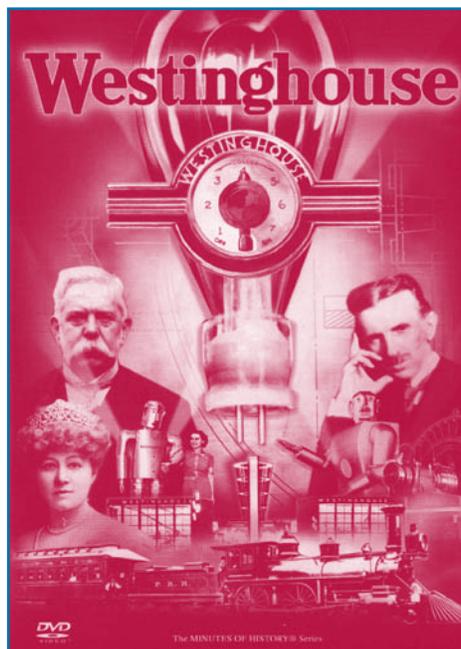
This work is a scholarly analysis, within a sociological framework on the theory of occupations, of the devel-

opment of electrical engineering in the United States with an emphasis on the major shifts that took place immediately after World War II. It is well researched and referenced, and carefully argued. All readers of this newsletter should be quite interested in the story it tells and its conclusions.

Without giving too much away, the book emphasizes the diversity of American electrical engineers over time, and it identifies a core profession within a broader occupational group. Of perhaps most interest, it proposes a major role for professional associations—notably the IEEE and its predecessor societies—in influencing the growth and direction of the profession. It ends with both predictions for the future of the profession and recommendations for further applied research to help the profession reach its gull potential.

Available from Boyd Associates, Walpole, Massachusetts, U.S.A., **Published@BoydAssociates.net** or from **Amazon.com**. Cloth, \$19.99, ISBN 978-0979170300, 302 pages, tables, appendix.

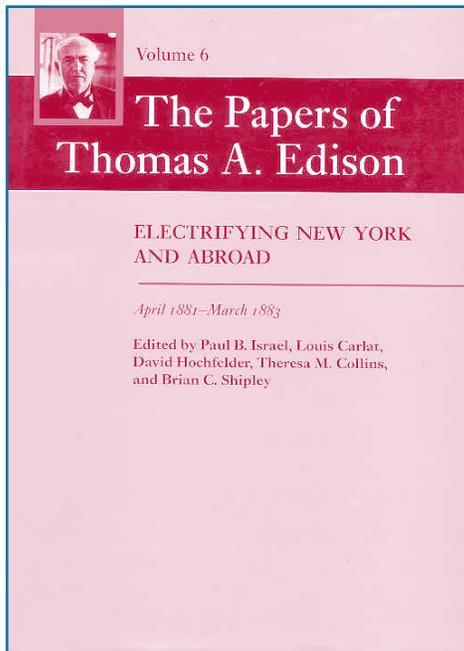
"Westinghouse", a documentary film written and directed by Mark Bussler.



The Minutes of History Series. Incom Entertainment Company, Pittsburgh, Pennsylvania, U.S.A., 2008.

This DVD contains the 112-minute documentary film "Westinghouse", written by Mark Bussler and narrated by Carol Lee Espy. The film covers both the personal life and the technological work of George Westinghouse. The treatment is roughly chronological. It begins with Westinghouse's birth in 1846, covers his early life and the founding of his company, and continues beyond his death in 1914, as it follows the evolution of the company up to the present day. Topics include the Westinghouse air brake, work on natural-gas drilling, the development of ac power, the marketing of appliances, and involvement in world's fairs. The personal side of Westinghouse, such as family life and his concern for laborers—he pioneered the Saturday half-holiday and he built homes for workers—is also presented. The so-called Battle of the Currents, the contest between Edison's direct current system and Westinghouse's alternating current system, receives much attention, including the huge contribution that Nikola Tesla made to Westinghouse's system. Westinghouse saw the 1893 Chicago World's Fair as an opportunity to demonstrate his system, and the lighting became one of the greatest draws of the fair.

The documentary makes use of numerous historical photographs, as well as a good deal of fascinating historical footage. There is commentary by Edward J. Reis, director of the George Westinghouse Museum, by Quentin R. Skrabec, Jr., author of a biography of Westinghouse, and by William H. Terbo, Executive Secretary of the Tesla Memorial Society. Special features of the DVD include a feature-length commentary track by Mark Bus-



sler and Edward Reis, interviews and unused footage, and a historical short "The Westinghouse Time Capsule".

Available from Inecom Entertainment Company, 150 Beta Drive, Pittsburgh, PA 15238; www.inecom.com; anamorphic widescreen DVD, NTSC, \$24.95, ISBN 1-59218-051-5, 112 minutes.

ISRAEL, et al, *The papers of Thomas A. Edison: Electrifying New York and Abroad, April 1881–March 1883, Volume 6*, Johns Hopkins University Press, 2007

Volume 6 of *The Papers of Thomas A.*

Edison makes available the correspondence, technical notes, laboratory reports to Edison, notebook drawings, and illustrations pertaining to the period of Edison's move to New York City and his international business dealings. An historical summary begins each period of correspondence, giving the reader context for the documents which follow. Historians, scholars, and readers with a deep interest in Edison will find this volume a vital resource as well as a look at how one of the first global technology corporations was built from the ground up.

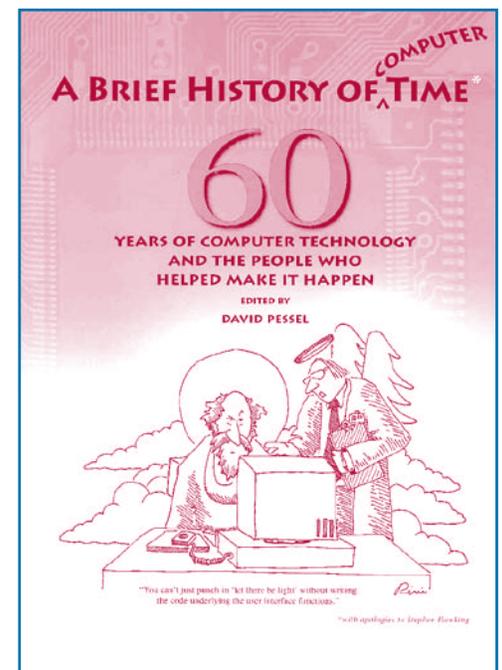
Available from Johns Hopkins University Press, HFSCUSTSERV@MAIL.PRESS.JHU.EDU, \$90.00, hardcover, ISBN 978-0-8018-8640-9, xlv + 893 pages, illus., chronology, index, appendices.

PESEL, DAVID, *A Brief History of Computer Time*, IEEE Computer Society Press, 2008

Published in honor of the IEEE Computer Society's sixtieth anniversary, *A Brief History of Computer Time: 60 Years of Computer Technology and the People Who Helped Make it Happen* pays tribute to seventy-three computer and information technology pioneers, from Blaise Pascal to MOSAIC browser pioneers Marc Andreessen and Eric Bina, with their images,

brief biographical notes of their accomplishments. Interspersed with these is a wonderful sampling of computer-related cartoons from *The New Yorker*. Favorites such as "I keep cutting and pasting but nothing happens," "You have to admit that your chip looks a lot like their chip," and "Can you hang on a sec? I think I just took another picture of my ear" add a wry look at some of the ways the technology has found its way into popular use and culture.

For more details, contact IEEE Computer Society Press at <http://www.computer.org/portal/site/store/index.jsp>



REMEMBERING YOUR PROFESSIONAL HERITAGE WITH A BEQUEST BY: KAREN GALUCHIE, IEEE DEVELOPMENT OFFICE

One of the simplest and most rewarding gifts you can make to the IEEE History Center is a bequest in your will or living trust. A bequest of any size will help perpetuate the professional heritage of electrical engineering and computing. These types of gifts ensure the IEEE History Center's ability to continue its important work of preserving, researching, and promoting the history of electrical engineering and computing for generations to come.

There are three different bequest options that you and your family may want to consider when deciding how best to remember the IEEE History Center in your plans.

- 1. General bequest.** You designate a specific dollar amount or percentage of your assets to the IEEE Foundation for the benefit of the IEEE History Center.
- 2. Residuary bequest.** After all other specific bequests, debts, taxes and expenses have been paid, you designate the IEEE History Center to receive the "rest, residue and remainder" of your estate.
- 3. Contingent bequest.** You request that the IEEE History Center receive all or a part of your estate if certain circumstances were to occur, such as all other named beneficiaries pre-decease you.

To leave an unrestricted bequest to the IEEE History Center, the language in your will or living trust would read:

"I give the rest, residue, and remainder of my estate (dollar amount or percentage) to the IEEE Foundation, Incorporated, New York, NY for the benefit of the IEEE History Center (for benefit of specific program, such as Oral Histories)."

If you decided to name the IEEE History Center as a beneficiary of your will or living trust, please share the good news with the IEEE Development Office (contact information below). This will allow us to thank you for your generosity and recognize you during your lifetime by adding you to the roster of **Goldsmith League**, the IEEE's planned giving recognition group. If you prefer to remain anonymous, we will honor your wishes and include you as an anonymous member.

To learn more about including the IEEE History Center in your plans, or to notify us of a legacy gift you have already established, please contact the IEEE Development Office at +1 732.562.3860 or supportieee@ieee.org. As always, thank you for supporting the IEEE and its efforts to preserve the history of our technology.

The information in this article is for educational purposes only and is not intended as legal, tax or investment advice. If you are considering making a bequest to the IEEE Foundation to benefit the IEEE History Center, we highly recommend you consult with your own tax and legal advisors to determine the best options for you.

How do I donate during my online dues renewal?

1. When you have completed your online dues renewal, click the yellow button – View Cart/Proceed to Checkout
2. There is a blue box called – What Do You Want To Do? Click the link – Make a donation to IEEE
3. You are now on the page reserved for donations – Contributions
4. Browse the choice of funds. Fill in the amount you would like to contribute. Click the grey button – Make Contribution. To contribute to more than one fund, write the contribution amount next to each corresponding fund and click Make Contribution for each fund
5. Your shopping cart balance will increase (the screen does not change)
6. To finish the online dues renewal process, click the yellow button – View Cart/Proceed to Checkout

Need another online giving option?

You can easily make your contributions through the IEEE Foundation website

www.ieeefoundation.org

CLICK THE “DONATE ONLINE” TAB

**THANK YOU IN ADVANCE FOR YOUR CONTINUED GENEROSITY
TO THE IEEE FOUNDATION!**

Making a safe and secure online gift to the IEEE Foundation – History Center Fund has never been easier! Register now by clicking the “Donate Online” tab at www.ieeefoundation.org



IEEE History Center
Institute of Electrical and Electronics Engineers
445 Hoes Lane, P.O. Box 1331
Piscataway, NJ USA 08855-1331