

# IEEE History Center

ISSUE 104, July 2017



*Presidential Recording Goes Back to the 1940s; IEEE History Center Outreach Historian Alex Magoun Can Tell You All About It (Image courtesy of [whitehouse.gov](http://whitehouse.gov))*

Signals from the Director . . . . .	2	Things to See and Do . . . . .	7
History Center in Action: Shaping the Future by Preserving the Past . .	3	Drones Exhibit at <i>Intrepid</i>	
Women Technologists in Congress Project		Technologies of <i>Frankenstein</i> Conference	
Magoun Article on the History of White House Recordings Gets Wide Media Play		Robots Exhibition, London	
Recent History Center Staff Publications of Interest		Section History . . . . .	8
REACH Wins Prestigious International Prize		Demonstration of Live TV as an IEEE Milestone	
First-Hand Histories		Tech History on the Web: Staff Favorites . . . .	9
History Center Staff Notes . . . . .	6	Donor Profile . . . . .	9
Steven Weis is 2017 IEEE Life Members’ Fund Summer Intern		Julian Bussgang, IEEE Life Member	
Technology Unexpectans . . . . .	6	Programs of Support for Scholars . . . . .	9
From Battlefield to Blues Harp		Devin Kennedy is 2017-2018 Life Members’ Fellow in the History of Electrical and Computing Technology	
		Bibliography . . . . .	11

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.

IEEE History Center  
at Stevens Institute of Technology  
Samuel C. Williams Library 3rd Floor  
1 Castle Point on Hudson  
Hoboken, NJ 07030-5991  
Telephone +1 732 562 5450  
Fax +1 732 562 6020  
E-mail: [iee-history@ieee.org](mailto:iee-history@ieee.org)  
URL: [www.ieee.org/history\\_center](http://www.ieee.org/history_center)

#### IEEE History Committee 2017

Allison Marsh, Chair  
Martin Bastiaans  
Robert Dent  
Jason Hui  
Kartik Kulkarni  
Janina Mazierska  
Juan Carlos Miguez  
Antonio Perez-Yuste  
Beth Robertson  
Corinna Schlombs  
Enrique Tajera  
John Vig

#### IEEE History Center Staff

Michael Geselowitz, Senior Director  
[m.geselowitz@ieee.org](mailto:m.geselowitz@ieee.org)  
  
Nathan Brewer, Archival and  
Digital Content Specialist  
[n.w.brewer@ieee.org](mailto:n.w.brewer@ieee.org)  
  
Mary Ann Hellrigel, Archivist/  
Institutional Historian  
[m.c.hellrigel@ieee.org](mailto:m.c.hellrigel@ieee.org)  
  
Alexander Magoun, Outreach  
Historian  
[a.b.magoun@ieee.org](mailto:a.b.magoun@ieee.org)  
  
Lisa Nocks, Historian  
[l.nocks@ieee.org](mailto:l.nocks@ieee.org)  
  
Kelly McKenna, REACH  
Program Manager  
[k.mckenna@ieee.org](mailto:k.mckenna@ieee.org)  
  
Robert Colburn, Research Coordinator  
[r.colburn@ieee.org](mailto:r.colburn@ieee.org)

IEEE prohibits discrimination,  
harassment and bullying.  
For more information visit  
[www.ieee.org/nondiscrimination](http://www.ieee.org/nondiscrimination)

© IEEE information contained in this  
newsletter may be copied without permission,  
provided that copies for direct commercial  
advantage are not made or distributed, and  
the title of the IEEE publication and its date  
appear on each copy.

## TWENTY YEARS OF PROGRESS

By Michael Geselowitz, Ph.D.

If you will allow me a moment of self-indulgence, as I am writing this column I have just celebrated the twentieth anniversary of my arrival as director of the IEEE History Center (my formal IEEE title is “Senior Director,” and it has become increasingly apt over the years). A lot has been accomplished over the past twenty years. Events that stand out include: the tremendous growth of the IEEE Milestones Program (a priority, I was told, when I interviewed for the position); the creation of the

Center’s first stand-alone content-based website, the IEEE Virtual Museum, which evolved into the IEEE Global History Network and is now the Engineering & Technology History Wiki; the revival of the Center’s book publishing program using the opportunities afforded by new print-on-demand technology; the increasing use of our oral history collection by documentarians and others; the move from Rutgers University to Stevens Institute of Technology, which became our new strategic partner in the history education space; and, most recently, the launch of the IEEE REACH

### 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 [iee-history@ieee.org](mailto:iee-history@ieee.org)

Current and past issues of the newsletter can be accessed at [www.ieee.org/about/history\\_center/newsletters.html](http://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](http://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 did. 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 [iee-history@ieee.org](mailto:iee-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 57,000. The newsletter reaches engineers, retired engineers, researchers, historians, archivists, and curators interested 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 [iee-history@ieee.org](mailto:iee-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](mailto:r.colburn@ieee.org).

Program. You will find the most recent updates for these and other programs in the virtual pages of this newsletter, and you will see that the IEEE History Center is still going strong.

Over the years, my supporting team has changed, as has the IEEE History Committee that oversees us on behalf of the organization and its members. What has not changed is the commitment of IEEE History Center staff to supporting IEEE volunteers, members, and staff in preserving and researching the history of IEEE, its members, their professions, and related technologies, and making that history known to the public. Another factor that has remained constant is the encouragement and financial support shown by you, the readers of this newsletter. As part of IEEE's public imperative to benefit humanity, we have been asked to work with the IEEE Foundation to raise additional funds for our operations over and above the contributions of IEEE and Stevens. So far, we have succeeded. That we have retained your trust in our programs all these years I

count as my greatest achievement.

Relatedly, I would like to note that History Center staff and History Committee volunteers will be participating in IEEE Sections Congress 2017, to be held in Sydney, Australia on 11 – 13 August. Led by History Committee Chair Allison Marsh, we will be giving two sessions on how Sections can use historical activities to engage members (one session is specifically on Milestones). In the exhibit area, we are teaming with many of the other diverse IEEE humanitarian and philanthropic programs to present a single pavilion that will highlight the way that IEEE members can use their time, talent, and/or treasure to help IEEE benefit humanity. Our motto is "doing good brings great returns." If you are one of the hundreds of IEEE volunteers who will be converging on Sydney, I hope you will attend our sessions and drop by the pavilion to meet us.

Thanks again for your support.

## HISTORY CENTER IN ACTION: SHAPING THE FUTURE BY PRESERVING THE PAST

### IEEE HISTORY CENTER ASSISTS WOMEN TECHNOLOGISTS IN CONGRESS PROJECT

When the Chairs of the Congressional Inventors Caucus asked IEEE's government relations staff to host and plan an event in March (Women's History Month) to celebrate women inventors and particularly women in STEM who have served in the United States Congress, the government relations staff turned to the IEEE History Center for help with the historical side.

There is a long history of women in the STEM fields who served in the Congress of the United States (see table below)

and the IEEE History Center was delighted to assist the project staff as part of its emphasis on raising the visibility of the history of women's contributions to technical fields. The Engineering & Technology History Wiki has information on women engineers, inventors and STEM pioneers. In particular, we have a collection of oral histories of women computing pioneers, with thanks to Professor Janet Abbate.

[http://ethw.org/Oral-History:Women\\_in\\_Computing](http://ethw.org/Oral-History:Women_in_Computing)

#### WOMEN TECHNOLOGISTS IN CONGRESS

<b>Ruth Pratt</b>	NY	1929-1933	Mathematics degree from Wellesly College
<b>Veronica Boland</b>	PA	1942-1943	Scranton Technical School
<b>Patsy Mink</b>	HI	1965-1977, 1989-2003	BA in chemistry and zoology
<b>Jean Ashbrook</b>	OH	1981-1983	BS from Ohio State University
<b>Katie Hall</b>	IN	1981-1985	BS from Mississippi Valley State University, MS from Indiana University
<b>Patricia Saiki</b>	HI	1987-1991	BS from University of Hawaii
<b>Lousie Slaughter</b>	NY	1987	BS from University of Kentucky
<b>Jill Long</b>	IN	1989-1995	BS from Valparaiso University
<b>Nita Louey</b>	NY	1989	BS from Mount Holyoke College
<b>Ileana Ros-Lehtilen</b>	FL	1989	MS from Florida International University
<b>Jocelyn Burdick</b>	ND	1991-1993	BS from Northwestern University
<b>Eva Clayton</b>	NC	1991-2003	BS in biology, MS in biology and general science
<b>Corrine Brown</b>	FL	1993	BS from Florida Agricultural and Mechanical University



WOMEN TECHNOLOGISTS

<b>Jennifer Dunn</b>	WA	1993-2005	Systems designer for a major computer company
<b>Eddie Bernice Johnson</b>	TX	1993	BS from Texas Christian University, worked as chief psychiatric nurse and psychotherapist
<b>Carrie Meek</b>	FL	1993-2003	BS in biology, MS in public health
<b>Lynn Woolsey</b>	CA	1993-2013	BS from University of San Francisco
<b>Karen Thurman</b>	FL	1993-2003	Worked as a math teacher
<b>Barbara Cubin</b>	WY	1995-2009	BS in chemistry from Creighton University
<b>Sheila Frahm</b>	KS	1995-1997	BS from Fort Hays State University
<b>Sue Kelly</b>	NY	1995-2007	BA in botany and bacteriology from Denison University
<b>Karen McCarthy</b>	MO	1995-2005	BS in biology from University of Kansas
<b>Blanche Lambert</b>	AR	1993-1997, 1999-2011	BS in biology from Randolph-Macon Women's College
<b>Donna Christensen</b> <i>(Virgin Islands)</i>	V.I.	1997-2015	BS from St. Mary's College and MD from George Washington University
<b>Kay Granger</b>	TX	1997	BS from Texas Wesleyan University
<b>Darlene Hooley</b>	OR	1997-2009	BS in education from Oregon State University
<b>Carolyn McCarthy</b>	NY	1997-2015	Nurse
<b>Anne Meagher</b>	KY	1997-2007	Worked for a major automobile manufacturer
<b>Lois Capps</b>	CA	1997-2017	BS from Pacific Lutheran University, Worked as a nurse and nurse instructor
<b>Janice Schakowsky</b>	IL	1999	BS from University of Illinois
<b>Marsha Blackburn</b>	TN	2003	BS from Mississippi State University
<b>Elizabeth Dole</b>	NC	2003-2009	Responsible for Dole lights and air bags
<b>Melissa Bean</b>	IL	2005-2011	Worked for 20 years in technology industry
<b>Shelley Gibbs</b>	TX	2005-2007	BS in chemistry, MD specializing in dermatology, President of the Texas Dermatological Society
<b>Marcia Fudge</b>	OH	2007	BS from Ohio State University
<b>Judy Chu</b>	CA	2009	PhD from California School of Professional Psychology
<b>Alma Adams</b>	NC	2013	BS and MS from North Carolina Agricultural and Technical State University

## MAGOUN ARTICLE ON THE HISTORY OF WHITE HOUSE RECORDINGS GETS WIDE MEDIA PLAY

***Presidents, motives, and technologies change, but good history is always useful.***

Three years ago, IEEE History Center Outreach Historian Alex Magoun wrote an article for the *IEEE Institute* on the technologies of White House recordings from the 1940s to the 1970s. Magoun wrote the article to coincide with the fortieth anniversary of U.S. President Richard Nixon's resignation, a resignation brought about largely by Nixon's own recordings of White House conversations which revealed Nixon's part in covering up the 1972 break-in of the Democratic Party National Headquarters in the Watergate Hotel. Magoun's article didn't attract much interest at the time of publication, but

Donald Trump's recent tweeted hint that Trump might have recordings of Oval Office conversations thrust Magoun's article into the limelight. On 12-13 May 2017, three major media sites—*Washington Post*, *NPR*, and the *New York Daily News*—all referred to the IEEE (“Institute of Electrical and Electronics Engineers”) or Magoun by name, and linked to the article.

[https://www.washingtonpost.com/news/politics/wp/2017/05/12/why-its-likely-that-trump-does-have-recordings-of-his-oval-office-conversations/?utm\\_term=.7078060acbd6](https://www.washingtonpost.com/news/politics/wp/2017/05/12/why-its-likely-that-trump-does-have-recordings-of-his-oval-office-conversations/?utm_term=.7078060acbd6)

<http://www.npr.org/2017/05/13/528222995/the-shadowy-history-of-secret-white-house-tapes>

## RECENT HISTORY CENTER STAFF PUBLICATIONS OF INTEREST

Nathan Brewer's article, "Computerized Dungeons and Randomly Generated Worlds: From *Rogue* to *Minecraft*," is pages 970-977 of the May issue of *Proceedings of the IEEE*. <http://ieeexplore.ieee.org/stamp/stamp.jsp?reload=true&tp=&arnumber=7906675>

The first in a new series of articles by Robert Colburn exploring how some notable innovators got their first job or breakthrough assignment is now live: <http://theinstitute.ieee.org/tech-history/technology-history/how-four-great-inventors-broke-new-ground>

To see a list of IEEE History Center staff publications, please click on [http://ethw.org/Archives:Books\\_and\\_Archival\\_Publications](http://ethw.org/Archives:Books_and_Archival_Publications)

## REACH WEBSITE WINS PRESTIGIOUS INTERNATIONAL PRIZE

by Kelly McKenna, REACH Program Manager

IEEE REACH continues to gain significant momentum and has garnered significant attention within the education community in the United States, as well as valuable international recognition.

REACH received the Ayrton Prize for Digital Engagement in the History of Science, Technology and Medicine from the British Society for the History of Science (BSHS). Founded in 1947, the BSHS is Britain's largest learned society devoted to the history of science, technology and medicine (HSTM) and has a strong global presence. The Ayrton Prize, first given last year to the British Library, recognizes a self-contained website with HSTM content, available in English, that reflects best current practices and makes effective use of media in communicating HSTM to a non-specialist audience. The BSHS announcement may be found here: <http://www.bshs.org.uk/ayrton-prize-winner>.

Since March, the REACH website added a third inquiry unit, or lesson plan, ([reach.ieee.org](http://reach.ieee.org)). This unit focuses on the engineering and design of the Greek Trireme, and its influence on democracy and empire in ancient times. Click these links to watch two videos associated with the unit: **Triremes Video Part One**, and **Triremes Video Part Two**.

At present, approximately two hundred subscribers have signed up for the program. These subscribers include state department social studies education supervisors, district supervisors, high school teachers, middle school teachers, home school educators, university professors - those who "teach the teachers" - consultants, and other interested parties. The subscriber base is made up of educators from more than twenty-five states within the U.S. and from eight countries outside of the U.S. This subscriber base offers a potential to reach more than 25,000 students.

This has taken place via a grassroots marketing effort, through presentations and exhibits at various pre-university educator conferences. Educators are extremely impressed with the REACH program, and REACH was invited to write a feature article in *Kentucky Teacher*, the newsletter for the Kentucky Department of Education, which is distributed to 42,000 public school teachers in the state. ([Click here to view the article.](#))

Throughout the rest of the year, new content will continue to be added to the site, including a unit on radio, and another on

drones. Once the site has been populated with additional units, a full marketing campaign will roll out in 2018.

REACH would not be possible without the generosity of the many IEEE donors who support the program through their gifts to the IEEE Foundation. For this, we are extremely grateful. We hope you will continue to support this effort and ensure that REACH continues to grow and attain its maximum potential - to reach students across the globe! Donations may be made here: (<https://www.ieeefoundation.org/reach-through-history>).



Fig. 1.

[oldbookillustrations.com](http://oldbookillustrations.com)

*REACH Lesson plans describe the history of mass communication from the printing press to the cell phone*

## FIRST-HAND HISTORIES

The Engineering and Technology History Wiki (<http://ethw.org> ETHW), a collaborative site composed of seven major engineering societies, acts as a repository for first-hand accounts and memoirs. Recently, two first-hand histories have been submitted to the ETHW. "The First CMOS and the Only Cryogenically Cooled Supercomputer," by Tony Vacca, provides brief history of the hardware technology developed for the ETA Systems ETA-10 supercomputer CPU and the major features of the resulting technology, many of which are applied to today's systems. "The IEEE Internet of Things Journal Started with a Conversation about Bread," by 2009 IEEE President John Vig, is an anecdote of the formation of an IEEE journal arising from a dinner with Life Member Mahmoud Daneshmand and IEEE Fellow Chonggang Wang.

### Oral Histories

In addition to first-hand accounts, the ETHW houses oral history collections from IEEE, AIME, SWE and SPE. Five oral histories were added recently to the site, three from IEEE's oral history program. Charles Maerfeld, an IEEE Fellow active in the Sonic and Ultrasonic symposium, details his work in Surface-Acoustic-

Wave (SAW) devices. Eva Andrei, an experimental condensed matter physicist recognized for her work on low dimensional electron systems, discusses her childhood, education, and career at Bell Labs. Arthur Krener, retired Distinguished Professor of Mathematics at the University of California, Davis, discusses his work and career at UC Davis, geometric control, and software packages. Two oral histories were posted by AIME, Robert Lee, a metallurgist at Air Liquide Canada and an Iron & Steel Society Fellow, and Douglas Fuerstenau, P. Malozemoff Professor Emeritus of Mineral Engineering in the Dept. of Materials Science and Engineering, University of California, Berkeley. Malozemoff's oral history is to date the longest oral history posted on the ETHW.

### Archival Documents

The ETHW also acts as a repository for primary and secondary archival documents. "Reminiscences of Early Electrical Development," an address by P.N. Nunn given at the First Joint Meeting of The Utah Society of Engineers, the American Institute of Electrical Engineers, and the Electrical League of Utah, on 15 February 1927, has been scanned and is available to read.

## HISTORY CENTER STAFF NOTES

### STEVEN WEIS IS 2017 IEEE LIFE MEMBERS' FUND SUMMER INTERN

The History Center is very pleased to announce that this year's IEEE Life Members' Fund Summer Intern is Steven Weis. Steven is a recent Stevens Institute of Technology graduate with a degree in Music and Technology, a minor in Entrepreneurship, and a Masters Certificate in Project Management. Steven completed courses in audio engineering, audio post production, sound design, music theory, orchestration, and electronic music, as well as business, entrepreneurship and project manage-

ment. This summer he will be working as an intern for the IEEE Reach program to help create tech history material for high school and middle school teachers.

The Life Members' Internship in the History of Electrical Technologies [https://www.ieee.org/about/history\\_center/internship.html](https://www.ieee.org/about/history_center/internship.html) is supported by generous donations to the IEEE Life Members' Fund of the IEEE Foundation [https://www.ieeefoundation.org/donate\\_history](https://www.ieeefoundation.org/donate_history)

## TECHNOLOGY UNEXPECTEDS

### FROM BATTLEFIELD TO BLUES HARP: THE "GREEN BULLET" MICROPHONE'S UNEXPECTED FOLLOWING

by Michael Petterson

The microphone known as the "Green Bullet," which Shure, Inc. introduced in 1949 (the model 520), was a "rugged unit that lends itself to fine-quality, low-cost installations where durability is an important factor." The military models using the same type of microphone element successfully passed all destructive shock, tumble, heat, cold, blast, and other tests which

determined the fitness of a microphone for battle operation. (It was the microphone Radar O'Reilly used in the television program M\*A\*S\*H.) The 520 was widely used for outdoor public address at carnivals, circuses, parking lots, athletic fields, mobile communications, and ham radio.

In the early 1980s, Green Bullet sales had fallen, and Shure intended to discontinue the model. When the discontinuation announcement was mailed, there was little reaction from deal-

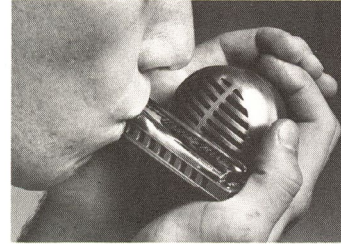


ers that sold the Green Bullet for two-way radio or for paging system use. Nonetheless, Shure was unprepared for the overwhelming reaction from harmonica players and blues harp performers. Letters and phone calls overwhelmed Shure Customer Service, pleading with Shure to keep making the Green Bullet. In 1985, the Green Bullet was re-packaged and marketed anew as a harmonica microphone.

Although it had not been designed for that purpose, there were a number of possible reasons why the Green Bullet became such an unexpected favorite in the music world. The 520 housing fit nicely into cupped hands and allowed the harmonica to be comfortably placed on top of the grill. The original 520 was high impedance. With the addition of a 1/4" male phone plug, it worked well with guitar tube amplifiers available since the 1940s. The \$16.50 price in 1949 was affordable for most musicians. In comparison, the model Unidyne 55 was \$67.50 – four times as expensive. The combination of the harmonica being so close to the mic element, and the mic output level being great enough to overload the guitar amp, led to a distorted, funky timbre. It is unknown if this was the desired timbre, or if this timbre simply became associated with blues harp.

Whatever the reasons, it demonstrated the point that well-engineered, well manufactured products often create additional markets for themselves. <http://www.greenbulletmics.com/>

## The Green Bullet is back!



Great news for harmonica players! The legendary 520D "Green Bullet" microphone is back. Delivering all the down home sound that's made it so popular with "harp players" for so many years. Same shape. Same sound. Same value. Pick up on it now.

# SHURE

THE SOUND OF THE PROFESSIONALS®...WORLDWIDE

## THINGS TO SEE AND DO

### DRONES EXHIBIT AT INTREPID

The IEEE Life Members Fund of the IEEE Foundation provided a grant to IEEE New York Section and the Intrepid Sea, Air & Space Museum in New York City for a new exhibition: "Drones: Is the Sky the Limit?" The exhibit opened 10 May and runs through 3 December, and is the first of a three-component project. There will also be a professional development event in August for NYC teachers, in which the IEEE History Center will be participating, and a technical event in November with the IEEE NY Section. For more information:

<http://www.intrepidmuseum.org/drones>

While the exhibit is open, IEEE members who live outside of the five boroughs of New York City are extended a 20% admission discount to the Museum with proof of IEEE membership (an IEEE membership card) at the box office. During the exhibit, IEEE members who live in New York City are welcome to come to the Intrepid Museum at the New York City resident price which is up to 40% off the regular admission fee. Donations to IEEE Foundation make grants such as this possible. If you are interested in supporting the IEEE Foundation Grants Program, please go to <https://ieeefoundation.org/donate>

### TECHNOLOGIES OF *FRANKENSTEIN*: 1818-2018 CONFERENCE

The conference will be held 7-9 March 2018 and is co-hosted by IEEE History Center and Stevens Institute of Technology, College of Arts and Letters (<http://frankenstein2018.org>).

The 200th anniversary of the first edition of Mary Shelley's *Frankenstein: Or, The Modern Prometheus* has drawn worldwide interest in revisiting the novel's themes. *Frankenstein* continues to inspire discourse in scholarly, popular, and creative culture about scientific ethics. This conference will examine the intersecting themes of humanism, technology, and science. We invite proposals from all fields of study for presentations that add a twenty-first century perspective to *Frankenstein*.

Topic areas include but are not limited to: Artificial Intelligence and Robotics; Engineering Technologies: Past/Present/Future (Chemical, Electrical, Biomedical); Future Technologies and Labor Concerns; Computational and Naval Technology (Mapping, Navigation, The Idea of the Journey); Digital Humanities; and GeoHumanities (Applications, Pedagogy, Library/Information Technology).

Submit abstracts of 300 words and brief cv by 15 October 2017 to Michael Geselowitz ([m.geselowitz@ieee.org](mailto:m.geselowitz@ieee.org)) and Robin Hammerman ([rhammerm@stevens.edu](mailto:rhammerm@stevens.edu)).

## ROBOTS EXHIBITION LONDON

**Of particular interest to fans of all things robotic** is the exhibition at the Science Museum in London. “Robots,” open now through 3 September 2017, includes one hundred examples representing “500 years of humanoid robots.” The collection includes everything from a sixteenth century automaton in the shape of a monk, and robot toys from the twentieth century, to working models of more recent projects including a robo-baby, and the beautiful wooden humanoid prototype made by the founding members of what is now Shadow Robot Company, makers of the Shadow Dexterous Hand. The Science Museum is located at Exhibition Road in South Kensington, London, SW7 2DD, and is accessible by public transportation. The museum itself offers free entry, though you must pay for entry to “Robots.” Ticket pricing and further information is available at <http://www.sciencemuseum.org.uk/>. **Nice for travelers:** the museum is open seven days a week, 10.00am–6:00pm, (last entry 5:15) and “Robots” stays open until 10:00pm on Friday evenings (last entry 9:00pm). Don’t forget that the Victoria and Albert Museum and the Natural History Museum are also in South Kensington, and very near the Science Museum.



*Kodomoroid communication android by Osaka University and Hiroshi Ishiguro Laboratories, Japan*

## SECTION HISTORY: A MILESTONE FOR TV

### DEMONSTRATION OF LIVE TV AS AN IEEE MILESTONE

By Prof. Anthony C. Davies, Life Members Affinity Group, IEEE UK and Ireland Section

From time immemorial, humankind has had ambitions to see at a distance. Early attempts at a complete television system include that of Charles Frances Jenkins, who publicly demonstrated silhouette images transmitted by radio for five miles (Maryland to Washington D.C.) in 1925. His US Patent no 1544156 is called “transmitting pictures over wireless.” It was John Logie Baird who is credited with the first public demonstration of real-time television images with true grey-scale reproduction (as opposed to moving silhouettes), which he showed to a group, including about forty members of the Royal Institution of Great Britain. Remarkably, Baird did not have the backing of large industrial companies, and had little prior education of a kind to prepare him to make these innovations. Unfortunately, he achieved negligible financial reward for his inventions.

On the 91st anniversary of Baird’s demonstration of 26 January 1926, an IEEE History Milestone was unveiled by IEEE President Karen Bartleson and Iain Logie Baird, a grandson of the inventor. [http://ethw.org/Milestones:First\\_Public\\_Demonstration\\_of\\_Television,\\_1926](http://ethw.org/Milestones:First_Public_Demonstration_of_Television,_1926) The IEEE plaque is mounted on the building at 22 Frith Street, London (now a coffee-shop “Bar-Italia”) where it joins an earlier blue historical plaque. The Life Members Affinity Group of the IEEE UK and Ireland Section

made the successful proposal for this milestone, having first considered various alternative locations.



*John Logie Baird used the upper floors of 22 Firth Street as his television laboratory in the 1920s. Photo courtesy of Anthony Davies*



## TECH HISTORY ON THE WEB – RECENT STAFF FAVORITES

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. This issue features sites on technologies for sharing information.

An excellent one-hour documentary on James Clerk Maxwell and his equations [https://www.youtube.com/watch?v=BC-4MH7mG0\\_U#t=4.620791](https://www.youtube.com/watch?v=BC-4MH7mG0_U#t=4.620791)

Bill Burns' site on Edison's electric pen and the beginnings of office copying technologies <http://electricpen.org/index.htm>

A great site on teletype machines and their history <http://www.columbia.edu/cu/computinghistory/teletype.html>

Worldmapper: an interactive site that lets us see the world's statistics in new ways. The map of internet users (1995, 2000-2007) and hydropower are especially interesting <http://www.worldmapper.org/index.html>

Virtual Colossus: Think you know how to program? Try your skills at coding for codebreaking on one of the world's earliest electronic computers, thanks to this marvelous site by Martin Gillow. <http://www.virtualcolossus.co.uk/>.

## DONOR PROFILE

### “IT'S IMPORTANT TO TRAIN THE NEW GENERATION AND TO ENCOURAGE PROGRESS” – Julian Bussgang, IEEE Life Member, IEEE Member since 1949



Julian Bussgang admires the work of the IEEE Foundation and has found a “painless” way to give. As a member of the Life Members Committee, Julian knows how much IEEE relies on donations to fulfill its mission. The IEEE Foundation supports many valuable educational and technological advancement programs, which encourage students and engineers worldwide to learn, innovate and document engineering topics. “It is very important that such programs continue, both to train the new generation and to encourage progress,” he says.

Having reached his 70 and ½ birthday, Julian has the opportunity to support the Foundation by giving through the IRA Charitable Rollover provision. For donors his age, federal law requires annual reductions of money saved in IRA accounts. The IRA Charitable Rollover allows withdrawals tax-free on the accu-

mulated gains, up to a total of \$100,000, which may be donated to qualified charitable organizations. It is a wonderful and “painless” way to make donations!

Julian joined the Institute of Radio Engineers, which later merged into IEEE, because he wanted to connect with colleagues. The benefits for him include the meetings and publications, as well as the professional connections. His fondest memories from IEEE membership include participation in the Information Theory Society Committee and conferences. Later, as Chair of the Boston Section, he enjoyed meeting with local colleagues to plan Section activities.

Julian says he especially admires the work of the IEEE Foundation, the Life Members Committee, and the History Center at Stevens Institute in Hoboken, NJ, USA. His donations to the Foundation support them.

## PROGRAMS OF SUPPORT FOR SCHOLARS

### DEVIN KENNEDY IS 2017-2018 IEEE LIFE MEMBERS' FELLOW IN THE HISTORY OF ELECTRICAL AND COMPUTING TECHNOLOGY

Devin Kennedy is a Ph.D. candidate in the History of Science Department at Harvard. His historical research centers on the interaction between computer technology and financial markets in twentieth century America. His dissertation traces how, in the 1960s, computers enabled an expanding financial sector, offered new regulatory models to the federal government, and assisted economists in the development of mathematical systems for analyzing financial assets, quantifying risk, and optimizing investment strategy.

As a history of computing, his dissertation explores the

use of real-time data processing and time-sharing systems in the operations of the financial sector beginning in the mid-1960s. He is currently completing an article on early electronic market data systems at the New York Stock Exchange. Devin has an A.B. from Princeton University in Comparative Literature and lives in Somerville, Massachusetts with his partner Eliza, a communications professional and writer, and their dog Chips, a retired greyhound. He would like to express his gratitude to the IEEE History Center and the IEEE professional community for the opportunity to pursue his research.

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/web/aboutus/history\\_center](http://www.ieee.org/web/aboutus/history_center) and more about the Engineering & Technology Wiki at [ethw.org](http://ethw.org)

From the editor of Sylvia Nasar's *A Beautiful Mind* and Walter Isaacson's *Steve Jobs* and *Einstein*

COMING JULY 18

JIMMY SONI &  
ROB GOODMAN

A  
MIND  
AT  
PLAY

HOW  
CLAUDE SHANNON  
INVENTED THE  
INFORMATION AGE

WHEREVER BOOKS ARE SOLD

 SIMON & SCHUSTER

Pre-order now! For more information,  
contact the author: jimmyasoni@gmail.com



**BRUDERER, HERBERT**

*Milestones in Analog and Digital Computing, Contributions to the History of Mathematics and Information Technology, de Gruyter, 2015*



During the 1970s, mechanical calculating instruments and machines suddenly disappeared and were replaced by electronic versions. Most of these devices developed since the 17th century – often very clever constructions – have been forgotten. Who can imagine today how difficult calculation was only a few decades ago? This book introduces the reader to selected milestones from prehistory and the early history of computing.

The Antikythera Mechanism

This device, made around the second century BCE, was discovered in 1901 by divers off the Greek island of Antikythera. It is believed to be the oldest known analog (or rather hybrid) computing device. Numerous replicas have been built to unravel the mysteries of this calendar calculator. It is suspected that the machine came from the school of Hipparchos.

Androids, Music Boxes, Chess Automats, Looms

This treatise also explores topics related to computing technology: automated human and animal figures, mechanized musical instruments, music boxes, as well as punched tape controlled looms and typewriters. Also mentioned are the chess playing machines of the highly gifted Spanish scholar Torres Quevedo (20th century), and the magnificent androids (artificial humans), and splendid still functional programmable handwriting automaton “The Writer” of the Neuchâtel clockmaker Jaquet-Droz (18th century). A similar machine can also be seen in Vienna.

Schickard, Pascal, and Leibniz

During the 17th century, broadly-gifted geniuses from Germany and France tried to build calculating machines. Developing a mechanism to perform decimal carry was very challenging. Famous calculators are covered in the text and pictures. These ornate works of art, often circular in form, were popular presents for royalty. Only in the 19th century did makers succeed in producing useful four-function calculators. The first successful, commercially produced device was the Thomas Arithmometer, made in Paris.

This book lists, for the first time, all the known Swiss makers of mechanical calculating machines and compares their products with one another. The most famous firms were Egli AG (maker of the “Millionaire” and the “Madas”) and Pecisa AG. Both companies were located in Zurich. In the 1950s Heinz Rutishauser, the inventor of automatic programming, used a Madas at the ETH Zurich.

Sectors, Proportional Compasses, Polar Planimeters, Pantographs, and Coordinatographs

Here the discussion is about exceptionally versatile analog calculation instruments such as sectors and proportional compasses (dividers). Vanished and forgotten are the products of the world’s former leading makers of mechanical integrators such as Amsler (Schaffhausen), Coradi (Zurich), and Ott (Kempten). They

also made planimeters and pantographs. These were used in land surveying offices and the textile industry (knitting).

Counting Boards

During the Middle Ages, and in more recent times, many city halls had a beautiful carved counting board. These tables were used for performing calculations using coins. This method was later replaced by written calculation. Only a few counting boards have survived, mostly in Switzerland, Germany, and France.

The Oldest Preserved Key-driven Adding Machine in World

The most important international discovery concerns Jean-Baptiste Schwilgué, the creator of the astronomical clock in the Cathedral in Strasbourg. The oldest preserved keyboard adding machine in the world (19th century) came to light next to an early Thomas Arithmometer in the collection of the observatory at ETH Zurich. This machine is featured on the cover of this book. Two examples of this machine have survived, an older one in Strasbourg and a later one in Zurich. The latter is in far better condition.

Process Computer for the Astronomical Clock at the Cathedral of Strasbourg

An additional big surprise was the discovery (in December 2014) of a rare large adding machine in the Strasbourg Historical Museum. Research has indicated that this adding machine was used to calculate the settings for a very precise milling machine used to make the gears of the astronomical clock at the Cathedral of Strasbourg. The results of calculations were transcribed by hand to a paper tape. This was put in a small box with rollers which was attached to the milling machine. Thus this formed a simple “process computer”.

The Strasbourg discovery was shown at a special exhibition at the Arithmeum of the Bonn University in 2015. If the English mathematician Charles Babbage had known of the gear milling machine of his contemporary Schwilgué, perhaps he would have been able to complete his famous program-controlled Analytical Engine (19th century), the forerunner of today’s digital computers. Schwilgué’s calculating machines are not covered by the authoritative publications about the history of computing. Until recently leading museums of science and technology throughout the world knew nothing of Schwilgué.

24-Meter Loga Cylindrical Slide Rule

Bruderer’s book also describes the invention of the powerful 24-meter cylindrical slide rule, the largest and most precise slide rule in the world. These analog logarithmical tools were used in large quantities by banks and insurance companies, for example for currency calculations. Eighty scale sections, each 60 cm long, are mounted on a drum. The result is a scale that (because of overlapping) is 24 meters long.

Curta, Technical Marvel from the Buchenwald Concentration Camp

The Curta is the world’s smallest mechanical calculating machine that is able to perform all four arithmetical operations. The story of the Curta is told in detail by the ingenious Austrian engineer Curt Herzstark, who drew the drawings for the device while he was in Buchenwald Concentration Camp. New minutes from Thüringen have come to light about his breakneck escape from Soviet pursuers. Affectionately known as the “Peppermill” and very



photogenic, the Curta was manufactured in Liechtenstein. However the inventor was cheated out of his life's work.

#### Who Invented the Computer, the Compiler, and the Stored Program?

This volume discusses the decade-long controversy over the invention of the stored program computer (von Neumann architecture). The debate between American and British historians of computing continues today. This debate has been stirred up recently by the attention given to the 100th birthday of Alan Turing, truly the most important founder of theoretical informatics. The Universal Turing Machine (1936) was a mathematical model of today's stored programmed digital computer. This book offers an overview of the first computers, the early relay-based, vacuum tube, and transistorized computers, the pioneers (both men and women) of calculator technology and their masterpieces. There is further coverage of the developmental lineage of calculation aids and their life span.

#### Alan Turing, Enigma and Colossus: at Bletchley Park

The dramatic events at Bletchley Park (the former British Code-Breaking Center) are presented in detail. For decades, even the existence of the electronic computer Colossus was concealed. For a long time it was rumored that after WWII Churchill ordered the destruction of the ten impressive machines. Vacuum-tube computers were used to crack the Lorenz Machine SZ40/42 which was used by Hitler and the German High Command. The Colossus was designed and built by the British Post Office Research Station. Colossus Mark 2 was ready to use a few days before the landings in Normandy. The Colossus was programmed with a plugboard and qualified as the world's first large electronic computer.

The "Turing-Welchman Bombe" was developed by Alan Turing in collaboration with Gordon Welchman. More than 200 copies of the bombe were manufactured. They helped to crack the German Enigma machine. The German Navy's U-Boat Enigma, which was considered unbreakable, was decrypted largely due to Alan Turing. The German armed forces had some 100,000 Enigmas.

#### Difficulties during the Construction of the Ermeth and its Marketing Failure

Many previously unknown documents relating to the early history of informatics have been discovered in the archives of ETH Zurich. These documents include contracts concerning the legendary relay calculator Z4 invented by and rented from the German Konrad Zuse. ETH Zurich was, in 1950, the first university in central Europe with a functional program-controlled computer. Recently, after a (required) waiting period of fifty years expired, documents came to light that describe the considerable difficulties that were encountered during the production of the (eventually successful) Ermeth. The development of the magnetic drum caused a lot of headaches. The documents, particularly letters, also clarify why the intended marketing of the first Swiss computer by Hasler AG, Berne (now Ascom), failed. Until now no one knew of these plans. As the result of research in connection with the Z4, the only surviving Zuse calculating punch, the M9, was tracked down. The Zuse gave rise to the first programming language, Plankalkül.

The book contains a wealth of illustrations from ETH Zurich's main library and an annotated bibliography as to the findings in the archives.

#### Abacus: How to calculate with historical calculators?

There are very few people still living who know how to handle early, widely-distributed calculating aids that were very versatile for their times. This book seeks to fill these gaps with sets of step-by-step instructions for the use of important calculating devices. These include the Chinese abacus (12th century), as well as the Japanese abacus, the Russian abacus, sectors and proportional dividers (which stem from 16/17th century, the era of Galileo Galilei and Jost Bürgi), Napier's bones (the co-discoverer of logarithms (17th century), the circular slide rule (17th century), the cylindrical slide rule (19th century), and mechanical calculators (19th and 20th centuries) such as the Curta.

#### What Kind of Calculating Machines have survived? In which Museums are they to be Found?

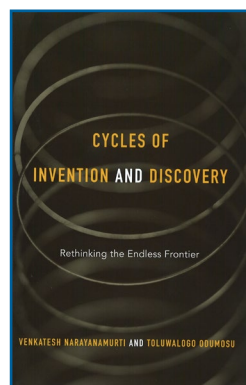
The book contains comprehensive and informative lists about the museums (throughout the world) in which one can find masterpieces of computing technology, including both analog and digital calculating aids.

Contact the publisher directly: de Gruyter, Berlin/Boston, <http://www.degruyter.com/view/product/432414> or contact book sellers.

*Translation by Rodger Shepherd, The Oughtred Society, USA/ revised by Tom Misa, Charles Babbage Institute, University of Minnesota, Minneapolis, and Brian Randell, Newcastle University, UK March 2017*

## NARAYANAMURTI, VENKATESH AND TOLUWALOGO ODUMOSU

### *Cycles of Invention and Discovery: Rethinking the Endless Frontier*, Harvard University Press, 2016



This book, by IEEE Life Fellow and noted professor of technology policy Venkatesh Narayanamurti and IEEE Associate Member and professor of both engineering and STS, Toluwalogo Odumosu, is actually an extended white paper proposing a new approach for U.S. science and technology policy. We bring it to the attention of our readers because it relies heavily on history. The authors make two main historical points. Their first point is that a linear model of innovation favoring "pure science" over "applied science" and engineering, most actively promulgated by Vannevar Bush in his famous paper "Science, the Endless Frontier" (1945), had a profound impact on U.S. science and technology policy. Although that policy would seem to have been successful for decades, it is now holding back research and development because, in fact, the model was flawed to begin with, and the U.S. global lead in innovation happened despite the model rather than because of it.

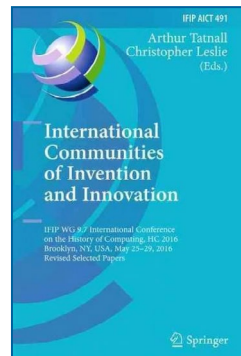
Their second point is that the postwar innovation boom itself proves this idea because one of the main engines of innovation,

Bell Labs, was in fact not structured the way the U.S. government and other corporations were (full disclosure: the authors cite the IEEE History Center's book *Bell Lab Memoirs* several times, as well as other History Center articles). Instead of assuming a linear progression from pure to applied research, Bell Labs was predicated on what the authors have termed an "innovation cycle" with back and forth interaction of discovery and invention. Bell Labs' operation of course arose uniquely out of its authorized-monopoly structure, but the authors argue that nonetheless it can be a paradigm for rethinking R&D today.

Although the history component in the book is dispersed and anecdotal, this is an important work that should be read by anyone with a concern about innovation in the 21st century, whether one's first interest is history or not. Furthermore, although important, at only 150 pages and extremely well written, it is not a burden but actually a pleasure to do so.

Available from Harvard University Press, 79 Garden Street, Cambridge, MA 02138, USA, +1 617-495-2600, fax: +1 617-495-5898, <http://www.hup.harvard.edu/>, \$24.95, hardcover, ISBN 9780674967960, 170 pp (150 pp + abbreviations + notes + bibliography + acknowledgements + index)

TATNALL, ARTHUR AND CHRISTOPHER LESLIE (EDITORS)  
*International Communities of Invention and Innovation*, Springer (IFIP AICT 491), 2016



In May 2016, Working Group 9.7 (History of Computing) of the International Federation for Information Processing (IFIP) held a conference in Brooklyn, New York, USA. The conference, in which IEEE History Center staff participated, focused on the theme that it was a network of pre-existing technical communities with ongoing intercommunication that enabled the rise of a global electronic network. The conference was a great success and attract-

ed scholars from around the globe. Now the organizers have selected about a dozen of the most significant papers and made them available in an edited volume. This collection is strongly recommended for those interested in the history of computing who were unable to attend the conference.

Available from Springer, 233 Spring Street, New York, NY 10013, USA, + 1 212 460 1500, \$84.99, hardcover (also available as eBook), fax: +1 212 460 1700, <http://www.springer.com/us/shop>, 193 pp

## NEW YORK POWER



Joseph J. Cunningham

**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](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.





## *Be the force behind change*

Preserving and promoting the history of technology enables us to better understand today and improve tomorrow. Donate now to the IEEE History Center Fund of the IEEE Foundation and help us to perpetuate and share the heritage of IEEE and technology with people of all ages.

- **Inspire technology education**
- **Enable innovative solutions for social impact**
- **Preserve the heritage of technology**
- **Recognize engineering excellence**

## **IEEE** Foundation

**Discover how you can do a world of good today.**

Learn more about the IEEE Foundation at [ieeefoundation.org](https://www.ieeefoundation.org). To make a donation now, go to [ieeefoundation.org/donate](https://www.ieeefoundation.org/donate).



Donations to the IEEE History Center Fund may be designated for general use to support IEEE history activities, to support collection and posting of Oral History interviews of important innovators, and to build the History Center endowment. You may donate online at [https://www.ieeefoundation.org/donate\\_history](https://www.ieeefoundation.org/donate_history) or by mail.





at Stevens Institute of Technology  
Samuel C. Williams Library 3<sup>rd</sup> Floor  
1 Castle Point on Hudson  
Hoboken, NJ 07030-5991



---

Making a *safe and secure*  
online gift to the IEEE Foundation –  
**History Center Fund** has never been easier!

You can support IEEE's historical  
activities by clicking on  
[https://www.ieeefoundation.org/donate\\_history](https://www.ieeefoundation.org/donate_history)  
and choosing **IEEE History Center Fund**  
at the **Designation** box.