

IEEE HISTORY CENTER

 THE STATE UNIVERSITY OF NEW JERSEY
RUTGERS

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

STATIC FROM THE DIRECTOR

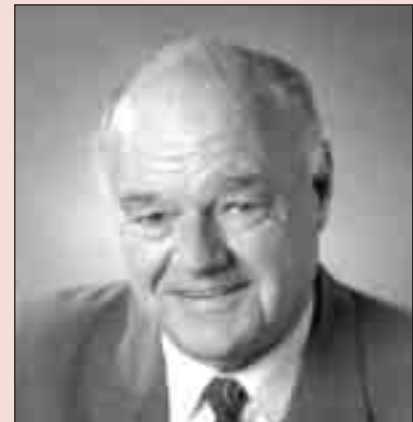
As I write this, the Center's programs to preserve, research, and promote the legacy of IEEE technologies continue to draw positive attention to our profession and its accomplishments. The second in our lecture series on engineering and society, held at our co-sponsoring institution Rutgers University, drew an audience of more than 100, was featured on the cover of the Rutgers student newspaper, and was filmed by C-SPAN [see page 4]. Our latest Milestone, in Switzerland, was attended by IEEE Past President Raymond D. Findlay and by the president of the Swiss Federation, and was widely covered in the local press. Our nomination of Philosophy Hall at Columbia University—home of Edwin Howard Armstrong's radio lab—was approved as a U.S. National Historic Landmark [see page 4]. And, of no surprise to regular readers of this newsletter, the IEEE Virtual

Museum has another feather in its cap. It was named a "Great Website for Kids" by the prestigious American Library Association.

We continue to work hard to keep the public and our constituents informed through our website and through various publications inside and outside of IEEE. Milestones and Legacies are the most popular areas of our website, which draws more than 5,000 visits a month. The last two issues of IEEE's member newspaper, *The Institute* (<http://www.theinstitute.ieee.org/>), featured history articles supplied by Center staff. This newsletter, which reaches you directly, helps keep you up to date on our activities. But we also hope it gives you interesting and useful information on engineering heritage and where to find it on the ground, on the Web, and in print. In 2004, look for it to be enhanced to bring you even more of these features.

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WALLACE S. READ NAMED TO THE ORDER OF CANADA; ARTHUR STERN TO BECOME NEW CHAIR OF IEEE HISTORY COMMITTEE



Wallace Read

Wally Read will be stepping down as Chair of the IEEE History Center at the end of 2003. We are pleased that he will remain as a regular member of the Committee, and as Chair of the Trustees of the IEEE History Center. We would also like to take this opportunity to congratulate Wally for his latest honor in a long, distinguished career.

On 5 August, Her Excellency the Right Honourable Adrienne Clarkson, Governor General of Canada, announced new appointments to the Order of Canada. Among those so honored is former IEEE President

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Static from the Director

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We are fortunate in all this work to be assisted by able, dedicated, and extremely distinguished volunteers who provide advice and guidance to us every step of the way. The end of this year will see past IEEE President Wally Read stepping down as Chair of the IEEE History Committee—to be replaced by past IEEE President Arthur Stern [see page 1]. However, we will be fortunate to have Wally continuing as Chair of the Trustees of the IEEE History Center, a committee of the IEEE Foundation, Inc.

Of course, even with the volunteer help, it takes a dedicated staff to produce the work of the Center, and I am blessed with an outstanding one. However, to support such a staff takes resources. That support has come by and large from you—the readers of this newsletter. We are in the middle of our major fundraising period, after our summer letter to you, during the IEEE renewal cycle, and before the crucial end of the fiscal year. So far, so good, though we still have a way to go. Therefore let me take this opportunity to thank you again for your past and current support, and to say that I look forward to continuing to work with and for you to make the public aware of the nature of engineering and engineers, and our important contributions to society throughout history. ♦

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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THE IEEE HISTORY CENTER NEWSLETTER ADVERTISING RATES

The newsletter of the IEEE History Center is published three times per annum with a circulation of 10,700 of whom approximately 7,100 are U.S. residents and 3,600 are non-U.S. The newsletter reaches engineers, retired engineers, researchers, archivists, and curators interested specifically in the history of electrical, electronic, and computing engineering, and the history of related technologies.

Cost Per Issue

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Full Page	\$250

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

WALLACE READ NAMED TO THE ORDER OF CANADA; ARTHUR STERN TO BECOME NEW CHAIR OF IEEE HISTORY COMMITTEE

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and current IEEE History Committee Chair Wallace Read. As an executive in the provincial utilities sector, Wallace Read headed the teams responsible for the design and construction of new hydroelectric power plants at Lower Churchill Falls. He also managed the expansion of Newfoundland's power system into the northern regions of the island. With steadfast leadership, he played a large role in the expansion and modernization of the electricity industry in Newfoundland and Labrador. In addition, he served as president of the Canadian Electricity Association and the Institute of Electrical and Electronics Engineers, where his mentoring skills have benefited the next generation of engineers.

The Order of Canada was established in 1967 to recognize outstanding achievement and service in various fields of human endeavor. It is Canada's highest honor for lifetime achievement.



Arthur P. Stern

Stepping into the Chairmanship of the IEEE History Committee will be Arthur P. Stern. Arthur is likewise a distinguished engineer and Life Fellow of the IEEE who has served the Institute in innumerable posts, most notably, in 1975, as president. Arthur was born in Budapest in 1925, and educated at the Swiss Federal Institute of Technology in

Zurich (Dipl. Eng., 1948) and then at Syracuse University (M.S.E.E., 1955). While studying for his Master's, he joined the staff of General Electric in Syracuse, where he worked his way up through the ranks, eventually becoming Manager of the Electronic Devices and Applications Laboratory. In 1957 he left GE for Martin-Marietta's Electronics Division in Baltimore, where he served as Director of Engineering. After a series of mergers he became Director of Operations for Bunker-Ramo. Then in 1966 he moved to the Magnavox research laboratories as Director, where he stayed until his retirement in 1991.

Arthur's IEEE awards include—but are not limited to—the Centennial Medal, the Third Millennium Medal, and the Haraden Pratt Award. He is also a Fellow of AAAS, and serves on the boards of numerous non-profit organizations. ♦

Staff Notes

2003-2004 GRADUATE ASSISTANTS AT IEEE HISTORY CENTER

Pam Epstein is a Ph.D. candidate in the History Department at Rutgers. Her focus is American cultural history, but her interests also lie in traveling around the world (South America and Africa are next on her list) and taking too many pictures while she's at it.

Cynthia Kreisel is a fellow in the Rutgers History Department. Her major field is modern Europe with an emphasis on post-World War II French history. Her minor fields are comparative global history and women's and gender history. Cynthia's dissertation discusses the recreation of femininity and women's social roles in France after the Second World War. Prior research projects have included the French

Resistance during the German occupation and an exploration of the biblical ties to the shaving of women's heads for adultery or political crimes.

Cynthia received her B.A. from the University of California, San Diego and her master's degree from U.C. Riverside. She also has a California credential for teaching social science at the secondary level, and she taught high school French, history, government, and economics for four years. Although her universe is scarcely larger than the College Ave Campus, in her "free" time Cynthia likes good coffee, running, enjoying Sierra Nevada or cosmic sorbet martinis with her girlfriends, and independent films.

Born and raised in New Jersey, **Melissa Stein** graduated from Franklin & Marshall College, where she double majored in History and English, and minored in Women's Studies. Prior to entering the Rutgers history Ph.D. program in 2002, she worked for 3 years as grant writer for the School District of Philadelphia. Her research interests focus on late 19th and early 20th century American cultural and intellectual history, particularly around issues of science, race, and sexuality.

The Center is delighted to have returning GAs **Tracy Eddy** and **Greg Swedberg** with us again in 2003-2004. ♦

Center Activities

LECTURE SERIES AT RUTGERS UNIVERSITY

In 2003 the IEEE History Center is co-sponsoring a series of five lectures at Rutgers University on topics related to history of electrical technology. By partnering with various co-sponsors throughout the University, this lecture series invites many different audiences—audiences that may not always communicate directly—to come together to explore the many social, ethical, economic, corporate, and cultural factors that shape technology and are in turn shaped by it. The series began in March with *Where Medicine and Engineering Meet: Computational Intelligence and Health Care*, by Dr. Evangelia Micheli-Tzanakou; followed by *Lessons From the Bill Gates of the '30s: How Thomas Watson Built IBM, Invented the Celebrity CEO, Created an Enduring Culture, and Still Found Time to Take Women Shoe Shopping*, by Kevin Maney, 16 September 2003; *The Era and the Impact of the Moog Synthesizer*, by

Herbert A. Deutsch, 20 October 2003; *Peering into the Brain: New Ethical Challenges of Neuroengineering*, by Dr. Kenneth Foster, 13 November 2003; and *The Edison Effect: Lessons in Increasing Innovation from America's First High Tech Entrepreneur*, Dr. Blaine McCormick, 5 November 2003.

Dr. Micheli-Tzanakou is a Professor and Director of the Computational Intelligence Laboratories in the Department of Biomedical Engineering at Rutgers University, and an Adjunct Professor of the University of Medicine and Dentistry of New Jersey. She is the President of the IEEE Neural Networks Society. Kevin Maney is a senior technology editor of *USA Today* and the author of the critically-acclaimed *The Maverick and His Machine: Thomas Watson Sr. and the Making of IBM*, and the 1995 BusinessWeek bestseller *Megamedia Shakeout*. *The Maverick* was reviewed in the July Issue of this

newsletter. Herbert Deutsch's interest in electronic music led him to collaborate, in 1964, with Robert A. Moog on the development of the first Moog Synthesizer. Kevin Foster is Professor of Bioengineering and a member of the faculty steering committee of the University of Pennsylvania's Center for Bioethics. His principal research concerns health effects and medical applications of nonionizing electromagnetic fields. He has written widely about technological risk, including two books: *Phantom Risk* and *Judging Science*. He is former (1997-98) President of the IEEE Society on Social Implications of Technology.

Interested members of the public are invited. Further information on the series, as well as times and locations, may be found at: http://www.ieee.org/organizations/history_center/lecture_series.html, or you may contact the IEEE History Center at +1 732 932 1066 or history@ieee.org. ♦

CROWNED WITH SUCCESS: HISTORY CENTER STAFF-WRITTEN PROPOSAL TO DESIGNATE ARMSTRONG LABORATORIES AS NATIONAL HISTORIC LANDMARK IS APPROVED.

On 31 July 2003, a year and a half of research by IEEE History Center staff was rewarded. U.S. Secretary of the Interior Gale A. Norton announced the designation of 18 National Historic Landmarks. One of these designations was Philosophy Hall, Columbia University, New York City, USA, the site of many of Edwin Howard Armstrong's experiments in radio. Within Philosophy Hall, the invention and demonstration took place of four major inventions: the regenerative or feedback circuit (1912), which made reception of distant and weak signals practicable, the superheterodyne receiver (1918), which underlies mod-

ern radio and radar reception, the superregenerative receiver (1921), which allowed even stronger reception of distant radio signals previously believed to be unreceivable, and wide-band frequency modulation (1933), which made FM radio broadcasting possible. At the end of his life, Armstrong was working on a fifth radio development with his assistant John Bose—FM multiplexing which allows an FM station to transmit more than one signal over the same FM wave simultaneously.

The proposal to designate the site was researched and written by IEEE Histo-

ry Center staff, and involved visits to the site, research in Armstrong's papers, and comparing architects' drawings and old photographs to subsequent alterations. One of the difficulties was establishing exactly which rooms in Philosophy Hall had been used for which experiments. It was sometimes difficult to tell from the descriptions in the secondary literature exactly which spaces in the seven-storey building had actually comprised the Hartley Dodge Laboratories. Many of the interior spaces have been remodeled and divided into offices since Armstrong's time. The room that had been Armstrong's personal lab

was relatively easy to identify from old photographs and the shape of room. But the two departmental labs were harder to place.

However, there were clues, painstakingly uncovered and connected. The 1910 plans showed sinks in some rooms, suggesting that they would have been the laboratories. In visiting the site, the marks from the former plumbing fixtures were still visible in the wall. A photograph in the Armstrong papers showed an experiment set up in a lab—with the room number just barely visible (reversed) in the frost-

ed glass of the door. A letter from the President of the University congratulating Armstrong, and addressed to a room number which no longer exists, was just one of the tantalizing clues.

That the search can be its own reward was true also in this case. “We were searching through a folder of Armstrong’s papers—archival gloves on, of course—when I suddenly recognized that what I was holding in my hand was Armstrong’s own pencil sketch of the regenerative circuit,” Research Coordinator Robert Colburn

recounted. “It was an incredible moment for me, realizing that I was looking at the inventor’s own sketch of the circuit which had led to so many things.”

The National Historic Landmarks designation is the highest such recognition accorded by the U.S. government to historic properties. They are places where significant historical events occurred, or where prominent Americans worked or lived, that represent those ideas that shaped the nation and that provide important information about the past. ♦

NEW JERSEY HIGH TECH ARCHIVES FORUM

On 11 August 2003, the IEEE History Center hosted a forum at the IEEE Operations Center in Piscataway, NJ, to bring together people from New Jersey who are responsible for high tech archives. A first of its kind, the New Jersey High Tech Forum was driven by the reality of budgetary and organizational concerns within companies that threaten the future security of these archives. New Jersey is where a great deal of communications technology was developed. The first research laboratory, the Edi-

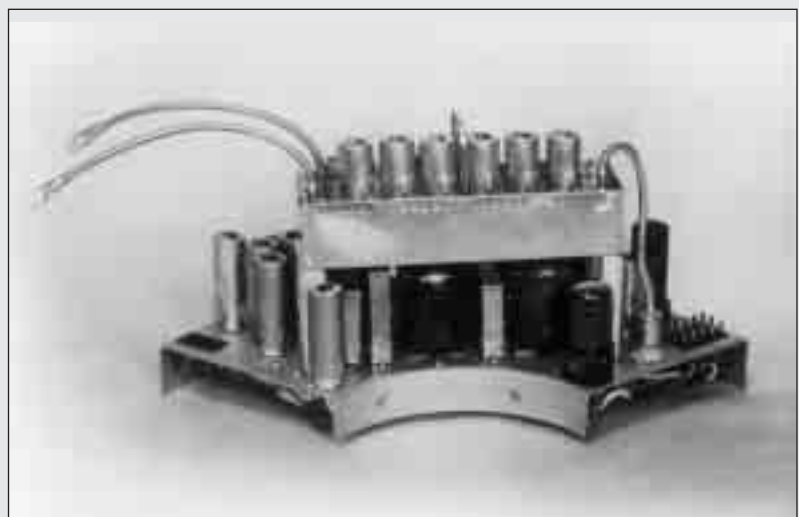
son Laboratory in West Orange, NJ, began the technology advances within the state.

In attendance were individuals from the David Sarnoff Library, InfoAge Science/History Learning Center, Edison National Historic Site, Thomas A. Edison Papers at Rutgers University, Lucent Technologies, and AT&T. Historic Speedwell, the birthplace of telegraphy by Alfred Vail and Samuel Morse, provided information for the final report.

The outcomes include the future development of a “Technology Trail” web portal that will link to the various web sites of technology in the State. A public awareness initiative will also be developed to make individuals familiar with the technology advances of the State. The Forum began with an introduction by Trustee A. Michael Noll. It was led by Michael N. Geselowitz and organized by Mary Ann Hoffman, both of the IEEE History Center. ♦

MYSTERY PHOTOGRAPH CHALLENGE #13

The IEEE History Center maintains a photographic archive of more than 3,300 images. From time to time images are donated without any identification. Can you help identify this photograph? We are interested in details such as type of equipment, approximate dates, manufacturer, how/where used, and anything else of historical interest you would like to tell us.



The IEEE History Center has a webpage that features the mystery photograph challenge. You may email us your answer at history@ieee.org, or you can fill out an on-line form. http://www.ieee.org/organizations/history_center/mystery_photo.html ♦

Surf City

The David Sarnoff Library recently launched a new site, featuring the accomplishments of the man and his corporation. It is a very professional site with a great deal of online information. The actual Sarnoff Library, a well-kept secret within the state of New Jersey, is located in Princeton, along the “technology trail.” You can view individual timelines for David Sarnoff, the history of RCA and the Victrola, and a rich photographic library online. Other technologies included on the site are black & white and color television, radio and liq-

uid crystal displays, among others. Visit the site at www.david-sarnoff.org, and don't forget to sign the guest book!

The Schenectady Museum also recently launched a new and improved web site. The Schenectady Museum maintains artifacts and information about General Electric. It also maintains a history of radio, television, and related technologies. The museum retains a photographic collection of more than 1.5 million images. It is currently digitizing part of its photographic collection, which will be served up on the web site in the future. www.schenectadymuseum.org/

Historic Speedwell sets the record straight! Speedwell, a true birthplace of the telegraph, provides an accurate history of its development. The telegraph was developed by Alfred Vail and Samuel Morse, at the Vail Factory in Morristown, New Jersey. The web site provides an excellent and detailed description of the telegraph and its development in 1838. Speedwell Village, nestled in the hills of Morris County, was the site of Speedwell Ironworks, owned by Alfred Vail. The Site also maintains other historic buildings, including the Vail residence and the old carriage house. www.speedwell.org ♦

DONOR PROFILE EMERSON W. PUGH

Using the Lessons of History

Dr. Emerson W. Pugh became interested in applying the lessons of history to the management of research and development early in his career at IBM. He extended this interest to government policy issues when, “on loan” from IBM in 1974, he served as executive director of the National Academy of Sciences’ study of “Motor Vehicle Emissions and Fuel Economy” mandated by the United States Congress. “The ultimate value of preserving and studying history,” he observes, “is in making it possible for leaders of industry and government and, in fact, for all people to use the lessons of history to make better decisions.”

As the 1989 IEEE President, Dr. Pugh quickly became involved with the IEEE History Center when a new director was hired and plans were made to move the Center from IEEE headquarters to a site on the Rutgers Uni-



Dr. Emerson W. Pugh

versity campus. Beginning in 1991, he served as chair of the Friends Committee to raise money for the History Center. His active involvement with the Friends Committee (now called the Trustees of the IEEE History Center) has continued to this day. He was influential in the establishment, by the IEEE and the IEEE Foundation in 1995, of a

History Center quasi-endowment—now valued at about US\$5 million. He has personally donated more than US\$30,000 to that endowment.

Serving as chair of the IEEE History Committee in 1996, when the Center was without a director, he rolled up his sleeves and became actively involved in day-to-day operations, while working to find and hire the current director. He has continued to help support and shape the Center's program.

When asked why he has devoted so much of his time and wealth to the IEEE History Center, Dr. Pugh responded: “I believe in the value of this work. The IEEE History Center is uniquely qualified to advance the world's understanding of the history of electrical and information technologies. In doing so, it makes a significant contribution to society, of which all IEEE members can be proud.” ♦

CALL FOR PAPERS

2004 IEEE Conference on the History of Electronics

THEMES AND TRANSITIONS IN THE HISTORY OF ELECTRONICS

Bletchley Park, United Kingdom; 28–30 June 2004

The 2004 IEEE Conference on the History of Electronics (CHE2004) is the fifth in a series of workshops sponsored by the IEEE History Committee and the IEEE History Center at Rutgers University. The profound role electronics have had in shaping the modern world, from the invention of the Fleming diode to the present, makes this an important topic of historical study.

Three Conferences— One Celebration

The IEEE conference will take place at historic Bletchley Park, the principal location of British codebreaking in World War II, from Monday 28 June 2004 through Wednesday 30 June. This is an ideal site for such a meeting, with conference facilities in the Victorian mansion and historical exhibits there and elsewhere in the park-like grounds (including a reconstructed Colossus computer). Bletchley Park is also an appropriate site, as it was there that the transition from electromechanical to electronic computing occurred in the effort to decrypt intercepted messages. Immediately following the IEEE conference, two other events will take place at University College. The first is the University College conference on “The Life, Work, and Legacy

of John Ambrose Fleming” and the other is the annual conference of the IEE History of Technology Professional Network.

Conference Theme

The intention of the IEEE conference is to help build a comprehensive view of electronics history through several dozen papers, each of which investigates some formative development in this 100-year-long history. The developments may include the opening of a new area of application, the invention of a major technique, or the gradual replacement of one dominant technique by another. An important feature of this conference is the participation of people with different backgrounds—engineers, historians, museum curators, avocational historians—that should make discussions particularly fruitful. The retreat-like setting of the conference should stimulate the exchange of ideas also.

Some possible themes for conference sessions are the following: Electronics and Music; Electronics in Communications, The Tools of Electronics Design; Power Electronics and Electronics in Industry; Semiconductor Electronics: A Story of Continuity or

Discontinuity?; Behind the Front Panel: Forgotten Bits and Pieces of Electronics; Standards and Technological Trajectories; Electronics in National Contexts; The Business of Electronics; the Emergence of the Electronic Computer; Electronics and Computation.

Submission Guidelines

For session papers, please send the proposed title, an abstract, and a single-page curriculum vitae to the Program Chair by email to <f.nebeker@ieee.org> or by regular mail to IEEE History Center, Rutgers University, 39 Union Street, New Brunswick New Jersey 08901 USA). The Program Committee is also interested in proposals for sessions. The deadline for paper proposals is 31 January 2004.

Registration and Accommodation

Conference registration and accommodation information will appear soon on the IEEE History Center website <http://www.ieee.org/organizations/history_center/>. The conference fee will cover two-and-a-half days of historical sessions, lunches, and historical tours. Reasonably priced accommodations will be available in nearby Milton Keynes. ♦

HIDDEN TREASURES

Recently, the IEEE History Committee and the Trustees of the IEEE History Center met at the Historical Electronics Museum in Baltimore, Maryland. They were pleasantly impressed by the material in this Museum. The Museum has a wide array of displays, all professionally

presented. The museum has Communications, Radar, Electronic Countermeasures, and Space Galleries. The AWACs radar and the SCR-270 are particular highlights. There are interactive displays for students, and a Library. The museum is just off Route 295 south of

Baltimore, and admission is free. (It's just minutes from the BWI Airport.) The Museum also has a number of radar units on their grounds. Visit their web site at www.hem-usa.org for more information. This is a hidden treasure and well worth the visit! ♦

ELECTRICAL TECHNOLOGIES IN THE MOVIES: RECORD PLAYERS

One of the great contributions of electrical technology to popular culture has been providing music in the home. For a hundred years the phonograph, from its first commercial success in the 1890s to its yielding to the CD player in the 1990s, gave people music they wanted to hear, when they wanted to hear it. Movies show quite well the social meaning of record players over this hundred-year period.

In the early years, a phonograph was a sign of wealth. The movie “Cat Ballou” (1965), which takes place in 1894, shows a rich Englishman with a phonograph in his private railroad car. It was also a sign of wealth in Martinique in the 1930s, as shown in the movie “Sugar Cane Alley” (1983). In industrialized countries, however, ordinary people soon acquired phonographs—in the United States already in 1904 one family in twenty had one—but they still represented luxury. At the time of World War I, a phonograph is the prized possession of a schoolteacher in western Ireland in the David Lean movie “Ryan’s Daughter” (1970). In Holland in the 1920s a poor mother and her son, in the movie “Character” (1997), take their phonograph with them to a shelter for the poor. “Jakob the Liar” (1999) shows a phonograph as a valued possession in a Polish ghetto in World War II.

For many people their record collections became extremely important. In “Diner” (1982) a person talks fondly of his collection, and



in “Ghost World” the main character is a collector of records. In “The Devil’s Backbone” (2001), set in Spain in the 1930s, we see an elderly, cultured gentleman ask that his phonograph and records be brought to him as he is dying. The hard-as-nails detective Mike Hammer, in the movie “Kiss Me Deadly” (1955), gains the attention of someone by smashing one of his valuable records.

Of all demographic groups it was probably teenagers who took most strongly to record players. This is shown in countless movies, such as “Last Picture Show” (1971), “Valley Girl” (1983), and “Dirty Dancing” (1987). The popularity of new music among teenagers in Germany in the 1930s is shown in “Swing Kids” (1993), and in “The Virgin Suicides” (1999) teenagers play records over the telephone to express their feelings.

Though the technology was fairly simple and reliable, there were occasionally problems, such as a bit of music repeating because of a scratch. (How long will the

expression ‘sounds like a stuck record’ be understood?) This occurs in “Bad Girls” (1968), also in “Margarita Happy Hour” (2001), where it is an indication that the person in the room has died. One could, of course, use a phonograph ineptly, perhaps scratching the record, as in “Play It Again, Sam” (1972), and it was possible to set the speed—33 1/3, 45, or 78—wrong, which happens in “Toy Story 2” (1999). With an expensive, complicated phonograph, someone trying to use it might be baffled (as happens often with modern stereo systems); this occurs with a console phonograph in the Cary Grant classic “The Awful Truth” (1937). Record players also gave us the slowing, deepening sound and abrupt silence when the power was cut off; a scene in “Little Voice” (1998) illustrates this.

Portable record players are prominent in many movies. In “Niagara” (1953) Rose Loomis (Marilyn Monroe) and others hold an impromptu party outside tourist cabins using a portable phonograph, and in the Billy Wilder movie “Sabrina” (1954) a portable phonograph is used on a yacht. In the movie “Out of Africa” (1985) a phonograph is taken on a safari and set up to play for baboons, with the comment “never a man-made sound and then Mozart”.

Jukeboxes are such a rich subject that they will be treated in a future column. As always, we would be grateful for reports from readers of other interesting cinematic depictions of phonographs. You may contact us at history@iecc.org. ♦

Bibliography

DUFFY, MICHAEL, *Electric Railways: 1880-1990*, Institution of Electrical Engineers, London, England, 2003



Electric Railways is a richly-detailed account of the long and difficult process of bringing electric traction and signaling to railroads. That electric traction would displace other forms of traction over many routes was by no means a foregone conclusion. The efficiencies of electric traction compared to the costs of the fixed works involved in electrifying the line were not always sufficient to convince railroads of electricity's advantages over steam and diesel. Progress from the 1883 30-horsepower locomotive *Ampere* to the TGV, Bullet Trains, and Eurostars of today was sometimes halting and uncertain, and relied on developments in signaling, solid-state rectifiers, thyristor control, and computerization to make them possible and practical. Electrification of a main line railway touches also on questions of government direction and public policy, and Duffy's book will be of interest not only to railroad enthusiasts, but also to readers interested in the interactions between technology and policy.

The book is primarily about the British experience in railroad electrification, but also discusses the United States, Switzerland, Germany, the Netherlands, and Russia.

No railroad—no matter what form of traction—can operate efficiently or safely without reliable signaling and control, and chapters on the history of railroad signaling and control alternate with chapters on electrification. Of particular interest is the chapter on the London Post Office Railway, which used driverless trains to carry mail across London, England. This was the first automatic working of a railroad.

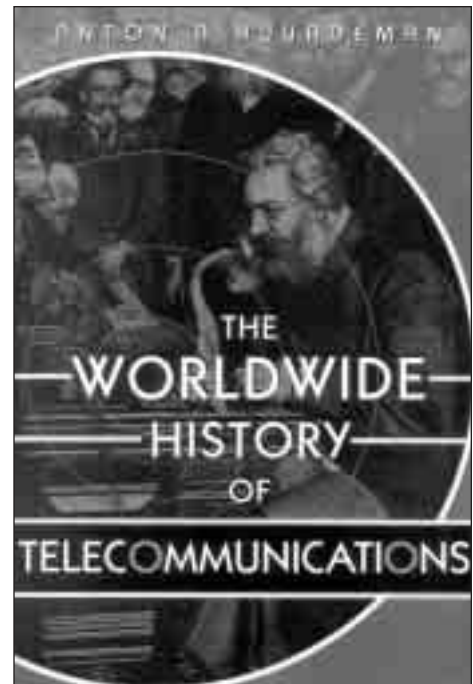
One refrain which runs through the book is the interruption of electrification work because of either World War I or World War II, a subtle refutation of the commonly-held belief that war inevitably fosters innovation and technological progress.

Detailed, and well-illustrated, *Electric Railroads* will be of interest to anyone with an interest in the development of big technological systems. Train buffs especially will enjoy it.

Available from the Institution of Electrical Engineers, Michael Faraday House, Six Hills Way, Stevenage, SG12AY, England, www.iee.org, \$84.00, ISBN 0-85296-805-1, 452 pp., index, illus.

HUURDEMAN, ANTON A., *The Worldwide History of Telecommunications*. Hoboken, NJ: John Wiley and Sons, 2003.

This is a comprehensive history of telecommunications, beginning with the optical signaling systems of antiquity, but concerned almost entirely with the electrical and electronic systems of the past century and a half. The book is divided into 35 chapters, which, after



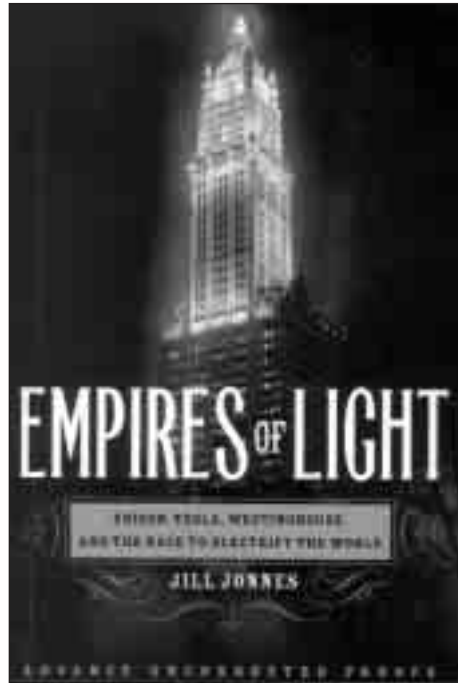
an introductory chapter, progress chronologically from the 17th century to the present. Most chapters concern a particular technology in a particular period, so there may be several chapters, widely separated, for one technology. For example, there are three chapters on the transmission of images: "Image telegraphy" (19th century), "Phototelegraphy" (early 20th century), and "Telefax" (mid-century to the present). *The Worldwide History of Telecommunications* is exceptional for its range of coverage in time, in technologies, and in geography. The emphasis throughout is on the technologies, but there is abundant explanation of the political, economic, and social contexts of the technologies, and the reader often learns something about the people responsible for the technical advances.

This is a substantial book: some 700 pages, in a fairly large format and with a good deal of information on each page. Sources of information are given in lists of books and articles at the end of each chapter, but particular information is not keyed, either by

footnote or endnote, to its sources. (There are footnotes, but these contain explanations or additional information.) The book is well illustrated, mainly with reproductions of photographs but also with diagrams, schematics, and maps. In addition, there are many tables with quantitative information and “how-it-works” explanations in boxes. Appendices present a timeline of the major events in telecommunications history, statistics on use of particular technologies, and a glossary of abbreviations and acronyms. There are indexes for, respectively, people, companies and institutions, and subjects.

Available from John Wiley and Sons, 111 River Street, Hoboken, NJ 07030, www.wiley.com hardcover, \$125.00, ISBN 0-471-20505-2, xx + 638 pp., index.

JILL JONNES, *Empires of Light: Edison, Tesla, Westinghouse, and the Race to Electrify the World*, Random House, 2003



Empires of Light is a colorful historical description of the men who pioneered the electrification of America. This book covers the development of alternating (AC) and direct current (DC), and lighting, portraying very dramatic images of Thomas Edison, Nikola Tesla and George Westinghouse.

Jonnes details the growth of the electric industry in the late 1800s, and the power struggle of direct current versus alternating current. She profiles the key personalities, Edison, Tesla and Westinghouse. Her detailed description of each of these main characters gives the reader a sense of the men and their personalities. She details their earlier accomplishments and their struggles to bring electricity, in a practical form, to America. This is a good book for readers not familiar with battles that were fought. Unfortunately, she goes into too much detail concerning the electrocution of animals during the battles of AC and DC.

Jonnes provides, in great detail, descriptions of the financial atmosphere of the time. She also discusses the other arenas where this battle was fought, between attorneys, in courts, and by little-known persons and companies of the time.

Available from www.randomhouse.com \$27.95, ISBN 0-375-50739-6, 432 pp., +illustr., refs. ♦

Miscellaneous

IEEE Support for Scholars

The IEEE History Center offers three different programs of support annually for young scholars pursuing the history of electrical engineering and computing: An Internship for an advanced undergraduate, graduate student, or recent Ph.D.; a Dissertation Fellowship for an advanced graduate student or recent Ph.D.; and a Post-Doctoral Fellowship for a recent Ph.D. The Internship and the Dissertation Fellowship are funded by the IEEE Life Members Committee; the Post-Doc is funded by Rutgers University. The Internship and the Post-Doc require residence at the IEEE History Center, on the Rutgers University Campus in New Brunswick, New Jersey; there is no residency requirement for the Dissertation Fellowship. The Post-Doctoral Fellowship is currently filled, but the IEEE History Center is pleased to announce the competitions for the other two 2004 awards:

IEEE Fellowship in Electrical History—2004/2005

The IEEE Fellowship in Electrical History supports either one year of full-time graduate work in the histo-

ry of electrical and computer 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. The stipend is \$17,000, and a research budget of \$3,000 is available.

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.

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The Fellow is selected on the basis of the candidate's potential for pursuing research in, and contributing to, electrical and computer history. The deadline for receipt of applications is 1 February. Applicants will be notified of the results by 1 May. The IEEE Fellowship in Electrical History is administered by the IEEE History Committee and sponsored by the IEEE Life Members Committee. Applications may be downloaded from: http://www.ieee.org/organizations/history_center/fellowship.html

IEEE History Center Internship—2004

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 pro-

ject 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. 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 15 March 2004.

IEEE is an AA/EO employer. Women and minorities are encouraged to apply for all positions. ♦



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