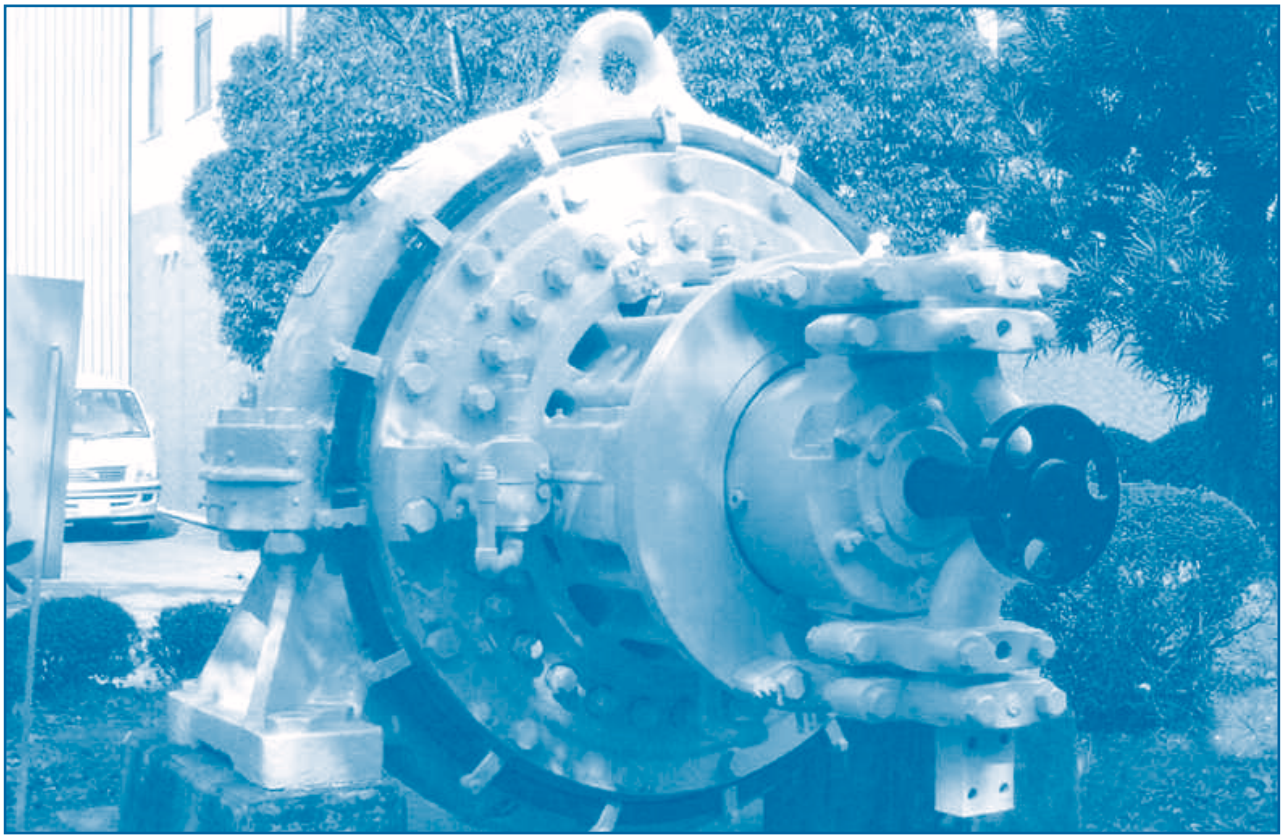
IEEE History Center

ISSUE 94, March 2014



An Alexanderson alternator dating from 1918, discovered last year in Japan. (see story page 5)

RUTGERS
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IEEE History Center

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—once in hard copy (March) and twice electronically (July and November) by the IEEE History Center.

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STATIC FROM THE DIRECTOR

By Michael Geselowitz, Ph.D.

2014 promises to be a remarkable year for IEEE's historical activities. In addition to continued expansion of our traditional programs such as Milestones, and our more recent programs, such as our social media (see page 4) and book publishing (see page 3) programs, the History Center is undertaking a major transformation of its IEEE Global History Network (GHN). Hard work during 2013 has led to agreement from our fellow Founder Societies to come on board a united web site for the history of engineering. The IEEE History Center has received a major grant from the United Engineering Foundation to adapt the GHN to the new task. We have an opportunity to use history to "change the conversation" about engineering—as the U.S. National Academy of Engineering has put it—and to build greater appreciation and understanding of the role of engineers in society.

The biggest change, however, is "hot off the presses." IEEE has just come to an agreement with Stevens Institute of Technology in Hoboken, NJ, USA, to relocate the IEEE History Center there in July 2014, when our agreement with Rutgers University expires. Stevens, which bills itself as "The Innovation University," is a premier, private research uni-

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**.

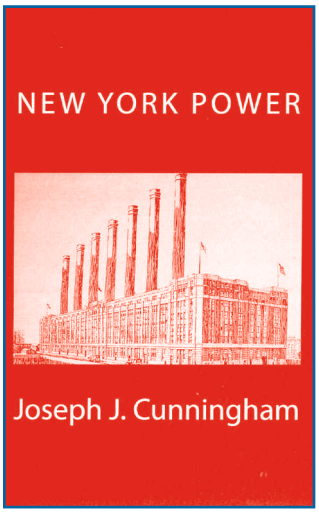
versity founded in 1870. Its mission to "advance the frontiers of science and leverage technology to confront global challenges" dovetails exactly with IEEE's goal of "advancing technology for humanity." Stevens is a leader in distance education, in pre-university STEM education and in technical communication, among other areas. Among its famous alumni are Louis Hazeltine, inventor of the neutrodyne radio, Peter Cooper Hewitt, inventor of the mercury arc rectifier, sculptor Alexander Calder, and Nobel laureate Frederick Reines. Stevens' College of Arts and Letters engages in research and scholarship at the intersection of science, technology, the arts, and humanities with the objective of having a positive and long-lasting impact on society and the world. These assets will position the IEEE History Center to move to the next level as a clearinghouse for information on the global history of engineering and engineers. Look for more details in the July 2014 newsletter!

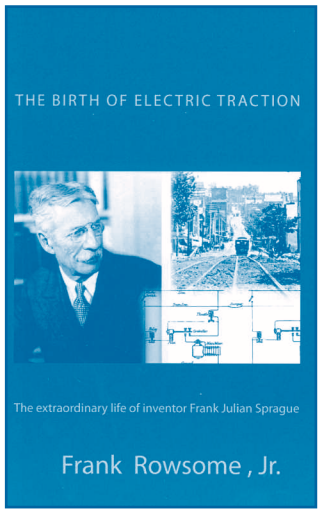
Finally, the IEEE Foundation is undergoing a strategic transformation, and has asked us to partner with them in rethinking IEEE's historical activities as a "signature program" that could undertake even greater philanthropic development. We are extremely grateful to you, our stalwart supporters, for your continued generosity that has enabled all the programs described above and throughout this issue. This issue is our annual opportunity to thank you all in print in our "Honor Roll of Donors" (see page 8, and I add my personal gratitude as well. I look forward to continuing to work with you and earning your support as our programs move forward in these exciting ways.

CENTER ACTIVITIES

THE IEEE HISTORY CENTER IS LOOKING FOR BOOK AUTHORS

The IEEE History Center Press is interested in working with authors to publish books on the history of electrical and computing-related technologies. For more information and for submission guidelines, please go to **www.ieeeghn.org/wiki/index.php/Archives:IEEE_History_Center_Book_Publishing**





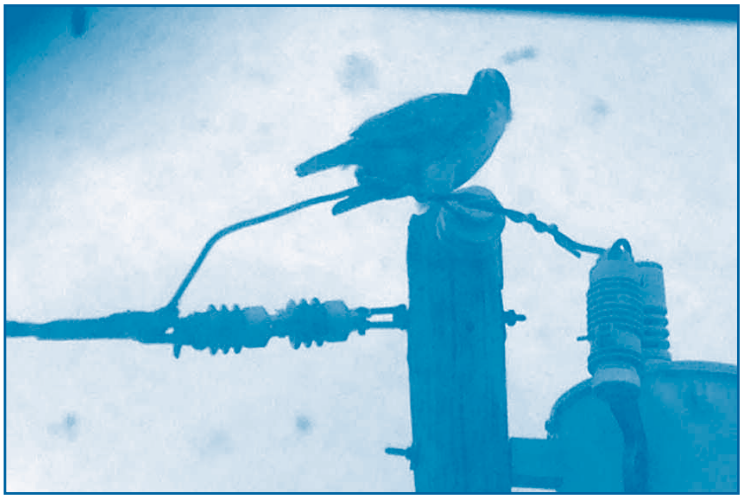
ARCHIVES UPDATE: HISTORICAL PHOTOS FOR IEEE'S INDIA OFFICE

When Harish Mysore, Director, India Operations, IEEE visited the IEEE Operations Center in New Jersey in the summer of 2013, he noticed the many historical photographs decorating the Center's corridors. He asked IEEE Archivist and Institutional Historian Sheldon Hochheiser if it would be possible to get a selection of photos to use similarly on the walls of the new larger IEEE India office in Bangalore. Hochheiser sent Mysore a set of 21 photos, but somehow these didn't fully meet his and his team's needs. Some things are just better accomplished in person. So, in December when Mysore returned to New Jersey, accompanied by other members of his team, IEEE India staff member Munir Mohammed arranged to work with Hochheiser at the IEEE Archives. The two together went through thumbnails of the 6,000 photos in the collection, and together selected 35 photos covering a wide range of both institutional and technical history. Among the photos selected were the AIEE and IRE Logos; portraits of more than a dozen prominent people in our fields including Ampere, Faraday, Steinmetz, Bell, Edison, Tesla, and Maiman; and technologies including a dynamo, an early light bulb, a testing laboratory, a radar dish, a radio telescope antenna, and an integrated circuit. Hochheiser then rescanned the photos at a resolution suitable for large size reproduction. To these photos, Munir will add photos portraying prominent Indians including Bose and Raman. So, like the Piscataway operations center, the IEEE India office will soon be using history to inspire today's technical leaders, and place their work in context.

IEEE HISTORY CENTER SOCIAL 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 **http://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 90,000 followers as of February 2014 and more than 18,000 social interactions. Three 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/**.



This visitor to the Center, (an immature red-tail hawk), ate its lunchtime pigeon on top of the utility pole outside Digital Content Administrator Nathan Brewer's office window recently.

THANK YOU TO OUR HISTORY CENTER DONORS!

Your support helps preserve the heritage of IEEE's technologies.

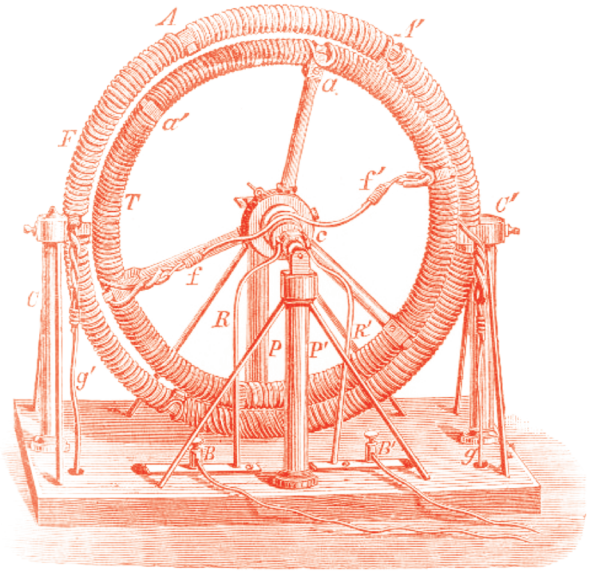


Image courtesy of Smithsonian Institution

JAPANESE-MADE 125KVA ALEXANDERSON ALTERNATOR REDISCOVERED IN FEBRUARY 2013

By M. Tari, K. Noda, Y. Ishikawa, D. Hiramatsu, K. Miyaike

A mystery was solved at Toshiba's Keihin Product Operations in early 2013, when a unique Alexanderson alternator was recognized for what it was and its history investigated. It turns out to be the very first alternator of its type to have been manufactured in Japan. In the 1900s, the growing need for a radio system capable of reliable, long distance communication accelerated development of powerful, continuous, long wave transmitters of a high frequency alternator type. After development of the 2kW Alexanderson alternator in 1908, General Electric shipped the first 200kW Alexanderson for intercontinental communication in 1918. High power alternators greatly contributed to increased communication volumes and decreased communication times.

Japan also wanted to introduce a powerful long wavelength radio system, however the imported equipment and technical references were difficult to come by, because in most countries the equipment was used primarily in military operations. These difficult circumstances forced Japan to promote its own development strategy, and its first 125kVA Alexanderson alternator was successfully developed in 1918 and started operation at the Hario transmitting station, Nagasaki. This was soon followed by success in developing 400kW and 500kW units. Around 1920, powerful electron tubes were made for use in radio communication. The advantages they enjoyed led to most alternators being scrapped or reused in other applications by around the end of 1950.

The 125kV Alexanderson alternator was rediscovered in February 2013. There are very few remaining long wave radio alternators today, and only two stations equipped with high frequency alternators remain open in the world. The 125kVA alternator is an historic artifact, and the only Japan-made large alternator that exists in Japan.

In June 1944, the 125kVA alternator was moved to the prime mover manufacturer where its application was not clear, and ultimately sent back to Toshiba Corporation.

Alternator Rating and Manufacturer

- Rating: 480poles -125kVA - 800V - 156 A - 3,000rpm - 12,000Hz
- Driving: Directly driven by DC motor rated 180HP -440V - 350A - 3,000/2,500rpm
- Manufacturer: Shibaura Engineering Works Co. Ltd, today's Toshiba Corporation

MAJOR FEATURES OF DESIGN AND CONSTRUCTION FOUND ON THE 125KVA ALTERNATOR

When the alternator was returned to the manufacturer for refurbishment, before being moved to another industry, design data was provided and these are still preserved.

Detailed studies show the unit is characterized by many distinguished design aspects. These design features and major construction are outlined below.

A. Compact and economic design

Generally, the main dimensions of an alternator increase in proportion to unit capacity, resulting in poor economic advantage due to undue machine volume. The 125kVA alternator was designed as a compact machine by application of high speed, resulting in decreased machine size and the highest "power density."

B. Higher efficiency

A compact design was secured by adopting a single-disk rotor with a large diameter, 1244.6mm. Meanwhile a high speed machine with larger disk induced difficult problems, mostly caused by high circumferential speed and centrifugal force. In particular, the air friction problem was more critical than anticipated. One suitable solution is a disk configuration designed on the basis of flow dynamics for steam turbine rotor, which showed that a disk with the right trajectory reduced windage loss. 240 slots machined as inductors on both disk surfaces were filled up with a nonmagnetic alloy to get smooth surfaces, and polished into mirror finish.

For reduction in high-frequency core loss, the 125kVA alternator adopted 3mil thick silicon magnetic steel that was developed by Shibaura Engineering Work, and the machined surface of the laminated armature core was chemically treated for elimination of inter-turn shorting between laminates.

C. Effective generation of electricity by application of small air gap

Effective voltage induction can be realized according to possible reduction in reluctance in magnetic paths. The alternator adopted a smaller gap of 1.5mm. The alternator provides inductors on both disk surfaces and two armatures facing each inductor through air gap. For effective voltage induction, the gaps between disk and armatures on each side should remain equal during operation. The alternator integrated an air gap equalizing mechanism to compensate for thermal expansion and thrust movement of the rotor shaft during operation.

The 125kVA alternator could be successfully developed in relatively shorter term according to closer collaboration with raw material suppliers and workers, in particular machine minders. The technical experience and knowledge gotten in the course of manufacturing were feed backed timely on the world largest 400kW high frequency alternator that was manufactured at the same time.

Continued on Page 6

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SURF CITY

A selection of sites which IEEE History Center staff have come across in the course of their work, and which might be of interest to our readers:

http://cudl.lib.cam.ac.uk/collections/longitude The archives of the Royal Greenwich Observatory, held in Cambridge University Library, include the complete run of the surviving papers of the Board of Longitude through the eighteenth century until its abolition in 1828. Invention and discovery, the energetic culture of technical ingenuity in the long eighteenth century, and exploration and maritime travel in the Pacific Ocean and the Arctic are featured.

www.computerhistory.org/collections/catalog/102746778 Interviews of applied mathematicians and computer science pioneers conducted by the Society for Industrial and Applied Mathematics (SIAM)

www.oberlinsmith.org/ A web site devoted to Oberlin Smith, pioneer of magnetic recording

http://blog.archive.org/2013/10/15/microcomputer-software-lives-again-this-time-in-your-browser

www.bl.uk/voices-of-science/ The British Library has one hundred oral histories by British engineers and scientists.

http://info.aiaa.org/tac/ETMG/HISTC/Gardner/default.aspx Aviation bibliographical resources, the U.S. WPA Bibliography of Aeronautics.

THINGS TO SEE AND DO

NORBERT WIENER IN THE 21ST CENTURY

2014 marks the 120th anniversary of the birth, and 50th anniversary of the death, of M.I.T mathematician Norbert Wiener, whose work influenced so many fields of interest to IEEE members, from his work in information theory and prostheses to his founding of cybernetics. To honor the occasion, a number of IEEE units, led by the IEEE Boston Section and the IEEE Society on Social Implications of Technology, is teaming with a number of other organizations to present a "Conference on Norbert Wiener in the 21st Century" to be held in Boston on 24 – 26 June 2014. The IEEE History Center is also serving as a technical co-sponsor. Full information on the conference can be found at **www.21stcenturywiener.org**.

VINTAGE COMPUTER FESTIVAL EAST

The ninth annual Vintage Computer Festival East will be held April 4-6, at the InfoAge Science Center, in Wall, New Jersey, USA. VCF East is a celebration of computer history from the 1940s-1980s. This year the IEEE History Center is serving as a technical co-sponsor. The schedule includes a hands-on exhibit hall, technical workshops, lectures, a marketplace, tours of the InfoAge museum complex, a dollar-per-pound book sale, prizes, and much more. This is one of the premier "swap meets" for computer and calculator collectors (A new feature on Friday 4 April, "VCF East University," will feature a full day of technical classes.)

The main show on Saturday – Sunday, 5 – 6 April, features family-friendly lectures/workshops and dozens of exhibits. Keynote speakers include former IBM archivist Paul Lasewicz and IEEE 802 LAN/MAN committee founder Maris Graube. Other lectures topics include software preservation and the history of Franklin Computer Corp. Registered exhibits so far cover everything from a real Apple 1 to the M.I.T.S. Altair to DEC minicomputers. In addition, the event's main sponsor MARCH (Mid-Atlantic Retro Computing Hobbyists) will debut its UNIVAC 1219-B military mainframe computer, circa 1965. Everything is hands-on!

Tickets for VCF East University are $20 and include a pizza lunch. Tickets for the main show are $15/day and $25/both days. Saturday/Sunday tickets are free for ages 17 and younger. A three-day adult admission is $40. Proceeds benefit MARCH. Full details are online at **www.vintage.org/2014/east/** or by contacting MARCH President Evan Koblentz at **evan@snarc.net** or +1 646 546 9999.

HOLD THE DATE FOR HISTELCON AND ICOHTEC 2015

Once again the IEEE History Committee and IEEE History Center will be technical co-sponsors of HISTELCON, the IEEE Region 8 history conference held about once every other year. The History Center is particularly happy to announce that HISTELCON 2015 will be held at Tel Aviv University in Israel on 16-21 August 2015, in conjunction with ICOHTEC 2015. It is being sponsored by the IEEE Region 8 and the IEEE Israel Section, and is also being organized in cooperation with the Cohn Institute for History and Philosophy of Science at Tel-Aviv University, the International Society for Science and Religion, and the Electrical Engineering Section of the Association of Engineers, Architects and Graduates in Technological Sciences in Israel (AEAI).

Founded in Paris in 1968, ICOHTEC (the International Committee for the History Of TEChnology) is the premier organization bringing together academic and public historians of technology on an annual basis. The HISTELCON series, previously held in Paris (2008), Madrid (2010), and Pavia (2012), is the recognition by IEEE Region 8 that history is a technical area worthy of its own conference outside of EUROCON.

The co-located conferences will build a comprehensive view of the worldwide development of high technologies and of their socio-cultural context, without any a priori limit on historical period. As always for conferences involving the IEEE History Center, the Conference will serve as catalyst for exchange of ideas from different technological fields. Participants with different backgrounds – engineers, historians, researchers in Science, Technology and Society, Museum curators etc. – will be welcome, in order to help in creating a network between researchers and practitioners from academia and industry that encourage interdisciplinary research. Young researchers and engineers will be especially welcome. HISTELCON 2015 will also provide a special opportunity to experience Israeli culture and to visit its archeological and historic sites as well as its academic and research institutions.

For more information, contact Jacob Baal-Schem at **j.baal.schem@ieee.org**.

DONORS AND SUPPORTERS

A MEMBER'S LEGACY PROMULGATES ENGINEERING HISTORY

Born in Bedford, Pennsylvania, in 1920, William "Bill" Middleton spent the majority of his life as an engineer dedicated to promoting the growth of engineering and its history.

Following his service in the Unites States Army Signal Corps, Bill received a Bachelor of Science in Electrical Engineering from Pennsylvania State University, PA, USA in 1947. He was involved in Section activities in the American Institute of Electrical Engineers (AIEE), one of the predecessor societies to IEEE. He served as the Vice Chair of the AIEE Sections Committee, which developed into the IEEE Regional Activities Board (RAB), and is now the Member and Geographic Activities (MGA). In 1990, RAB (now MGA) created the William W. Middleton Award for Distinguished Service to honor his achievements. The award is presented every three years to an IEEE Senior member by MGA.

Bill's influence on IEEE was felt in nearly every aspect of the organization. He chaired the committee responsible for Section Chair training and led the development of the Sections Operations Guide. He also assisted in the development of the

Continued on Page 8

United States Activities Board, served as Region 2 Director, served on the IEEE Awards Board, and was a member of the IEEE Board of Directors. In his 40 years of volunteer service, many of his ideas were implemented as policy, but Bill was never one to gloat about his accomplishments. "Don't worry about taking credit for things." he would say, "there is more personal satisfaction in seeing them happen and knowing you had a big hand in it."

William and Joyce Middleton

In particular, Bill was deeply interested in the history of the engineering field. His passion was so deep that he left two legacy gifts to the IEEE Foundation for the IEEE History Center totaling US$75,000. These bequests were recently fulfilled more than ten years after his death through the estate of his wife, Joyce Middleton, who passed away during November 2012.

The sheer size of his donations, in addition to the four decades he spent in service of IEEE, exemplify that he was "a hard worker, dedicated to IEEE and the profession, and over the years contributed greatly to IEEE's continued advancement and success," 2008 IEEE President Lew Terman recalls.

Bill's first bequest for US$25,000 will enable the IEEE History Center to support the development and publishing of IEEE history, the organization to which he dedicated half his life. The second bequest of US$50,000 combines two of Bill's interests – history and awards. It will support the newly established IEEE William and Joyce Middleton Electrical Engineering History Award. The award will be bestowed by the IEEE History Committee and will recognize the author(s) of a book in the history of an IEEE related technology that exemplifies exceptional scholarship and reaches beyond the IEEE and historian of technology communities toward a broad audience.

Bill believed in spreading the history of engineering beyond the borders of the field and into the public eye. "This award will encourage the kind of writing that Bill would have enjoyed," IEEE Life Fellow and IEEE Foundation, Vice President, Development Lyle Feisel explains.

Thanks to Bill's lifelong dedication to serving IEEE and his generous donations, the work and history of engineers is now more accessible to members, the engineering community and the general public alike. The IEEE Foundation will continue to acknowledge Bill and Joyce's extraordinary commitment by including their names on the roster of the IEEE Goldsmith Legacy League. To IEEE and the IEEE Foundation, they are *Forever Generous*. Read more about **William W. Middleton on the GHN: IEEE Global History Network.**

Bequests are the most common form of legacy giving. By leaving a bequest in your will or trust, you provide the crucial resources that allow the IEEE History Center to preserve, collect, research and disseminate the history of IEEE, its member, the profession and the related technologies. Bequests to the IEEE History Center Fund of the IEEE Foundation should be worded as follows: ***"I give the sum of $_____ [or all (or stated percentage) of the rest, residue, and remainder of my estate] to the IEEE Foundation, Incorporated, New York, NY for the benefit of the IEEE History Center Fund."*** Notify the IEEE Foundation of your intentions to leave a bequest in your will or trust and you will be invited to join the elite legacy giving donor recognition group — the **IEEE Goldsmith Legacy League** and be ***Forever Generous***. Donors may choose to remain anonymous. For more information visit **www.ieeefoundation.org** or contact the IEEE Development Office at +1 732 562 5550 or **donate@ieee.org**.

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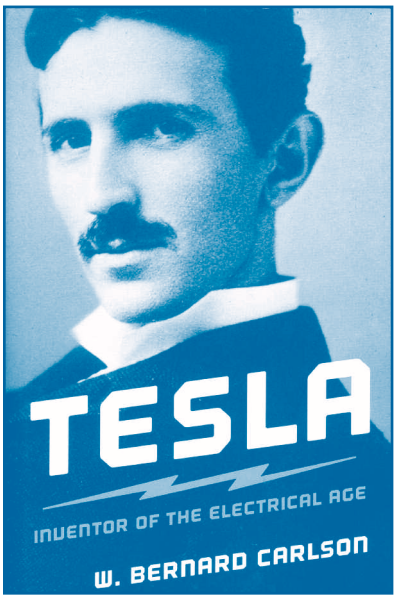
**Deceased*

CARLSON, W. BERNARD

Tesla: Inventor of the Electrical Age
Princeton University Press



Nikola Tesla is a name likely familiar to many readers of this Newsletter. Tesla is well known as the inventor of the AC polyphase motor and the associated system of power transmission, as a showman, as a rival to Edison, and as a person with a devoted public following in the early twenty first century that extends far beyond those interested in the history of technology. Much has been written over recent decades on this fascinating inventor; he even appeared, portrayed by singer David Bowie as an important character in *The Prestige* a 2006 movie about competing magicians. Yet, until this magnificent biography by Bernard Carlson, Professor of Science, Technology and Society at the School of Engineering and Applied Science at the University of Virginia (and past-chair of the IEEE History Committee), there has been no volume that has dealt fully with both Tesla's successes and failures while presenting Tesla's achievements with all the technical detail and sophistication that engineers will appreciate, and placing those achievement in the contexts of their era, the broader patterns of the history of invention and technology, and Tesla's personality and patterns of invention.

In the introduction, Carlson lays out his plan for the book:

> Previous biographies of Tesla have tended to be celebratory. In this book, I want to strike a balance between celebrating and criticizing Tesla; as suggested, he had a spectacular ascent (1894-1904) followed by an equally dramatic descent (1895-1905). The task for a Tesla biographer is to piece together his life so that both the ascent and descent makes sense. (p. 6)

Carlson succeeds in the task he laid out for himself.

He begins with two and one half chapters on Tesla's childhood, education, and early career in Europe, culminating in his June 1884 move from Thomas Edison's Paris operation to his New York headquarters, and his separation from Edison after six months. Tesla would make New York his home for the rest of his life.

Tesla then set out on his own, inventing a thermomagnetic motor in 1885-1886, which attracted the attention of two business-oriented backers knowledgeable in electricity, Charles Beck and Alfred Brown. Tesla next turned to alternating current, and soon devised a polyphase AC motor. With encouragement, advice, and guidance from Peck, Tesla developed this motor into a patentable system of motor and an associated transmission system, culminating in a set of seven patents awarded on 1 May 1888. Tesla then set out to promote his invention, in hopes of selling or licensing it to an appropriate manufacturer. Carlson points out that in pursuing this Tesla, Peck, and Brown pursued an alternate business strategy than the better-studied late 19th century practice of an inventor going into business the route followed by inventors such as George Eastman and Thomas Edison. The centerpiece of Tesla's promotional effort was a successful lecture to the American Institute of Electrical Engineers (a predecessor of IEEE) on 16 May 1888. Peck succeeded in selling the patents to George Westinghouse for a combination of cash and royalties on 7 July. Westinghouse saw AC current as a way to diversify his company into the new field of electric power. Peck took ill and died in 1890. Never again would Tesla have a solid partner to help shape his ideas into a practical invention and successfully market them.

The polyphase AC system, after further development at the Westinghouse Company, achieved striking commercial success in 1893, when, with a substantial assist from Tesla, Westinghouse succeeded in selling polyphase AC current for use in the massive hydroelectric project at Niagara Falls, New York. By 1896, 20 generators based on Tesla's work were producing AC electric power that was delivered for use in Buffalo, 20 miles away. Within a few years, power from Niagara Falls was distributed widely throughout New York State.

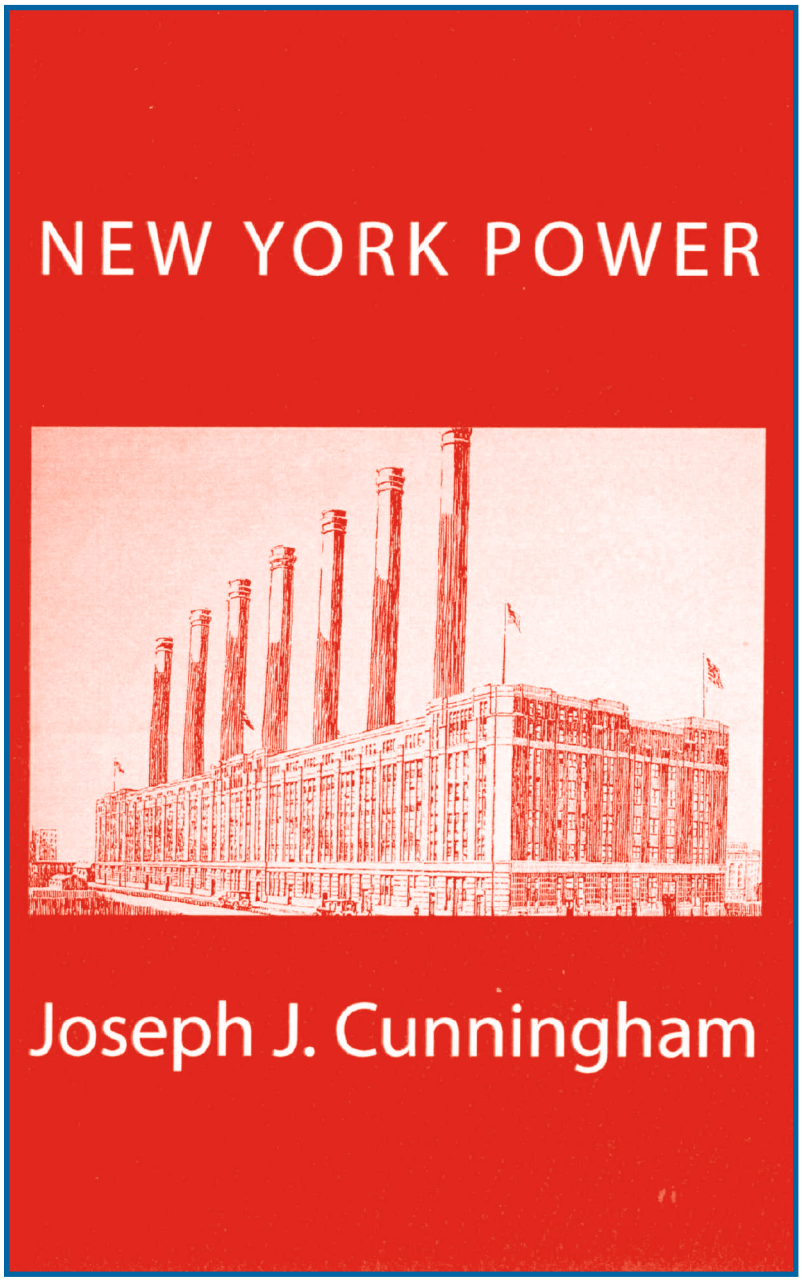
In the meantime, Tesla had become interested in high-frequency, low amperage AC electrical currents. This led to his invention of the Tesla Coil, beloved of science demonstrations everywhere, and to an abiding interest in wireless lighting. Tesla addressed the AIEE again in 1891, but this well received lecture was filled with flashy demonstrations as much as by sober discussion of technical issues.

By 1893-1894 Tesla had become seriously interested in the wireless transmission of power through the earth, an interest that he would pursue for the next decade, but one which unlike his earlier work would ultimately yield neither technical nor commercial success. Carlson carefully traces the path of this work from New York to Colorado Springs and finally Wardenclyffe on Long Island. He demonstrates how, in contrast to Tesla's polyphase AC work, Tesla gradually became so convinced of his theory, his ideal, that in his research he came to seek confirmation only, rather than look as well for evidence that might disconfirm what he knew to be true. Tesla stopped being open to alternatives. For this and other reasons, he ultimately could not get the financial support needed to continue. Financier J. P. Morgan provided $150,000 that Tesla used to finance his work, and construction of the Wardenclyffe laboratory, but then refused to provide more; nor could Tesla find other investors. His wireless power work garnered wide interest in the popular press but skepticism in scientific and technical circles. In the early twentieth century, Tesla had become wrapped up in his illusion, claiming in a letter to Morgan that wireless power, of which he was the inventor, was the most important invention of all time. But wireless power was not to be. Ultimately, there was a disconnect between what Tesla believed would happen and the way the Earth worked. Tesla suffered a nervous breakdown in 1905. Though he recovered, and lived another 38 years, he would never again pursue such grand projects as AC electricity and wireless power. In 1917, in recognition of his achievements, the AIEE awarded him its highest honor, the Edison Medal.

This short summary can only begin to touch on the richness of this biography; to get the full measure of Carlson's portrayal of Tesla, go and read the book. You'll find it well worth the time.

by Sheldon Hochheiser

Available the Princeton University Press, Princeton NJ. **http://press.princeton.edu/** Hardback $29.95. ISBN: 9780691057767, 520 pp., index, illus.



NEW YORK POWER

by Joseph J. Cunningham
published by the
IEEE History Center

New York City's density placed unique constraints on its electric light and power supply. Electrification began during the 1880s, but many innovations were required to supply urban service at a cost that would make possible large-scale consumption.

New York Power tells the story of the electrification of the one of the densest electrical load areas in the world, it was also where alternating current challenged and then ultimately vanquished the original direct-current system.

Author Joseph J. Cunningham has consulted a variety of historical sources to bring us the story of the massive and sustained effort to develop New York City's electric utility system. He has researched and authored numerous articles and books on topics such as industrial electrification and electric rail transportation, and has taught widely on the history of electric power systems and consulted on numerous electro-technology projects and television productions. Lionel Trains has consulted him on the historical details of its model trains.

Available from
http://www.amazon.com/New-York-Power-Joseph-Cunningham/dp/1484826515/ref=sr_1_1?s=books&ie=UTF8&qid=1383598253&sr=1-1&keywords=cunningham+new+york+power
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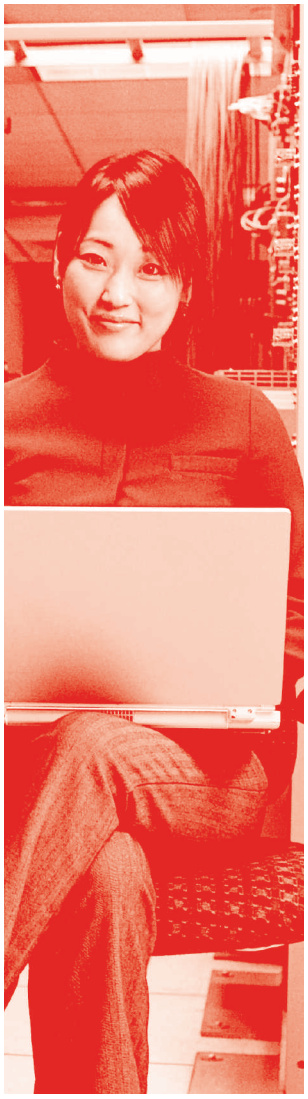

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