IEEE History Center

ISSUE 101, July 2016

SERVING THE MEMBERS; SERVING THE PROFESSION

Students at Manalapan High School use towels to simulate darkness or fog while guiding themselves with compasses they made as part of the REACH learning module on the history of maritime navigational technologies.

STEVENS INSTITUTE of TECHNOLOGY
THE INNOVATION UNIVERSITY

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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SIGNALS FROM THE DIRECTOR

By Michael Geselowitz, Ph.D.

Those who were paying attention to our March newsletter (issue 100!) will have noticed that the title of my column has changed from "Static from the Director" to "Signals from the Director." This was done to reflect that my column adds to and helps to focus the message of the newsletter. That message is that the IEEE History Center staff are working hard—hand-in-hand with the IEEE History Committee—to fulfill our mission to help preserve, research and make known the proud heritage of IEEE, its members, their professions and industries, and, most importantly, the underlying technologies.

In keeping with the theme of messages and outreach, I would note that in late May, I had the opportunity to address a large group of residents of Piscataway, New Jersey, U.S.A.—where the main IEEE Operations Center is located—on the history of IEEE and its relationship to the town. The lecture was organized by the Piscataway Historical and Heritage Society as part of a series on local businesses and organizations in celebration of the 350th anniversary of the founding of the town. I was told afterward that it was the

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 Engineering & Technology History Wiki, Milestones, and Oral History Collection, please click on **www.ieeefoundation.org/donate_history**

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, and 2 October.
For more information, contact Robert Colburn at **r.colburn@ieee.org**.

largest audience for the series, and that my remarks were greatly enjoyed.

The Piscataway Senior Center was somewhat an unusual venue, but if you look throughout this issue you will see that History Center staff are using a variety of channels, from scholarly to popular, to present and publish our work and get the word out (see page 4), while the Engineering & Technology History Wiki continues to add fascinating material (see below). At the same time external journalists and scholars are using our materials to tell the story to other audiences and in other ways.

Our newest audience, as you have been reading the past few issues, is the pre-university student who will be served by our new REACH Program. REACH is really starting to gain traction (see page 4), and you will be hearing even more about it in issues to come.

In addition, although not featured in this issue, our other programs such as IEEE Milestones and oral histories continue to thrive. As always, I would like to thank you, our supporters, for your generosity that makes all of this activity possible.

HISTORY COMMITTEE ACTIVITIES

HISTORY COMMITTEE CHAIR'S MESSAGE

By Allison Marsh

I am writing this column while en route to Singapore for the annual meting of the Society for the History of Technology (SHOT). Although SHOT does not have an official affiliation with IEEE, it has definite overlapping interests with the History Committee. In 2014 and 2015, the History Committee held its fall meeting at the SHOT annual meeting, which has allowed great opportunities for IEEE members to mingle with professional historians. Sometimes the engineers even chime in to correct the historical record!

I believe that these types of informal social interactions are mutually beneficial and open the lines of communication across disciplines. By engaging with academic historians, IEEE members make sure their voices are heard and historians are kept on their toes.

SHOT has several Special Interest Groups (SIGs) that are of particular interest to IEEE. They include The Jovians, who focus on the history of electrical technology, and The Mercurians, who focus on communication history. The Special Interest Group for Computers, Information, and Society (SIGCIS) is especially active, often waging public campaigns for accuracy in journalism reports on all aspects of computer history. The Promethians focus explicitly on engineering education. Region 10 members may be interested in joining the SHOT Asia Network. There is also a group that focuses on Women in Technology History (WITH) and one that is Exploring Diversity in Technological History (EDITH) – two areas of ongoing interest for IEEE. I have to admit that one of my favorite groups is TEMSIG – the technology and museum group, but— as past chair— I may be a bit biased. History Center Outreach Historian Alexander Magoun will be addressing the SIGs during their plenary session in Singapore. More information on the SIGs can be found here: **http://www.historyoftechnology.org/interest_groups/index.html**

Another connection is through the Bernard S. Finn/IEEE History Prize. Generously supported by the IEEE Life Members Fund, this prize is awarded annually to the best paper in electrical and computing history, as selected by a committee appointed by SHOT.

Next year the SHOT conference will be held in Philadelphia, Pennsylvania, 26-29 October 2017. I hope I will see some of you there.

SERVING THE MEMBERS; SERVING THE PROFESSION

IEEE ETHICS HISTORY REPOSITORY

Proposed by Walter Elden, the IEEE Ethics History Repository (IEHR) is an online collection detailing and preserving the history of IEEE and its predecessor societies' involvement in ethical practices. The AIEE's establishment of a code of ethics in 1912 was the first code of ethics adopted by a major American engineering society. In 1978, IEEE formed the Member Conduct Committee with the goal of providing ethical support to engineers whose employment was placed in jeopardy for trying to uphold IEEE's code of ethics.

The IEHR can be viewed on the Engineering and Technology History Wiki (ETHW) and contains dozens of primary documents, opinion pieces, articles, conference papers, oral histories, and first hand histories, as well as links to hundreds of articles on topics related to engineering ethics. The repository aims to be a comprehensive collection of IEEE's ethical activities, and the History Center invites any IEEE member to contribute any first hand historical information, papers, documents, or artifacts to the repository.

To view the repository, comment on it, or add material, please visit the page on the ETHW at:
http://ethw.org/IEEE_Ethics_History_Repository_%28IEHR%29

IEEE HISTORY CENTER ON TWITTER AND TUMBLR

The IEEE History Center is bringing history to increasing numbers of 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 167,000 followers as of June 2016 and more than 226,000 total social interactions. To date, six of the posted images were featured on Tumblr's *radar,* a feature that allows the Tumblr staff to broadcast selected images to all logged-in users. These posts receive significantly more social interactions, the highest reaching 26,000. To follow the blog or to view the images, go to **http://engineeringhistory.tumblr.com/**.

REACH UPDATE

"NAVIGARE NECESSE EST": IEEE HISTORY CENTER'S REACH PROGRAM PILOTED IN MANALAPAN

Excitement, curiosity, and laughter filled two history classrooms at Manalapan High School on 10 June when history teachers Brian Sullivan and James Somma introduced the IEEE History Center's first REACH pilot on maritime navigation in their classrooms. "It was wonderful to see the program come to life and watch how the students reacted to all the elements that encompass REACH, from the videos and hands-on-activities, to how the teachers brought to life the importance of the power of the sea, and how the navigational technology developed at that time in history affected society," states Kelly McKenna, REACH Program Manager. "It was thrilling to see the collaboration of so many people come together in an engaging and effective lesson plan from which the students walked away with a true understanding of how technology impacts humanity, economically, socially, and civically."

IEEE Senior Historian John Vardalas worked with Michelle Lilley, Manalapan Social Studies Supervisor, to create the inquiry unit (lesson plan) for the maritime navigation pilot. In addition, Dr. Vardalas provided the teachers with background information on the history of maritime navigation technologies and their connection to social studies. "Understanding the power of the sea is important," Dr. Vardalas believes, "as Sir Walter Raleigh proclaimed at the close of the sixteenth century: 'Hee that commands the sea, commands the trade, and hee that is Lord of trade of the world is Lord of the wealth of the world.'" To command this hostile environment, advances in science and engineering were essential. Finding one's way across the oceans was far more difficult than on land, and errors often proved fatal.

This pilot's focus was on the magnetic compass and Portolan charts. From those devices, the inquiry unit follows the evolution of technologies associated with measuring space and understanding the earth as a sphere, and further explores the history of determining latitude and longitude at sea. This REACH inquiry unit emphasizes how the need to master the sea drove science and engineering. Societies who were at the forefront of advancing navigational instruments gained commercial and political preeminence in the world. This REACH inquiry unit comes full circle by showing that today's navigational technologies, such as the GPS, are based on concepts developed hundreds of years ago, with satellites replacing celestial bodies for accurate determining of one's location.

This compass made by Manalapan students as part of the REACH pilot uses the same components as 14th-century compass: a bowl, a float, and magnetized needle.

The Manalapan students who participated in the REACH pilot gained hands-on knowledge and understanding of how maritime navigation technology affects trade and economic viability. As Veronica Feather, one of the students in the Manalapan pilot expressed, "If society needs to advance, it will ask something of technology and science, but then sometimes science will advance faster than society and that in turn will advance society."

Interested in both science and engineering, as well as philosophy, Shreyas Selvaraj, another Manalapan student expressed, "If I only liked philosophy or the humanities, there is a whole other side to knowledge and how you can view the world. It's really interesting to find the connections between them and what we are learning here is food for thought."

The maritime navigation REACH pilot was a success with the teachers as well as the students. Social Studies Supervisor Michelle Lilley explained, "My experience with the IEEE has enlightened me to the importance of including scientific processes as a part of history; our progress as humans and societies is contingent upon new ideas becoming a reality. Engaging students in hands on experiences allowed for them to make connections between science and history; reinforcing their understanding of the challenges faced by past generations and giving them insight as to those they may face in their lifetimes."

This REACH pilot was a success, and it will be further enhanced to create a more in-depth inquiry unit that will be re-introduced in the classroom this September. REACH offers teachers and students a new way to understand the importance of technology throughout history.

You can support REACH by clicking on **https://www.ieeefoundation.org/donate_history** and choosing "IEEE REACH Fund" at the "Designation" box.

SENIOR HISTORIAN DR. JOHN VARDALAS RETIRING

With mixed feelings, the IEEE History Center announces the retirement of Dr. John Vardalas, Senior Historian, effective 1 July 2016. John has been an invaluable member of the History Center team and will be greatly missed. On the other hand, after more than ten years of indefatigable work for the History Center, he has earned his rest.

John became affiliated with the History Center as a Rutgers University postdoctoral fellow. After two years, he joined the IEEE History Center as a full-time Research Historian on 2 January 2008. Holding a B.S. in physics, an M.Sc. in mathematical physics, an M.A. in geography (economic), and a Ph.D. in history, and having worked in a number of museum and academic positions, John became a key part of the History Center's professional core. John was vital in developing the IEEE Global History Network, the award-winning site that evolved into the Engineering & Technology History Wiki. In 2013 John was promoted to Senior Historian. When the History Center relocated to Stevens Institute of Technology, John developed a new course on the history of pre-modern engineering that incorporated engineering lab sessions into the historical framework. A paper written with Center Director, Dr. Michael Geselowitz, on the pedagogy of the course, presented at the May 2015 Northeast Section Conference of the American Society for Engineering Education won the "Outstanding Faculty Paper" prize.

John has had a number of important publications both prior to and after joining IEEE. In 1994, with Dr. Norman Ball, he published *Ferranti-Packard: Pioneers in Canadian Electrical Manufacturing* (Montreal: McGill-Queens University Press, 1994). His 1996 doctoral dissertation on the history of Canadian computing won the best thesis award from the Canadian Historical Association, a rare feat for a work in the history of technology. A book that developed out of his thesis work, History of the Computer Revolution in Canada: Building National Technological Competence (Cambridge, Mass: The MIT Press, 2001), won the American Association for History and Computing best book award for 2002. His most recent paper, "Robert A. Millikan: measuring the controversies of an electron's charge," was published in *Proceedings of the IEEE*, (Vol. 104, 2016, Issue 6, 1354-9).

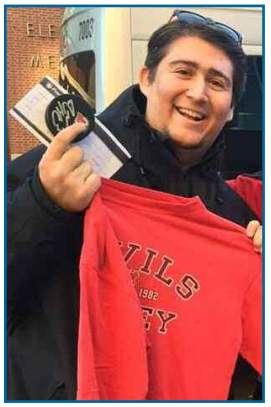
Outside of work, John enjoys many outdoor activities including global travel, skiing, scuba-diving, and—especially—sailing. We hope that retirement will give him more time for these pursuits, which he loves to share with his wife, Dr. Karen Lapsley. He and Karen particularly look forward to cruising around the West Coast on their 44 ft. sailboat. However, since Karen intends to continue as Chief Scientist for the Almond Board for a few more years, perhaps John will also finally find the time to write that history of the recreational sailing industry. Either way, we wish him the best of luck.

STAFF NOTES: MEET THIS SUMMER'S INTERNS

The History Center is pleased to welcome this summer two Interns, Alexander Slizewski and Joseph Strokusz.

Alexander Slizewski joins the Center's team as the Life Member Summer Intern. This internship is supported through the generosity of Emerson and Betsy Pugh and provides young scholars of the history of technology with valuable research experience and an opportunity to work with the History Center staff on a variety of projects. He is currently a student at Stevens Institute of Technology, the Center's strategic educational partner, where he is pursuing an undergraduate degree in Science & Technology Studies and a minor in Pre-Law and Policy Making. His prior experiences include an intellectual property research project at Stevens, an externship at JPMorgan Chase, and numerous student leadership positions.

As an intern at the IEEE History Center located on Steven's campus, Alexander is performing historical research on topics that include science, technology, and business related subjects. Alexander is also interested in pursuing law school, where he plans to study copyright, patent, or general intellectual property law. He is very happy working with IEEE over the summer, and looks forward to supporting the organization.



Joseph Strokusz has been hired through the regular IEEE Summer Internship Program. This is the first time that the History Center has taken advantage of this program. Joe will be working with Kelly McKenna on the IEEE REACH Program. He is a student at Stevens where he is a rising senior in the Visual Arts & Technology program. He grew up in Jersey City, NJ, lived in Hoboken for two years, and now commutes from home. Joe has been passionate about video production since his sophomore year of high school and says that this internship is the perfect fit for him. Since starting college, his interests have broadened to include motion graphics and audio production, as well as augmented and virtual reality. Joe has been involved with the Stevens Dramatic Society for two years, acting as the Lighting Designer for several shows, and is also the technical manager for the Stevens student performing arts center. He brings a wealth of multimedia skills that will be a great help in developing REACH.

In his spare time, Joe enjoys playing guitar, riding his bike and playing video games. He is also a passionate hockey fan, particularly the New Jersey Devils, and has a Devils ticket membership for the 2016-17 season.

PHILANTHROPY IS BRINGING TOGETHER THE PHYSICAL AND VIRTUAL WORLDS

Richard (Dick) and Nancy Gowen (photo to left) have a long history of service and generosity to IEEE and its philanthropic arm, the IEEE Foundation. Since becoming a member in 1957, Dick has served IEEE in many capacities including as the 1984 IEEE President; IEEE Foundation President; and Chair, IEEE History Committee. During his tenure, he and Nancy have been instrumental in several key IEEE projects.

In 2015, Dick and Nancy made a multi-year pledge to the IEEE History Center Fund of the IEEE Foundation to enable the completion of the addition of Quick Response (QR) Codes to the photographs, busts and artifacts in multiple IEEE locations and to support the History Center's overall operations.

The QR Codes bring together the physical historical artifacts with the virtual world. By scanning the codes, volunteers, visitors, and staff will gain immediate access to articles on the Engineering and Technology History Wiki (**www.ethw.org**), where they will learn about the person, place, or technology depicted.

A plaque (photo above) acknowledging the Gowen's generosity is strategically located on the conference level of the IEEE Operations Center, Piscataway, NJ, USA.

YOUR DONATIONS AT WORK

With your support, the IEEE History Center has accomplished impressive things so far this year. We want you to know where your donations are going, and some of the ways they are being used.

Highlights of book and journal publications by IEEE history center staff:
The many articles and books written by IEEE History Center staff are highlighted on the newly-formatted page on the ETHW: **http://ethw.org/Archives:Books_and_Archival_Publications**

The page provides links to some of our "greatest hits" measured by readership statistics and publication reach. We invite you to browse; we hope to surprise you with the breadth of interesting topics we've explored.

REACH promotional video:
The promotional video for our REACH (Raising Engineering Appreciation through the Conduit of History) program is online. This is an exciting introduction, and a foretaste of the course modules.

https://www.youtube.com/watch?v=5vmMxJrt3F4&feature=youtu.beb9?projector=1

Providing Assistance to Scholars:
The History Center multiplies its impact by assisting scholars and policymakers, thus spreading the importance of technology to a wider audience. This year, the IEEE History Center assisted authors of five books, multiple technical articles, a masters thesis, and a report by a government energy agency. Two high-school students we helped with their History Day projects won their state championships, and will compete at the national contest. We also consulted on the PBS documentary "Pioneering Power" **http://www.cpt12.org/local/production-partners/pioneering-power/**

Want to get involved in technical history?
Our Engineering and Technology History Wiki (**http://ethw.org**), receives an impressive 114,418 page views per month (up 29% from last year). The ETHW is a platform which allows people to write their first-hand histories, or topic articles. We invite you to use it to write yours.

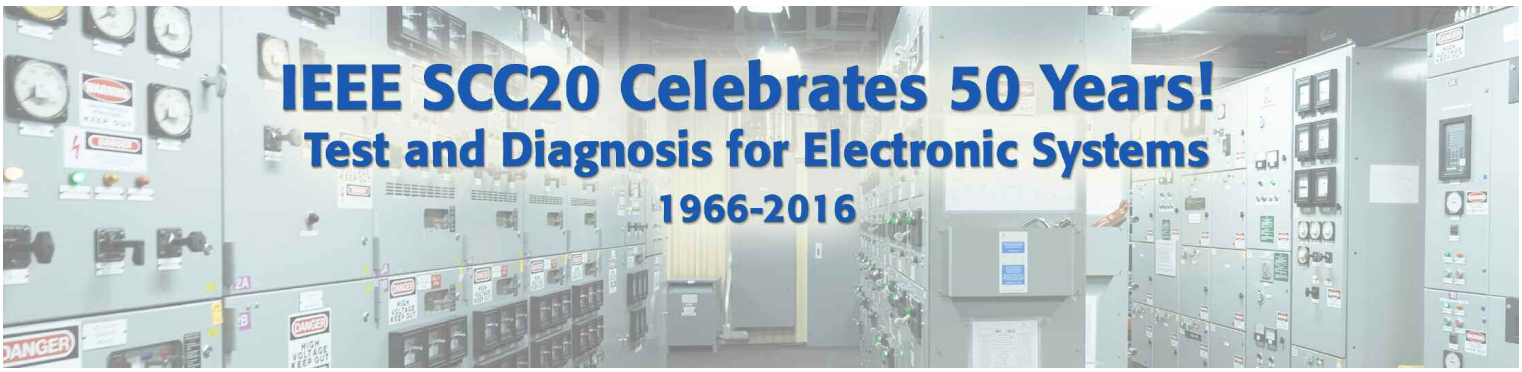
IEEE LIFE MEMBERS FELLOWSHIP BIOGRAPHY

Thomas Turnbull is a historian and geographer from Dorset, Great Britain. He is currently finishing his doctorate at the University Of Oxford. Thomas is grateful to have been awarded the 2016-2017 IEEE Fellowship In The History Of Electrical And Computing Technology in order to develop a study of the history of energy conservation. His proposed research project, *Computerisation and the Science Of Energy Conservation In The United States in the Years 1971-1980*, is intended to document the role computer science and new computational technologies played in the development of a science of energy conservation in a decade of marked energy crises. The study addresses the contributions made by the National Science Foundation, Oak Ridge National Laboratory, the Lawrence Berkeley Laboratory, the Ford Foundation, and, of course, the IEEE, in developing a variety of techniques for conserving energy, ranging from improving an individual appliance to reconfiguring the entire economy and infrastructure of energy use. Before beginning his doctoral research Thomas worked as a bibliometrician, a policy advisor for a British environmental think-tank, and as a researcher on a project documenting endangered languages at Cambridge University. He is currently a Junior Fellow at 'MECS', a research institute at Leuphana University in Lüneburg, Germany where he is carrying out a study of the RAND Corporation's computational modelling of energy demand in California in the early 1970s. With the support of the IEEE Life Members Fellowship Thomas will have the opportunity to prepare a manuscript and to visit a number of important archives across the United States.

GERARDO CON DIAZ WINS YALE'S PRESTIGIOUS PORTER PRIZE

The 2015-2016 IEEE Life Members' Fellow in the History of Electrical and Computing Technology, Gerardo Con Diaz was a cowinner of Yale University's prestigious Porter Prize for his thesis *Intangible Inventions* completed while he was a fellow. The John Addison Porter Prize is a university-wide award given for a written work of scholarship in any field in which it is possible, through original effort, to gather and relate facts and/or principles and to make the product of general human interest. The award was established in 1872 by the Kingsley Trust Association (The Scroll and Key Society) in honor of the late Professor Porter, who received a bachelor's degree from Yale in 1842. The IEEE History Center is proud that IEEE was able to support his research.

A BRIEF HISTORY OF STANDARDS STEERING COMMITTEE 20



CELEBRATING A HALF-CENTURY OF WORK ON AUTOMATED TESTING STANDARDS: IEEE STANDARDS STEERING COMMITTEE 20

By Mike Seavey, Chair, IEEE Standards Steering Committee 20

2016 marks a half-century of collective efforts to improve automatic test systems (ATS) through work on standards, and that's worth celebrating for several important reasons. First, this effort – directed by the IEEE Standards Steering Committee 20, carried out by myriad working groups – began with a single standard for the commercial aviation industry. It eventually encompassed a family of more than thirty related standards that apply to the United States' and NATO's military capabilities on the ground, at sea and in the air. Second, the work in this area

Continued on Page 8

represents decades of data-gathering on component and system failures that today form the basis for more rapid and accurate troubleshooting and even "prognostics" – the ability to predict maintenance needs and/or incipient failures. Third, the history of this family of standards reflects on the strengths of the IEEE Standards Association (IEEE-SA) as a globally-respected standards development organization with a transparent, inclusive process trusted by industry and government. It reflects how standards are living documents that evolve to meet new needs and changing circumstances.

Fifty years ago, commercial aviation needed a standardized language for expressing test specifications and procedures. What emerged was ATLAS, an Abbreviated Test Language for All Systems – an English-like description of a test of an electronic component readable by computers as well as humans. In need of a reputable third party to complete the work, the industry turned to IEEE-SA. A decade later (1976), the IEEE-SA Board approved IEEE/ARINC Standard ATLAS Test Language, IEEE Standard 416™–1976. The avionics industry embraced the standard and, gradually, it was used in military applications. The U.S. Department of Defense soon designated it an interim standard.

As stakeholders recognized new needs, working groups developed more than thirty specific standards in related domains. The IEEE 1505™-based series, for instance, addresses the mass interconnect to the automated test equipment station itself, the hardware interface on how signals get in and out of whatever electronic component is being tested, and extends to the instrumentation in use. The IEEE 1232™-based family of standards encompasses artificial intelligence, diagnostic reasoning, and expert systems. The IEEE 1636 series covers maintenance information.

The data gathered through the application of these and related standards have formed the basis for improvements in condition-based maintenance as well as prognostics that embody the promise of data analytics. Prognostics will make maintenance schedules more data-centric and condition- and priority-based. And many of these standards are being revised as issues such as cybersecurity arise. Cybersecurity was an unknown field in 1966, but has in the computer and Internet age vaulted to the top of our concerns.

Accomplishing this would be impossible without a diverse set of volunteer subject-matter experts (SMEs), dedicated support staff and the co-sponsorship of the IEEE Computer Society, the IEEE Instrumentation & Measurement Society and the IEEE Aerospace & Electronic Systems Society. As one might guess, fifty years' work comprises a multi-generational effort.

The work continues; by its nature, it perennially needs new blood. If you have expertise in testing and diagnostics for electronics, you are cordially invited to contribute to our ongoing work. The benefits of participation include professional networking, career building, and insight into and influence on how ATS standards for commercial aviation and national defense are defined and addressed.

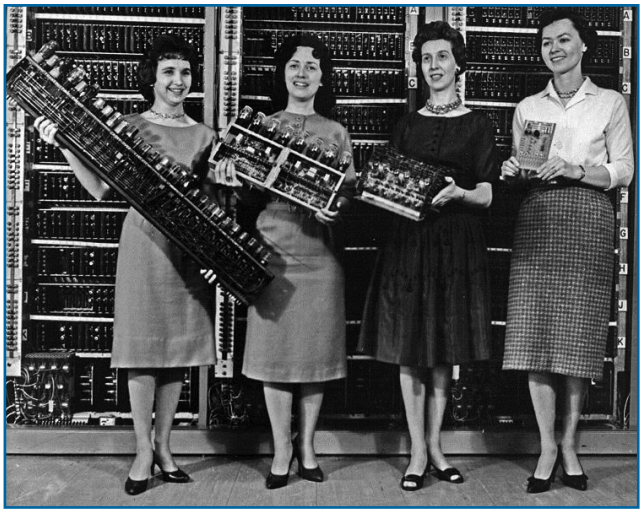
THINGS TO SEE AND DO

AWA MUSEUM EXPANSION AND 2016 CONVENTION

The Antique Wireless Association will complete the installation of new Western Union telegraph displays in the Antique Wireless Museum by August in time for the 2016 AWA Convention. The displays include the recently-donated collection from the former National Telegraph Museum. This historically important collection includes many rare Civil War items, Samuel Morse's manuscript circuit diagrams, and hundreds of other artifacts.

The AWA Convention will be held Wednesday, August 17 to Saturday, 20 August 2016 at the RIT Conference Center in Rochester, NY. The dual themes this year include Pre-Broadcast Wireless and Zenith Radio. For additional information, see the AWA website at
http://www.antiquewireless.org/annual-convention.html

TEST YOUR HISTORICAL KNOWLEDGE WITH THE IEEE HISTORY CENTER'S PHOTO CHALLENGE



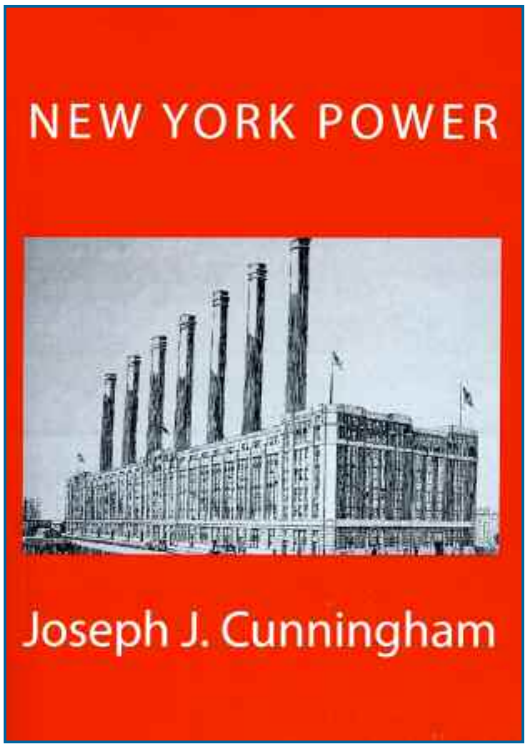
Do you know what is happening in this photograph?
As a way of connecting to a wider audience, the History Center has set up an ongoing photo quiz page at:
http://www.ieee.org/about/history_center/photo_challenge.html

DOCUMENTARY ON ROBERT MOOG AND SYNTHESIZED SOUND TECHNOLOGY

Former IEEE life member Bob Moog made major contributions to the development of electronic synthesized sound technology, and also had close and influential relationship with many artists of many genres of music and the music industry. The Bob Moog Foundation, established by Bob Moog's daughter Michelle Moog-Koussa and family, is planning to produce a documentary, "Electronic Voyager: Retracing Moog's Sonic Journey." The foundation's mission is to ignite creativity at the intersection of music, science, history and innovation, and the preservation of Bob Moog's archives and musical inventions in a future interactive museum, or Moogseum, online and in Asheville, NC, U.S.A. **http://moogfoundation.org/**

Your contributions to the IEEE History Center Fund preserve the heritage of the profession and its contributions to humanity. We invite you to find out more about the Center and its programs at
http://www.ieee.org/about/history_center
and more about the Engineering & Technology History Wiki at **www.ethw.org**

BIBLIOGRAPHY



NEW YORK POWER

by Joseph J. Cunningham
published by the IEEE History Center.

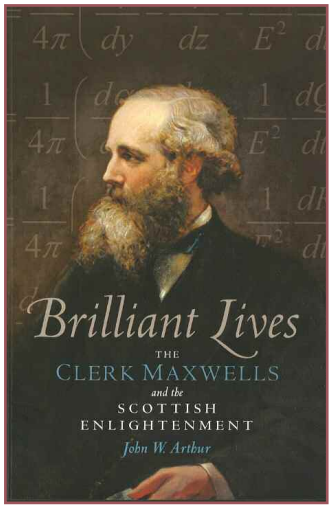
New York City's density placed unique constraints on its electric light and power supply. Electrification began during the 1880s, but many innovations were required to supply urban service at a cost that would make possible large-scale consumption.

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** in hard copy and on Kindle.

ARTHUR, JOHN W.,
Brilliant Lives: The Clerk Maxwells and the Scottish Enlightenment, Birlinn Ltd., Edinburgh, 2016



Historians have long been fascinated by the disproportionate representation of Scots among the major figures of both the Enlightenment and the Industrial Revolution, especially in the areas of science and technology. One of the major figures of the latter period is James Clerk Maxwell, the great physicist whose seminal publication on electromagnetism is an IEEE Milestone in Electrical Engineering and Computing (**http://ethw.org/Milestones:Maxwell's_Equations,_1860-1871**).

Many historical accounts of the Scottish Enlightenment and of the Scottish Industrial Revolution, and biographies of Maxwell have been published. John W. Arthur, a decorated physicist and Senior Member of IEEE, has produced an innovative and engaging addition to the literature. Instead of focusing on society as a whole or on James Clerk Maxwell in particular, he has written a group biography of the Clerks, the Maxwells, and the other interlocking middle-ranking Scottish families to whom James Clerk Maxwell was related. Arthur engagingly traces the families and their many members over the course of 300 years, revealing that Maxwell's relations included, among other key figures, the economist Adam Smith and the novelist Sir Walter Scott!

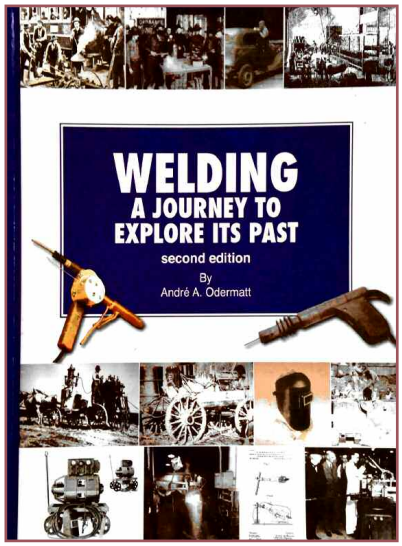
The book is impeccably researched, combining thorough knowledge of all the secondary literature (the bibliography runs to twenty-one pages!) with in-depth work at a number of Scottish archival repositories. Mastering the material alone is to be appreciated, let alone being able to present it in such an enjoyable and enlightening way.

Finally, we should note that Maxwell was himself an amateur genealogist, and Arthur has done a splendid job of starting with Maxwell's draft family trees and completely filling in eight interlocking family trees that make it easier for the reader to follow the huge cast of characters.

This book is highly recommended for anyone interested in James Clerk Maxwell and his work (the opening chapter and an appendix deal with his scientific contributions), or in the broader question of the social context of the rise of science and technology in the modern era.

Available from: Birlinn Ltd., West Newington House, 10 Newington Road, Edinburgh EH9 1QS, UK, **www.birlinn.co.uk**, £25, softback, ISBN 9781906566975, xxvi + 358 pages, black & white illustrations and color plates.

ODERMATT, ANDRE A.,
and edited by August F. Manz,
Welding: A Journey to Explore its Past, Hobart Institute of Welding Technology, 2014 (2nd ed.)



Thanks to IEEE Life Member Augustus "Gus" Manz, the History Center received recently a copy of this remarkable and richly illustrated history of the long-neglected and essential technology of welding. Few have noted that the development of electric power generators and human-made gases in the nineteenth century improved the power and efficiency of ancient processes of bonding metals, and provided incentives for creating new techniques. Without them, our built environment, from circuit boards to airplanes, would be very different and much more expensive. Drawing largely on the library of the Hobart Institute and patents, Odermatt does a masterful job of explaining the international history of numerous welding techniques and their applications, as well as the challenges of organizing and standardizing welding education. Electrical engineering history buffs will find that many of their electrical pioneers—Davy, Thomson, Braun, Langmuir—participated in welding's evolution. The book is well referenced and will serve as an invaluable starting point for scholars seeking to explain this hidden bond of modern societies.

Available from Hobart Institute of Welding Technology, Troy, OH, 800-332-9448, fax 937-332-9550, **www.welding.org/product/welding-journey-explore-past-softback-book/** $29.95, Softback, ISBN 978-1-936058-29-7, 213 pp.

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