IEEE History Center

ISSUE 95, July 2014

The IEEE History Center's new home: the campus of Stevens Institute of Technology overlooking the Hudson River. Image by Jeffrey Vock Photography, Creative Commons Attribution-Share Alike 3.0

STEVENS
INSTITUTE *of* TECHNOLOGY
THE INNOVATION UNIVERSITY

STATIC FROM THE DIRECTOR

THE HISTORY CENTER MOVE TO STEVENS INSTITUTE OF TECHNOLOGY

By Michael Geselowitz, Ph.D.

By the time you receive this issue, the summer season should be in full swing in the northern hemisphere. July and August are slower times in many circles, but it looks to be an action-packed time at the IEEE History Center.

The most important activity, as first announced last issue, is our move to Stevens Institute of Technology. As I sit here writing in early June, I am on the Rutgers campus surrounded by half-packed boxes. By the time you receive this issue in mid-July, we hope to be fully settled on the Stevens campus. You can read more about Stevens on page 4.

Despite the obvious disruptions caused by the move, however, we will not be letting up on our historical endeavors. A quick glance at the Center Activities section (page 5) shows that United Engineering Foundation funded project is going full steam ahead, and

SUBSCRIPTION INFORMATION

The IEEE History Center newsletter is available free to all persons interested in technological history – whether engineers, scholars, researchers, hobbyists, or interested members of the public. It is published in hard copy in March, and in electronic form in July and November of each year.

To subscribe to the IEEE History Center's free newsletter, please send your name, postal mailing address, e-mail address (optional if you wish to receive the electronic versions), and IEEE member number (if applicable – non-members are encouraged to subscribe as well) to **ieee-history@ieee.org**

Current and past issues of the newsletter can be accessed at: **www.ieee.org/about/history _center/newsletters.html**

The IEEE History Center is a non-profit organization which relies on your support to preserve, research, and promote the legacy of electrical engineering and computing. To support the Center's projects – such as the Global History Network, Milestones, and Oral History Collection, please click the "Donate Online" tab at **www.ieee.org/donate** or **www.ieeefoundation.org/**

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 **ieee-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; one issue (March) in paper, the other two (July and November) electronically. The circulation of the paper issue is 4,800; the circulation of the electronic issues is 22,500. 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 **ieee-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**.

has been joined by projects involving the IEEE Robotics & Automation Society and the IEEE Life Members Committee. Our social media effort continues to bear fruit. The Milestones program is also going gangbusters. None of these activities will let up over the summer.

An as also mentioned last issue, we are working with the IEEE Foundation to rethink IEEE's historical activities as a "signature program" that could undertake even greater philanthropic development. Look for more details in the November issue.

Finally, as always, I want to express my gratitude to you, our stalwart donors, for your continued generosity that has enabled all the programs featured throughout this issue. I hope we continue to earn your support. Have a great summer (or winter, for our southern friends)!

HISTORY COMMITTEE ACTIVITIES

IEEE MILESTONE FOR THE INVENTION OF CP/M OPERATING SYSTEM RECEIVES NATIONAL PUBLIC RADIO COVERAGE

The dedication of the IEEE Milestone in Electrical Engineering and Computing for the invention of the CP/M operating system generated some wonderful coverage for IEEE and for technical history. The Monterey, California National Public Radio station KAZU-FM posted the following story by Krista Almanzan: "Recognizing the Legacy of Pacific Grove Inventor Gary Kildall." Included with this story is an audio clip that was broadcast three times on 24 April 2014 (the day before the dedication).

Almanzan sums up part of Gary Kildall's legacy as: *Kildall, who passed away in 1994, has often been referred to "as the man who could have been Bill Gates," if not for one missed opportunity. But those who knew him best hope Friday's dedication will begin to change that legacy.* Recognizing the Legacy of Pacific Grove Inventor Gary Kildall **http://kazu.org/post/recognizing-legacy-pacific-grove-inventor-gary-kildall**

On 2 May 2014 (one week after the dedication) NPR stations throughout California broadcast an audio clip that included comments from the dedication and unveiling ceremonies by IEEE President-Elect Howard Michel and Gary Kidall's daughter Krisitin. "Pacific Grove Inventor Finally Honored for Operating System" **http://www.californiareport.org/archive/R201405020850/a**

See also **http://blogs.kqed.org/newsfix/ieee-recognizes-gary-kildall-for-pioneering-computer-operating-system**

Details of the Milestone, with photos of the dedication ceremony, can be found on the IEEE Global History Network at: **http://www.ieeeghn.org/wiki/index.php/Milestones:The_CP/M_Microcomputer_Operating_System,_1974**

IEEE HISTORY COMMITTEE TO MEET IN CONJUNCTION WITH THE SOCIETY FOR THE HISTORY OF TECHNOLOGY (SHOT)

The next meeting of the IEEE History Committee will be held on Sunday, 9th November 2014 in Dearborn, MI, U.S.A. in conjunction with the annual meeting of the Society for the History of Technology (SHOT) **http://www.historyoftechnology.org/** . The IEEE History Committee had met the previous autumn in conjunction with the annual meeting Society for the History of Technology. Both organizations benefited from meeting together. Members of the IEEE History Committee were able to meet with, and hear papers by, leading historians of technology, and those historians were able to gain a feel for the magnitude of IEEE's history efforts. Based on that success, SHOT had invited the History Committee to meet with them again at its 2014 annual meeting.

Dearborn, MI is the site of the Henry Ford Museum, one the foremost museums of technological history in the world.

ARCHIVES UPDATE: ERIC HERZ

By Sheldon Hochheiser

Eric Herz is one of the central figures in IEEE history, having served as an officer in Region 6 and several societies; a member of the IEEE Board from 1976 to 1978 first as Division III director, and then as Vice President for Technical Activities; Executive Director and General Manager of IEEE from 1979 to 1992; and since then as an active director emeritus. Recently, he contacted IEEE History Center Director Mike Geselowitz. Herz was moving from his longtime home, and had a variety of materials that he was sure would be of interest to the History Center for preservation in the IEEE Archives. Would History Center staff be willing to come to his home to review and collect the material? Geselowitz, of course quickly said yes, and on 13 May, he and Center Archivist and Institutional Historian Sheldon Hochheiser drove to Herz's home in Westchester County, New York. There, Herz offered them a variety of things—books he thought would be of inter-

IEEE WESCON (Western Electronic Show and Convention), San Francisco, November 1983. (L-R: Eric Herz, C. A. "Bud" Eldon, Don Christensen, D. L. Berereton, Henry Basillo, F. X. Timmons.)

est, a variety of plaques and awards Herz received on behalf of IEEE, a small stack of documents, and most amusingly a collection of ties with IEEE logos.

But the most important part of what Herz had saved was a substantial collection of IEEE photographs, most of which documented trips around the world that Herz had participated in with other IEEE leaders from 1974 into the 1990s. There was an apparent problem—most of the pictures bore no identification. But that proved only an apparent problem. Herz went through the photos and from memory identified them—where and when they were taken, and who the people in the photos were. Hochheiser recorded Herz's comments, and as the photos are processed into the Archives collection they will be cataloged with this information, thereby making them valuable visual documentation of the activities and relationships of IEEE leadership. One of these photos accompanies this article.

IEEE HISTORY CENTER RELOCATES TO STEVENS INSTITUTE OF TECHNOLOGY

After twenty-four years on the campus of Rutgers University, in New Brunswick, N.J., which served as a strategic partner for IEEE's historical activities, the staff of the IEEE History Center are relocating to Stevens Institute of Technology, in Hoboken, N.J. The Center will be located in a small wing on the third floor of the school's Samuel C. Williams Library.

In 2012 a review was conducted to see what strategic partnerships might best enhance IEEE's historical activities. It was decided that, when its agreement with Rutgers expired on 1 July, the IEEE History Center would move to Stevens and begin a strategic partnership with that institution. The History Center will work closely with Stevens' College of Arts and Letters (CAL)—the academic unit dedicated to teaching and research at the intersection of science, technology, the humanities, and the arts.

A private university founded in 1870 as the first U.S. school to use a science-based engineering curriculum, Stevens is focused on IEEE's fields of interest. Last year it was ranked the "fastest-rising" college by *U.S. News & World Report* of the best national universities. It is a leader in distance education and in engineering curriculum development.

George Korfiatis, Stevens Provost and University Vice President (left) shakes hands with History Center Senior Director Michael Geselowitz

Stevens provides a number of synergies with IEEE, most notably that the College of Arts and Letters, currently in an expansion mode, focuses on the history and social study of science and technology, as does the IEEE History Center. The move will provide the History Center with access to academic resources and colleagues that will enable it to fulfill better its mission to preserve, research and make known the history of IEEE-related technologies. Benefits will include expanded and public display space, access to the Stevens archival and library collections, direct interaction with innovative engineering educators, and increased opportunities for staff development through teaching and planning public programs.

As part of its partnership with Stevens, History Center staff members will teach courses on the history of engineering and help organize historical exhibits and other appropriate historical activities on the school's campus. "Having the History Center staff on campus and part of the Stevens community will allow us to further our goal of promoting an understanding of the past so that we not only become more responsible in the present, but also explore what is possible in the future," says Lisa M. Dolling, dean of CAL.

THE ENGINEERING AND TECHNOLOGY HISTORY WIKI (ETHW)—A NEW COLLABORATION BETWEEN ENGINEERING ASSOCIATIONS

The IEEE History Center is leading a new and exciting collaborative arrangement with other engineering associations to build the "Engineering and Technology History Wiki (ETHW)": a website dedicated to the history of all engineering. This collaboration first took shape in February 2013, at a workshop organized by the IEEE History Center and supported by the United Engineering Foundation (UEF). Present at the workshop were senior representatives from AIChE, AIME, ASCE, ASME, IEEE, SPE and SWE. This day and a half workshop produced a remarkable consensus: all the engineering groups should get together to create one site on the history of engineering. Such a site would be a powerful tool to advancing public awareness of the vital role of engineers and engineering in human history. Given the achievements of the IEEE Global History Network (GHN) (**www.ieeeghn.org**), all agreed that the GHN should be the model for ETHW.

On behalf of all these engineering groups, the IEEE History Center applied to the UEF for funding to build the new website. By the Fall of 2013 the UEF had approved a sizable grant to help cover the costs of building and launching the new site. In March of 2014, AIChE, AIME, ASCE, IEEE, SPE and SWE signed an operating agreement to jointly oversee the design and operation of the new site. Each also agreed to help fund the costs of running the new site. Other than the formation of ABET, the agreement to create the ETHW may be the only other time that so many engineering associations have come together for a common cause. The ETHW has a governing Council composed of one voting member from each of the participating engineering groups. The Council Chair for 2014 is Dr. Theodore Bickart. Among his many volunteer roles for IEEE, Dr. Bickart also sits on the History Committee. Despite the many challenges of organizing the consortium before work could even begin, development is now underway and the launch of the ETHW will take place as scheduled, in January 2015. All the participating societies have already started to identify, collect and prepare information to load on to the new site. All of the current content on the IEEE GHN will be migrated to the new site. As with IEEE's GHN, the power of the ETHW will come from its hybrid wiki structure that will allow all registered users to contribute content. All members from the participating engineering groups will have guaranteed logon privileges.

Now the public will have access to the collective memories of men and women from a very diverse range of engineering disciplines. A future goal, as expressed in the signed operating agreement between all the participants is to welcome other engineering societies to join the ETHW.

LIFE MEMBERS COMMITTEE HISTORY PROJECT

By Sheldon Hochheiser, Archivist and Institutional Historian

Last summer, IEEE Life Committee member (and IEEE Life Fellow) Ralph Wyndrum approached the IEEE History Center with a request for assistance. The committee had decided to undertake a project to document its own history. Wyndrum was willing to collect material, but he wanted our help in evaluating that material and figuring out how to compile it in a useful form. Center Director Mike Geselowitz and Institutional Historian Sheldon Hochheiser readily agreed to help. Together, the three collected and evaluated available material—minutes of the IEEE Life Member Committee and its predecessor the IEEE Life Members Fund Committee back to 1963, available issues of the Committee's newsletter, articles on the still earlier predecessor, the AIEE Life Members Fund Committee from AIEE's magazine, *Electrical Engineering*, and yearly roles of the committee membership.

The next question was how to compile it. Geselowitz and Hochheiser recommended that the material be used as a the basis for a narrative history, supplemented by appropriate appendices, to be published on the IEEE Global History Network (ieeeghn.org), and that the Life Members Committee appropriate funds so that a project historian could be hired to do the work under History Center supervision. The committee agreed, and appropriated the necessary funds. The History Center pub-lished an RFP, with a 1 June deadline. By the time you read this, the History Center will have completed its evaluation of the proposals, and likely selected a historian to do the work, which we expect will be completed sometime next year.

There is a way that you, our readers, may be able to help. The biggest hole in our source documents is that we are missing many issues of the Life Members Newsletter/Life Members Fund Newsletter. We know that the newsletter existed by the 1970s, but we are lacking the following issues:
- *Any issues earlier than November 1981, including any issues that might have been issued by the Predecessor, the AIEE Life Members Fund Committee.*
- *Any issues from Fall of 1983 through Fall of 1996.*
- *Second and third quarters, 2005.*

If you have any of these issues, (or for that matter any other material related to the history of the Life Members Committee) we would be grateful if you sent either the originals or copies to the History Center at: Sheldon Hochheiser, IEEE History Center at Stevens Institute of Technology, Samuel C. Williams Library, 3rd Floor, Stevens Institute of Technology, Castle Point on Hudson, Hoboken NJ 07030
s.hochheiser@ieee.org

If you have any other documents relevant to the Committee's history, we'd be interested in them as well.

IEEE HISTORY CENTER SOCIAL INTERACTIONS ON TWITTER AND TUMBLR

The IEEE History Center is bringing history to more people via social networking tools such as Twitter and Tumblr. Follow the activities of the IEEE History Center and others involved in the history of engineering on its Twitter feed at **https://twitter.com/ieeehistory**.

The IEEE History Center maintains a blog on tumblr in which interesting images related to the history of technology are posted. Featured in Tumblr's history and science categories, the blog has approximately 100,500 followers as of May 2014 and more than 65,000 social interactions. Four of the posted images were featured on Tumblr's radar, a feature that allows the Tumblr staff to broadcast images they feel are interesting to all logged in Tumblr users. To follow the blog or to view the images, go to **http://engineeringhistory.tumblr.com/**.

USA SCIENCE & ENGINEERING FESTIVAL

On 26 and 27 April 2014, IEEE-USA again participated in the USA Science & Engineering Festival (**http://www.usasciencefestival.org/**). The annual Festival— which is a national, grassroots nonprofit with a number of academic partners and industry sponsors— aims to re-invigorate the interest of America's youth in science, technology, engineering and math by producing and presenting compelling, exciting, educational and entertaining science and technology exhibits on the Mall in Washington, DC. IEEE-USA sponsors a booth to promote engineering careers. Once again this year the IEEE History Center supported IEEE-USA by supplying historic banners and other materials to help broaden the appeal of engineering by emphasizing its exciting past. In addition, this year IEEE-USA, led by volunteer Dusty Fisher, chose to emphasize power engineering, so they also promoted the Center's recent books on electrifying New York and on Frank Sprague (see page ?).

THANK YOU TO OUR HISTORY CENTER DONORS!

Your support helps preserve the heritage of IEEE's technologies.
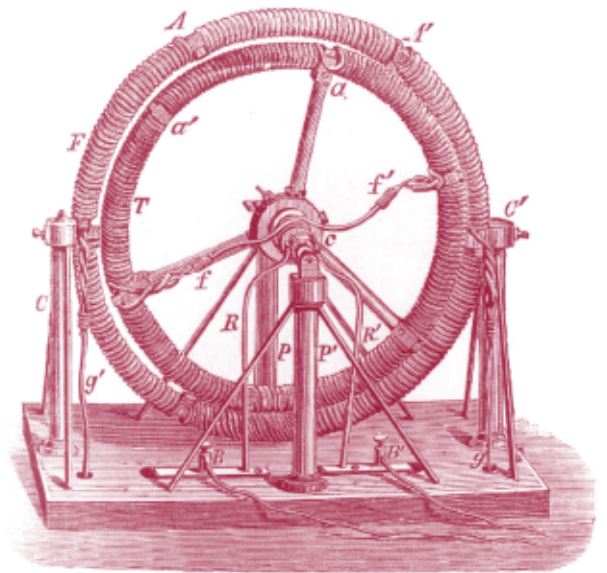
Image courtesy of Smithsonian Institution

STAFF NOTES

MATTHEW STEHNEY IS 2014 LIFE MEMBERS' INTERN IN ELECTRICAL HISTORY

The IEEE History Center is pleased to announce that Matthew Carlos Stehney is the 2014 IEEE Life Members' intern at the IEEE History Center. Stehney is a third year Ph.D. Student in the Department of History at Rutgers University. He received his BA in history and American culture from the University of Michigan. Matthew studies 20th Century American social, cultural, and political history and is currently researching black capitalism in the 1960s and 1970s. Stehney will be doing a number of projects related to the History Center's signature program and archives.

TECHNOLOGY UNEXPECTANS
DID BYZANTINES ATTEMPT LIGHTNING PROTECTION IN THE 13TH CENTURY?

By Robert Colburn

Benjamin Franklin and his lightning rods of the 1750s mark the earliest documented lightning protection technology, and the beginnings of the understanding of the principle of drawing off strong electric charges in order to protect buildings.

However, a member of the IEEE History Center staff recently came across a tantalizing passage in a medieval manuscript while reading for his own recreation. It hints that earlier people might have noticed the relationship linking lightning strikes, metal, and high buildings, without understanding it.

Robert de Clari, a knight from Piccardy, France who participated in the infamous 4th Crusade and its unprovoked attack on, and sack of, Constantinople in 1204 CE, wrote about the marvels of the sophisticated city he and his steel-clad fellow soldiers were brutally looting.

"Now there was elsewhere in the city a gate which was called the Golden Mantle. On this gate there was a golden

Walls near Blachernae Palace, Istanbul
photo by Adam Carr, courtesy of Wikipedia Commons

globe which was made by such enchantment that the Greeks [i.e. Byzantines] said as long as it was there, no thunderbolt would fall in the city. On this globe there was an image cast of copper."

Scholars hesitantly identify the gate Robert was referring to in his *Conquest of Constantinople* as the Gyrolimne (from Argyra Limne: "Silver lake or harbor"). If so, it stands on Istanbul's seventh hill at the north end of the land walls slightly above the Blachernae Palace. Although the copper statute and the metal globe on top of the gate could not have protected the entire city, it might have afforded some lightning protection to the nearby Blachernae Palace itself. The word "enchantment" is an indication that the Byzantines, as well as their European invaders, looked more to supernatural explanations than to a scientific understanding of lightning protection.

It is these tantalizing, unprovable hints which occasionally surface unexpectedly in old books which makes the study of history so absorbing.

THINGS TO SEE AND DO

MYSTERY PHOTO

The IEEE History Center maintains a photographic archive of more than 6000 images. From time to time our readers contact us for help identifying images. Can you help identify this photograph? We are interested in any 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 photo shows what is believed to be an NC-2 plotter from a U.S. submarine.

Please email any ideas you might have to:
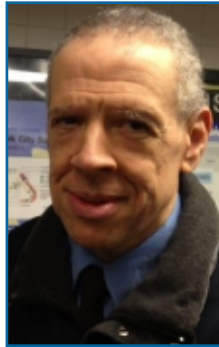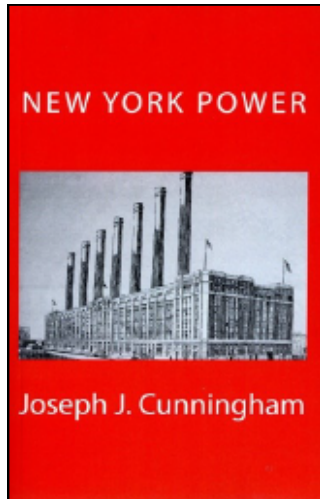**ieee-history@ieee.org**

CUNNINGHAM BOOK TALK AT CON EDISON

Joseph J Cunningham

presenting an illustrated lecture on his book

New York Power

Presentation to the IEEE New York Section and Industrial Applications Society

When:
Tuesday, 26 August 2014
5:00 pm — Refreshments
5:30 pm — Program begins

Where:
Con Edison
Edison Room, 19th Floor
4 Irving Place, NY 10003
Nearest Subway: 14th St/Union Sq.

RSVP: email preferred
Arnold Wong: wongar@coned.com

FOR SECURITY: NO WALK-INS!

This illustrated lecture will tell the story of the innovation and creative engineering necessary to electrify New York City and make possible the metropolis that it became.

New York City has long represented one of the most concentrated urban developments in the world. That density has placed unique constraints on every aspect of life. Electric light and power appeared during the 1880s, but much development was required to supply urban service at a cost that would make possible large-scale consumption. Innovation was needed most in midtown Manhattan, where the sheer density of electrical load overwhelmed the early systems and which continues to be the greatest concentration of electrical load in the world. The first public service was initiated in 1880 with the illumination of Broadway, Madison Park and some businesses by arc lights of the Brush Electric Company. Two years later, Thomas Edison introduced incandescent light service to the offices and businesses of the financial district from his station on Pearl Street. While that installation entered the record books, his long term objective was the midtown area. It was obvious that the load of the midtown area required electric capacity on a scale that surpassed any planned elsewhere.

GRANTS AND FELLOWSHIPS

CASEY CATER IS THE 2014 IEEE LIFE MEMBERS' FELLOW IN THE HISTORY OF ELECTRICAL AND COMPUTING TECHNOLOGY

A native of Atlanta, Georgia, Casey Cater is a PhD candidate in the Department of History at Georgia State University in Atlanta. Cater's research focuses on the environmental, cultural, business, and political history of the electrification of the U.S. South from the late-nineteenth to the late-twentieth century. His dissertation, titled "Regenerating Dixie: Electric Energy, Environment, and the Making of the Modern South," demonstrates that the development of electric power—in its physical manifestations and in the imagination—was fundamental to the creation of the modern South. Most recently Cater was named the 2013 Joel Williamson Visiting Scholar in Southern Studies at the University of North Carolina, Chapel Hill. Cater has published articles on the confluence of race, religion, and reform in the Progressive Era South and is currently at work on an article called "Power Shift," which considers how anti-New Deal politics and drought-induced power shortages drove the transition from hydroelectricity to coal-fired electric power in the mid-twentieth-century South. He is developing another piece, tentatively titled "A Slave in Every Stream and Socket," that deals with the co-production of race, nature, and hydroelectricity in the early-20th Century South.
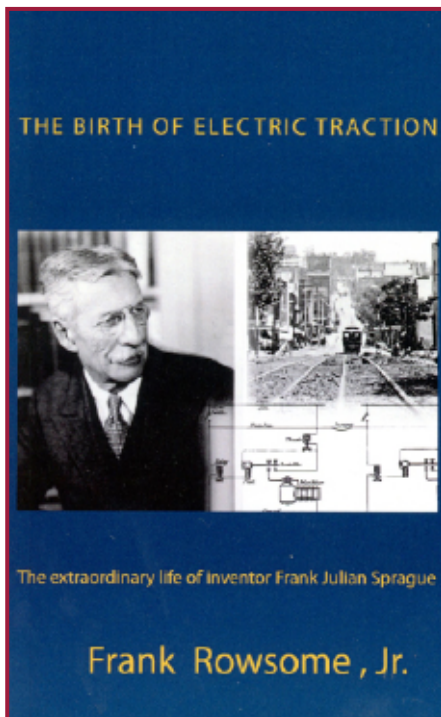
THE BIRTH OF ELECTRIC TRACTION:
THE EXTRAORDINARY LIFE OF INVENTOR FRANK J. SPRAGUE
by Frank Rowsome Jr., *published by the IEEE History Center*

Frank Julian Sprague has often been called the inventor of public transportation. In addition to his developments in electric traction, Sprague made enormous contributions in the areas of control and safety, without which mass transit would not be possible. Sprague developed automatic signal and brake control for railroads, and an auxiliary train control to take charge if the driver made a mistake. He was active in the planning and construction of New York City's subway system, and in the electrification of Grand Central Terminal.

Sprague believed that "Transportation is the key of civilization…for without it our existing social structure would collapse."

Among Sprague's other achievements are the introduction of electric elevators and of electric power units suitable for machine tools, printing presses, dentist's drills, and labor-saving conveniences in the home.

Rowsome's engaging and colorful biography not only gives a detailed view of Sprague as a person, but also Sprague's approach to design and problem-solving. Numerous personal, and sometimes quite humorous, anecdotes bring Sprague, his assistants, and the early history of electric railroads to life.

Frank Rowsome Jr. is probably now most famous for *The Verse by the Side of the Road* (1966), but he was also managing editor of *Popular Science Monthly* and later became NASA's chief of technical publications.

ISBN 9 7181490955346   Available from Amazon.com in hard copy and on Kindle.

http://www.amazon.com/The-Birth-Electric-Traction-extraordinary/dp/1490955348/
ref=sr_1_1?ie=UTF8&qid=1395169365&sr=8-1&keywords=birth+of+electric+traction

FREEBERG, ERNEST,
The Age of Edison: Electric Light and the Invention of Modern America, The Penguin Press, 2013
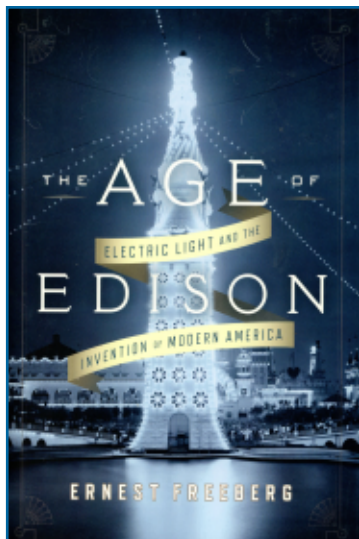
This is not another book about Thomas Edison, though Edison does appear does play a part, rather it is a book , as the subtitle notes on Electric Light and the Invention of Modern America, and an excellent one at that. Freeberg's aim is to show the ways in which the invention and spread of electric lighting transformed American society. He lays out three related themes in his introduction: 1) "To modern readers electric light has become so pervasive that its remarkable qualities have been buried under a thick layer of the obvious" (That is, successful major technological innovations become ingrained parts of the subsequent society), 2) Lighting systems that emerged by the 1930s were shaped by many different types of people and 3) Electric Light changed American Civilization in all sorts of ways.

Freeberg develops his themes through the rest of the book. Municipal lighting came first, and it was not from Edison's system, but from more powerful (and somewhat more finicky) arc lights, largely as part of a system invented by Charles Brush of Cleveland. These lights were best suited for larger, public space and beginning in Cleveland, spread rapidly throughout urban and even small town America. Properly placed, they gave bright light, far more resembling daylight than the dimmer flickering light of the gas lights they often replaced, although they cost more. Edison's incandescent lighting systems soon followed, initially with installations primarily in offices, other work spaces, and homes of the well-to-do, again replacing technically inferior and dimmer gas lighting. Electric lighting transformed the workplace, long before most workers had it in their homes. For those who had to work at night, it replaced the semi-darkness of gas light with high quality light. It allowed department stores to expand and open longer hours, and factories to extend their shift. While urban nightlife existed in the gas light era, electric lighting led to a great expansion, and brought night life to the masses. New York's Broadway became the great white way, with signs that entertained while selling products. Amusement parks embraced electric light, and became well-visited spectacles. Lighting soon reached humble saloons and simi-

lar haunts, and brought respite from still dimly lit flats. Electric Lighting led to the rise of new professions, notably our own field of Electrical Engineering.

The spread of electric lighting changed American attitudes in several ways including a belief in the ability to control nature through technology; that Americans were the most inventive people and that American and by implication other western civilizations were more advanced than all others.

Especially after 1910, Household electric lighting spread rapidly, at least within urban America, so that by the 1920s, electric lighting had for many retreated in to the background of everyday life; an expected comfort of middle class (and in many cases working class) life. Rural household would largely wait until the federal government programs of the 1930s. Freeberg closes his book with the celebration Henry Ford arranged in 1929 for his friend Thomas Edison on the occasion of the fiftieth anniversary of Edison's first Menlo Park demonstration of his electric lighting system. By this time, electric lighting had become with contributions from countless people, but a part of American Life. And as President Herbert Hoover put it at his celebration address, the humble bulb from 1879 had turned into something with "an infinite variety of unexpected uses."

Available from the Penguin Press USA, **http://www.us.penguingroup.com**. Hardback, $27.95. ISBN 978-1-59420-426-5. 354 pages, index, illus.

MISA, THOMAS J.,
Digital State: The Story of Minnesota's Computing Industry, University of Minnesota Press, 2013

By Sheldon Hochheiser

In previous works, Thomas J. Misa has written very broadly on the history of technology, most notably in his book "From Leonardo to the Internet," a single volume history of technology in world civilization since the Renaissance that IEEE History Center staff uses regularly in its teaching. Now, Misa, the ERA Land-Grant Professor of History of Technology (and Director of the Charles Babbage Institute for the history of computing) at the University of Minnesota has turned to regional history in the best sense of the term with his new book, which as its subtitle notes is a history of Minnesota's computing industry. Misa begins with a claim that the first distinctive computing industry center took form in the Twin Cities in the 1950s through the 1970s. He demonstrates this in the three chapters (2-4), each covering one company, that form the core of the book. Chapter 2 provides a history of the pioneering computer company, Engineering Research Associates, (1946-1952). ERA founders William Norris and Harold Engstrom came to St Paul, since a local businessman, John Parker, provided a building in which they could continue as a corporation the cryptographic computing work they had been doing for the US government during World war Two. Since many of the customers for their products were government agencies, either intelligence or military, ERA kept a low profile until 1952 when business machine company Remington-Rand acquired both it and the Philadelphia based Eckert-Mauchly. After Remington Rand merged with Sperry three years later, the combined company merged its two computer divisions under Eckert-Mauchly's brand name, Univac, and ERA's computers were rebranded as Univac computers. Chapter 3 follows with the history of ERA's successor, the Univac St. Paul division. Within a few years, Univac employed more than 10,000 people in multiple locations in the Twin Cities, including laboratories, factories and offices. They produced a series of successful scientific computers, most notably the Univac 1103, as well the Naval Tactical Data Systems for deployment throughout the U.S. Fleet. Seymour Cray, as computer designer, and William Norris, as a senior manager played major roles at Univac St. Paul, but frustrated with the corporate structure strategy of Sperry Rand, they left with others in 1957 to found Control Data Systems, the subject of chapter 4. Univac St. Paul continued to thrive for many years, employing 10,500 people around the Twin Cities as late as 1968.

Control Data was probably the most important Twin Cities-based computer company. The company was best known for its Seymour Cray-designed model 1604 and 6600 computers, which through the 1960s and into the 1970s were the world's leading edge supercomputers. But it also was a leader in the production of a number of computer peripherals, for both its own and other computer manufacturers' use, and a pioneer in the development of data centers and computer services, selling spare computer time to large companies. Control Data gained additional renown and an expanded business when its successful antitrust suit against IBM lead to Control Data acquiring IBM's Service Bureau business at a bargain price. Control Data was also known for its social activism. But by the 1990s, Control Data had slipped far from its glory days, and ultimately disappeared for reasons that Misa claims are unclear. In Chapter 5, Misa adds one additional company, Honeywell as a core business in Twin Cities' computer district, even though its major business was in another sector, variable feedback control. Honey was most important in computing history not for its own modestly successful line of mainframe computers or its joint venture with GE, but because it was the plaintiff in a long-running court case Honeywell vs. Sperry Rand that sought to overturn Eckert and Mauchly's Univac patent and answer (at least in a legal sense) who invented the computer.

Because Misa set up his task as a history of computing in Minnesota, and not just the story of how the Twin Cities arose as the first US computer district, he concludes with three additional chapter on respectively IBM's major development and manufacturing complex in Rochester, ninety miles south of the Twin Cities; Minnesota's role in the emergence of the information economy; and finally, the influence of   the industrial district and workforce developed in the heyday of Minnesota's computing industry for the emergence of the Twin Cities most important current technical center, medical devices. Misa thus has succeeded twice, both in

telling the more nationally significant story of the era when the Twin Cities was a national center for the computing industry, and in telling the more regional story of the continuing importance of computing to Minnesota.

Available from the University of Minnesota Press, Minneapolis, Minnesota, **https://www.upress.umn.edu/**. Paperback, $29.95. ISBN 978-0-8166-8332-1. 320 pp., index, illus. index.

RUSSELL, ANDREW L,
Open Standards and the Digital Age: History, Ideology, and Networks, New York, 2014
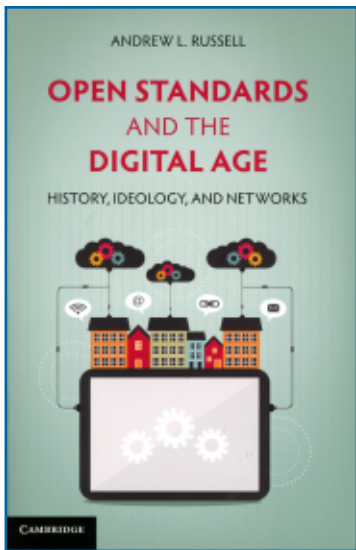
If one were to ask technologically-oriented people what IEEE does, if they had any idea, they would probably say publications or conferences. If you ask the same people about the number "802.11," they may well get excited and point out that it is the standard that allows wireless local area networks to exist. They may or may not know that it requires an "IEEE" before the number to be official. It turns out that setting standards, especially in the area of digital communications, is one of the most important functions of IEEE, which has more than 1,500 standards and projects under development.

A standard is (as defined by Wikipedia) "an established norm or requirement in regard to technical systems. It is usually a formal document that establishes uniform engineering or technical criteria, methods, processes and practices." In order for a technical standard to work for a large technological system, there must be consensus across a wide range of designers, producers and consumers. Such agreement would seem to suggest the need for authority. Yet, in the Internet age, the preferred paradigm is the "open standard," defined (again by Wikipedia) as "a standard that is publicly available and has various rights to use associated with it, and may also have various properties of how it was designed (e.g. open process)." Any standard must be made known to a variety of stakeholders, or it has no value as a standard. The idea that standards are best produced by an open, nonhierarchical process and needs to be made completely available to all, would seem at first glance to be a recent innovation, somehow tied into the rise of the Internet and "Geek Culture." In fact, it has a long and complicated…and informative…history.

Andrew Russell, assistant professor of science and technology studies at Stevens Institute of Technology and former IEEE Life Members Fellow (and a Corresponding member of the IEEE History Committee), has written several articles on the history of telecommunications standards. Now he has produced a scholarly but accessible book addressing specifically the history of open standards in the digital age, placing this history in its full historical context and situating it in its technical, political, and organizational environments.

Russell has divided this history into three periods: Colonial Era – 1900: 1900 – 1980; and 1980 to the present. As the name of the first period suggests, the book is written from an American perspective. This is appropriate, as the U.S. was the global center for these activities; in fact, he dates the beginning of the drive for open standards to American colonial resistance to the British Stamp Act of 1765! He does not, however, ignore the international context, critical in any study of telecommunication in the modern era. The book is more focused on the political and economic aspects of the standards, but there is sufficient technological detail to satisfy readers of this newsletter.

Without spoiling his conclusions about how the "open standard" paradigm emerged and what this means for the present and future of telecommunication, it is safe to say that anyone interested in the history of standards or the history of modern telecommunication would do well to read this latest contribution to those fields.

Available from Cambridge University Press, 32 Avenue of the Americas, New York, NY 10013-2473, **www.cambridge.org**, $32.99, paperback, ISBN 978-1-107-61204-4 (also available in hardback, $90.00, ISBN ISBN 978-1-107-03919-3; Adobe e-book , $72.00), xvii + 306 pages, 8 illustrations, 3 tables, index.
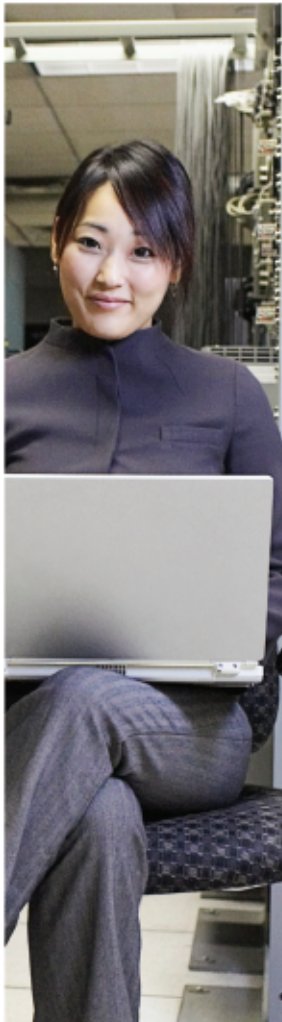
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