

IEEE History Center

ISSUE 90, November 2012



Dignitaries attending the dedication of the Bose Coherer as an IEEE Milestone in Electrical Engineering and Computing in Kolkata, India.

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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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By Dr. Michael N. Geselowitz, Senior Director, IEEE History Center

I have recently returned from Italy where I had the privilege of meeting with the IEEE History Committee and to participate in IEEE HISTELCON 2012. HISTELCON is the history conference of IEEE Region 8, held about every other year. This was the third such conference, and for the first time, the IEEE History Committee and History Center served as technical co-sponsors (that is why the Committee chose to meet in conjunction with the conference). In fact, the IEEE History Committee and History Center participated in HISTELCON rather than hold their own separate conference as has been customarily done about

every other year.

Now that the IEEE Global History Network (GHN) is a mature platform, the History Center staff are working even harder to serve as a clearinghouse for IEEE's historical content and to leverage our resources to encourage and support historical activities by IEEE Organizational units (OUs), rather than trying to everything ourselves. We hope that HISTELCON will serve as a model for historical conferences throughout IEEE.

In the same vein, this year we have been undertaking a major preservation project with the IEEE Electromagnetic Compatibility Society, that can also serve as an example for other IEEE Societies (see page 5). The IEEE

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

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

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

NEWSLETTER SUBMISSION BOX

The IEEE History Center Newsletter welcomes submissions of Letters to the Editor, as well as articles for its "Reminiscences" and "Relic Hunting" departments. "Reminiscences" are accounts of history of a technology from the point of view of someone who worked in the technical area or was closely connected to someone who was. They may be narrated either in the first person or third person. "Relic Hunting" are accounts of finding or tracking down tangible pieces of electrical history in interesting or unsuspected places (in situ and still operating is of particular interest). Length: 500-1200 words. Submit to 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 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 iee-history@ieee.org.

Deadlines for receipt of ad copy are 2 February, 2 June, 2 October.

For more information, contact Robert Colburn at r.colburn@ieee.org.

Milestones Program (see page 6) has always intimately involved IEEE Sections, and they remain active; but this year we have worked with the IEEE Photonics Society to bring historical events in their field into the Program. In the past we have given in-person workshops to OUs who wanted to work with us in historic preservation by conducting oral history interviews on their own (Region 8, in addition to hosting HISTELCON, took one of the workshops and has been active in this regard). This year, we piloted the workshop as a webinar, which should enable us to reach many more OUs next year and beyond, and greatly expand our already impressive and important oral history collection. We recently arranged with IEEE Xplore to make available historical articles from the Solid-State Circuits Society magazine available through links from the GHN, and we are now exploring the possibility with the Communications Soci-

ety. These are just a few of the ways we are working at the OU level to strengthen our programs to preserve, study and make known the proud heritage of IEEE, its members, their professions and the related technologies.

Having pointed out all of the in-kind efforts by IEEE OUs, I still need to emphasize that most of our central activities are supported by philanthropic giving from you, our loyal supporters. I am pleased to welcome the eminent IEEE Life Fellow Les Vadasz to the ranks of our donors (see page 11), and I hope, as the end of the year approaches, you will consider an additional gift to us, perhaps when you renew your IEEE membership or complete your IEEE Life Member profile.

Finally, let me take this opportunity to wish you and yours a pleasant holiday season and a healthy and happy new year.

STAFF NOTES

2012-2013 HISTORY CENTER GRADUATE ASSISTANT PROFILES

Marsha Barrett earned a B.A. in history from Yale University in 2005. Her research interests include twentieth century United States political, social, and urban history. Her dissertation, written under the direction of David Greenberg, is a political study that examines Nelson Rockefeller's relationship with the Republican Party during his tenure as governor of New York from 1959 to 1973. By focusing on the public's reception to various policies Rockefeller forwarded as governor and three-time presidential candidate, this project explores the dissolution of moderate Republicanism as its most renowned proponent compromised his liberal ideals in hopes of becoming president.

Travis Jeffres attended Hartwick College in central NY from 2005 to 2008 where he earned a BA (*magna cum laude*) in history and anthropology. His doctoral research at Rutgers focuses on Native Americans in the Missouri River Valley and their diverse encounters and relations with Spanish, British, and later, American interlopers from the end of the Seven Years' War (1763) to the Louisiana Purchase (1803). Interested in the history of American expansion into the West, he finds useful parallels between recent works by IEEE History Center staff and major problems in the history of the American West. For instance, *The U.S. Federal Government and Innovation: A Brief History*, published by IEEE History Center staff as an e-book in 2011, explores the relationship between the federal government and technological innovation from the late eighteenth century to the present. No course on American history, the American West, Native American history, or environmental history would be complete without addressing the historical significance of the relationship between technology and government that informs that book and many other IEEE History Center projects.

Julia Katz received her BA in Africana Studies from New York University. She spent two years working in public health at an HIV/AIDS clinic in Chinatown. She is currently a second-year doctoral student of US and Pacific Islands histories. Her research investigates historical intimacies between Polynesians and Asian migrant workers in the mid-nineteenth to early twentieth century Pacific.

Raechel Lutz earned her B.A. in History and Art History from Ithaca College in 2007. While working at the Montclair Art Museum in Montclair, NJ, she earned her M.A. in History from Rutgers, the State University of New Jersey, Newark in 2010. Now a Ph.D. student at Rutgers in New Brunswick, Raechel's current research explores the intersections between nature, work, and identity in U.S. and transnational histories.

Kenny Moss is a fourth year Phd Candidate in the History Department at Rutgers University. He has a Bachelors Degree in History and Spanish from Alfred University '07 and a Masters Degree in History from Binghamton University '09. At Rutgers University, he studies Mexican History, with a strong focus on the 20th century and women's political movements.

Tal Zalmanovich received her BA in History from Tel Aviv University. She is now completing her dissertation *Sharing a Laugh: Sitcoms and the Creation of Post-Imperial Britain 1945-1980* at the history department at Rutgers University. The dissertation combines her experience as a journalist and her interest in media and popular culture with historical exploration. Her research focuses on television sitcoms in post-WWII Britain as an entry point to public debates regarding national formation, public memory and race.

GHN UPDATE

IEEE GLOBAL HISTORY NETWORK USAGE ON THE RISE

Thanks to the growing popularity of the IEEE Global History Network, its service provider has increased server RAM to accommodate the increasing numbers of hits the site is receiving. Usage was growing so heavy that it was actually slowing the access down. Thanks to everyone who uses the GHN, and please keep coming and keep contributing articles.

The Global History Network has had its most successful year to date. Traffic has increased significantly; this year to date has seen 267,075 visits by more than 223,842 unique visitors, a 115% increase from this time last year. 267 users have signed up for GHN accounts, and 8,316 pages have been modified with over 12,199 edits. As of October 1st, more than 185 new topic articles, thirty-five First Hand Histories, fifty oral histories, and forty archival videos have been added to the Global History Network. The IEEE History Center would like to thank IEEE members and especially donors for your continued support and patronage of the Global History Network.

50-YEAR MEMBER FIRST HAND HISTORIES

IEEE was formed by the merger between AIEE and IRE in 1963, and 2012 marks the 50th year that IEEE has been in existence in its current form. To recognize this, IEEE President Gordon Day sent more than 9000 IEEE Members who have been continuous members since 1963 a letter and a commemorative pin. President Day also invited these members to contribute their experiences to the Global History Network as part of a special First Hand History project.

More than fifty of these First Hand Histories have been posted on the Global History Network. Spanning a variety of topics from wartime experiences with radio and radar to pioneering developments in integrated circuits and computing, these histories provide a unique and personal insight into the history of IEEE's technologies. To view the 50-Year Member First Hand Histories, visit the page for the collection here:

http://www.ieeeahn.org/wiki/index.php/First-Hand:50-Year_Member_First_Hand_Histories

The IEEE History Center invites and encourages IEEE Members to contribute their first person experiences to the Global History Network. If you are a member who would like to submit your history, please visit the First Hand Histories landing page:

<http://www.ieeeahn.org/wiki/index.php/Special:FirstHandHistories>

ARCHIVAL VIDEOS

In celebration of the Centennial in 1984, IEEE held numerous events throughout that year. The IEEE History Center has now posted more than twenty-eight hours of Centennial footage on the Global History Network. Some of these include the IEEE Centennial Technical Convocation, held in Philadelphia on October 9th and 10th of 1984, and features talks by prominent persons such as William Hittinger, Robert Frosch, Robert Lucky, Leonard Kleinrock, Herman Schwan, and Robert Noyce. The IEEE Centennial Briefing for the Media features presentations on electronics in defense, health, supercomputing and power, and features talks by Simon Ramo, Secretary of US Department of Energy Donald P. Hodel, and Congressmen Ed Zschau and Doug Walgren.

IEEE also produced a number of commercials and public service announcements which were aired on television, including one advocating the support of improved math and science education, and another with a clip featuring actors playing Benjamin Franklin and Thomas Edison discussing IEEE's role in guiding technological progress.

In addition to the Centennial material, several other videos are now available on the GHN. IEEE Presidents Bruno Weinshel and Henry Bachman, in 1986 and 1987 respectively, appeared several times on the television program "Nation's Business Today" during the "Perspectives" segment. Advances in technological fields such as computing, radar and medical technology were discussed, as were other professional issues including engineering education, technology management, and international competition. These videos are now available, as is a 1983 video of the world's first Congressional testimony by a robot, who testified on behalf of the IEEE on robotics.

To view these footage and other videos, please visit the videos page on the Global History Network:

<http://www.ieeeahn.org/wiki/index.php/Archives:Videos>



Innovation doesn't just happen.
Read first-person accounts of
IEEE members who were there.

IEEE Global History Network
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IEEE HISTORY CENTER STAFF HELPS THE IEEE ELECTRO-MAGNETIC COMPATIBILITY SOCIETY PRESERVE ITS HISTORY

This past August, IEEE History Center Director Mike Geselowitz together with Archivist and Institutional Historian Sheldon Hochheiser, attended the IEEE Electromagnetic Compatibility Society's (EMCS) Annual Symposium in Pittsburgh, Pennsylvania at the invitation of Daniel Hoolihan, Chair of the IEEE EMCS History Committee and an EMC Society past-president. EMCS has a well-established, active history committee, with members actively engaged in preserving and disseminating the history both of the society and of its prominent members.

As part of the conference, Hoolihan organized a Friday morning workshop with six presentations titled "EMCS History—Society Records and Individual Member Records—Retention, Retrieval and Digitization." Geselowitz gave an overview of the activities of the History Center and the IEEE Global History Network, and Hochheiser provided "An Archivist's Guidelines on Preserving Society and Individual Information on EMC Engineering."

Hoolihan gave two presentations: the first provided background on the EMCS History Committee and its activities and the second his perspective on the work he was doing to process and preserve the papers of the late Leonard Thomas, an EMC founding member who was the society's long time secretary. While this project is at an early stage, once the papers are processed and digitized, electronic copies will be both preserved and made available through the IEEE Global History Net-

work. EMC member Don Sweeney gave a parallel presentation on his work to process and digitize the papers of long-term EMCS stalwart and Past President Ed Bronaugh. And EMCS Past-President Don Heirman presented "One Engineer's Perspective on Archiving His Professional Records on EMC and EMC Standardization Activities," where he described the work he was doing with the Purdue University Archives to process and preserve his papers. Finally, at the conclusion of the workshop, Hochheiser went through one box of Thomas's records that Hoolihan had brought to the workshop, and gave a demonstration of how an archivist weeds a collection.

The workshop was only one part of Geselowitz and Hochheiser's EMCS-sponsored historical activities at the Symposium. They also conducted seven oral histories with EMCS past-presidents—Bill Duff, Bob Hofmann, Dan Hoolihan, Joe Butler, Todd Hubing, Kimball Williams, and Elya Joffe. Like all of the center's oral histories, these are being posted on the Global History Network as the interviewees complete their reviews of their respective transcripts. The seven new EMCS oral histories will join nine oral histories of EMCS past-presidents and founders that History Center staff did with EMCS sponsorship in 2003-2006. You can find a list of the EMC oral histories at: http://www.ieeeahn.org/wiki/index.php/Oral-History:IEEE_Electromagnetic_Compatibility_Society_Interviews

THANK YOU TO OUR HISTORY CENTER DONORS!

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

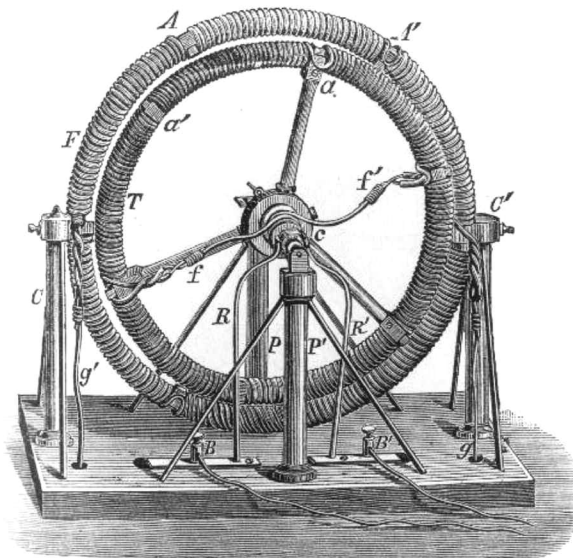


Image courtesy of Smithsonian Institution

REPORT ON IEEE MILESTONE PLAQUE DEDICATION CEREMONIES IN KOLKATA

DEDICATION OF IEEE MILESTONE PLAQUE FOR SIR J.C. BOSE

Date: 15th September

Venue: Presidency University, Kolkata, India

The IEEE Milestone Plaque for the “First Millimetre-wave Communication Experiment” by Sir J.C. Bose in 1894-1896 was formally dedicated on 15th September 2012 at the Presidency University in Kolkata. In a glittering ceremony, the plaque was handed over to Prof. Malabika Sarkar, Vice-Chancellor of Presidency University, by Dr. Peter Staecker, IEEE President Elect. The milestone plaque was subsequently installed at a prominent location within the Presidency University campus. In this program Prof. Malabika Sarkar, Vice-Chancellor of Presidency University, and Prof. Sivaji Chakravorti, Chairman, IEEE Kolkata Section, extended warm welcome to the large number of audience including members of press and local intelligentsia. Prof. Kalyan K Mallik and Prof. Pradip K Saha, proposers of the IEEE Milestone, talked about the significance of IEEE milestones as well as the significance of Sir JC Bose’s contribution. Dr. Peter Staecker made a valuable presentation on the importance of this milestone as well as this event. He specifically expressed his happiness to be able to be present on the occasion of the dedication of the first IEEE milestones in India. Prof. Sabyasachi Bhattacharya, Former Director of Tata Institute of Fundamental Research, Prof. Sibaji Raha, Director, Bose Institute, Kolkata, and Prof. Somak Raychaudhury of Presidency University, made captivating presentations. The message from Prof. Bikash Sinha, Former Director of Saha Institute of Nuclear Physics and Variable Energy Cyclotron Center, was also read. More than 200 participants took part in this IEEE milestone plaque dedication ceremony.

DEDICATION OF IEEE MILESTONE PLAQUE FOR SIR C.V. RAMAN

Date: 15th September

Venue: Indian Association for the Cultivation of Science, Kolkata, India

The IEEE Milestone Plaque for the “Raman Effect” by Sir C.V. Raman in 1928 was formally dedicated on 15th September 2012 at the Indian Association for the Cultivation of Science in Kolkata. In a very well attended program, the IEEE Milestone plaque was formally handed over to Prof. Kankan Bhattacharyya, Director, Indian Association for the Cultivation of Science, by Dr. Peter Staecker, IEEE President Elect, which was then installed at an important location within the IACS campus. In this enthralling program, Prof. Kankan Bhattacharyya spoke on the work carried out by Sir C.V. Raman at IACS. The welcome address was given by Prof. Sivaji Chakravorti, Chairman, IEEE Kolkata Section. Prof. Kalyan K. Mallik and Prof. Prasanta K. Basu, proposers of IEEE Milestone, spoke on the process of IEEE Milestone approval as well its significance. Dr Peter Staecker in his absorbing address spoke on the significance of C.V. Raman’s work in relation to technology development and also on the significance of IEEE milestones in India. About 250 participants attended this program which included members of English as well as vernacular print and electronic media, people from academia and also people from different strata of the society interested in the growth of science and technology.



Audience at Raman Effect Dedication

IEEE MILESTONES PROGRAM STREAMLINED

At the direction of the IEEE History Committee, the IEEE Milestones proposal process has been streamlined into a one-stage process using a single form. Instead of submitting an initial proposal and then waiting for an invitation to submit the full nomination, IEEE members can submit the complete proposal via the IEEE Global History Network at www.ieeeahn.org/wiki/index.php/Milestones:Milestone_Guidelines_and_How_to_Propose_a_Milestone

Interested in proposing a milestone? We encourage you to go to the link above to begin the process. If you are looking for ideas, the Global History Network has a selected list of achievements suitable for proposal as IEEE Milestones (this is only a selection, there are many others). http://www.ieeeahn.org/wiki/index.php?title=Milestones:List_of_Achievements_Suitable_for_Milestones

DEDICATION OF THREE NEW IEEE MILESTONES: LORAN, WHIRLWIND, SAGE

by David Walden, History Committee Corresponding Member

On June 27 at the Westin Copley Place hotel in Boston, the IEEE Boston Section hosted the dedication ceremony for the LORAN, Whirlwind, and SAGE IEEE Milestones.

Boston Section Chair Soon Wan welcomed attendees, described the Milestone program, and highlighted the founding of the Boston Section in 1913 (as a branch of the AIEE, a predecessor organization of IEEE). Arthur Winston, honorary chair of the section Milestones committee, introduced rest of the participants in the ceremony. Gilmore Cooke, Boston Section History and Milestones Committee Chair, outlined the rest of the proceedings, and he thanked MIT Lincoln Laboratory and the MITRE Corporation for their corporate support of the event.

Erik Johannesen, the president of Megapulse, Inc. (which manufactures LORAN systems), gave a brief history of LORAN. There was a "loran-like hyperbolic radio navigation system" in the UK in 1937, and Alfred Lee Loomis (of Tuxedo Park fame) conceived LORAN. MIT's Radiation Laboratory was chosen as a subdivision of the National Defense Research Committee, and in 1941 John Pierce joined the laboratory and, for his guiding efforts, he became known as the father of LORAN. LORAN was deployed at an astonishing rate around the North Atlantic and then in the Pacific in the middle years of WWII. The early system required operator involvement, later supported with pre-computed lines overprinted on navigation charts. The more modern LORAN-C became operational in 1957 with involvement of many countries, manufacturing by 30 or so companies, and eventual full continental US coverage. With the development and deployment of GPS, LORAN was phased out of operational use in the United States although development of a more modern system as a backup for GPS continued until 2010. Johannesen says, "Although loran signals were terminated in the US, they still exist in many parts of the world and the future of LORAN, both internationally and Domestically, is still a history to be written."

Capt. Alan Arsenault, who spent twelve of his years with the Coast Guard working with LORAN, noted the breadth of use of LORAN: marine and terrestrial navigation and for timing without navigation (e.g., in banking or power generation). As an electrical engineer himself, he called LORAN "an engineers dream—nanosecond timing and control and 700,000 to 1,200,000 watt transmitters."

Eric Evans, Director of MIT Lincoln Laboratory, noted that Lincoln Laboratory was created to develop SAGE and— in turn— Lincoln Laboratory had come out of the Radiation Laboratory's radar work. In time, MITRE Corporation spun out of Lincoln Laboratory to carry on the SAGE work. Evans then introduced Jay Forrester, who with Bob Everett, led the development of Whirlwind and the early phases of SAGE.

Forrester credited Parry Crawford, George Valley, and Carl Compton with providing vision for connecting a digital com-

puter to a radar, for seeing the defense need, and for requesting the multi-year plan that led to construction of the SAGE system. Forester emphasized that the project was set up in a way that his and Everett's MIT team had central influence with the military and the vendors; this made possible construction of a operational and reliable system. Along the way they had to understand how to make vacuum tubes be very reliable, and they included margin-checking hardware in the system and pairs of computer running in parallel at each site (one monitoring the other and available for switching to operational). Thus they achieved 99.8 percent system uptime.

Bob Everett who was with the Whirlwind and SAGE projects from their beginnings was a founding member of the MITRE Corporation in 1958 (at the time the first SAGE site was deployed) and president from 1969-1986. He credited Jay Forrester with being responsible for the creation of Whirlwind, SAGE, Lincoln Laboratory, and MITRE. Everett went on to describe the 250 engineers at Lincoln Laboratory who developed the SAGE system (fifty of whom were computer programmers) and the involvement of other organizations (such as IBM and SDC) with thousands of additional engineers. Development of SAGE was done in close collaboration with the Air Force customer, which supported Lincoln Laboratory acting as director of the project, while arranging for SAC bombers to do fly-bys for systems tests, and eventually taking over maintenance of the system.

IEEE 2012 President Gordon Day noted that each of the three projects was like nothing that came before—they all were ground-breaking, building on the then-latest research, and each had broad impact, moving technology ahead beyond the specific application. All three were related to MIT and funding came from the Department of Defense in each case. Then Day unveiled the plaques with help for LORAN from Professor William Freeman of MIT and Capt. Allan Arsenault; help for Whirlwind from Freeman; and help for SAGE from Eric Evans, Jay Forrester, and Bob Everett.

The development of LORAN under wartime conditions transformed navigation, providing the world's first near real-time positioning information. Whirlwind was the first real-time high-speed digital computer using random-access magnetic-core memory.

SAGE was an engineering marvel for its time in terms of the computing, networking, and successful management of an enormous project.

Gilmore Cooke and Soon Wan passed out miniatures of the plaques to the participants in the ceremony. Soon Wan concluded the event with an invitation for attendees to come back next year for the 110 anniversary of the Boston Section and a request for all participants and attendees to stay for a group photo with the plaques. People then went to the next door meeting room for a reception and to continue meeting new people and old colleagues and friends and to celebrate the LORAN, Whirlwind, and SAGE Milestones.

IEEE MILESTONE TECHNICAL TOUR OF JAPAN, 20 – 28 MAY 2012

Following the Panama and the UK Tours, the third Technical Tour by the Life Member Committee took place in Japan. The twenty-seven attendees, sixteen Life Members and eleven spouses, checked in at the hotel in Kyoto in the evening of 20 May 2012. The tour began the next morning after watching the Golden Sun Eclipse.

The first stop was a visit to Sharp Historical Hall in Tenri, which has two plaques for IEEE Milestones in Electrical Engineering and Computing: one for the electronic calculator and one for the PV cell. The tour visited Keage hydropower station in Kyoto, the oldest hydroelectric station in Japan, and Nagoya to visit the Railway Park and the Yosami Museum, both of them have Milestone plaques, and the Toyota Museum. Tour participants rode on the super express train "Hikari" to Shinagawa, Tokyo. They visited NHK, Seiko, Toshiba, TEPCO and JVC museums, all of who have been awarded IEEE Milestones and have plaques which are displayed.

All participants enjoyed the tour and deepened their insight into the histories of technology and industries through the visits to companies and laboratories which have been awarded Milestones. They also improved their understandings of Japanese culture through the visits to several museums, temples and shrines.



Technical Tour Participants visiting the Nara Locomotive Park

SURF CITY

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

www.murciatoday.com/cartagena-history-of-the-isaac-peral-submarine_6471-a.html -- Simon Peral's electric submarine

<http://findingaids.princeton.edu> -- The Archival Working Group at Princeton University's Department of Rare Books and Special Collections is pleased to announce the availability of a redesigned finding aid interface.

www.recording-history.org/index.php -- Web site on the history of recording technology.

www.llnl.gov -- Lawrence Livermore National Laboratory has released the first installment of a historical timeline reflecting the laboratory's history as it approaches its 60th anniversary.

THINGS TO SEE AND DO

CRYPTOLOGIC HISTORY SYMPOSIUM OCTOBER 2013

The National Security Agency's Center for Cryptologic History sponsors a biennial Cryptologic History Symposium. The next conference will be held 10-11 October 2013 at the Johns Hopkins Applied Physics Laboratory's Kossiakoff Center, Laurel, Maryland, U.S.A. Historians from the Center, the intelligence community, the defense establishment, and the military services, as well as scholars from American and foreign academic institutions, veterans of the profession, graduate and undergraduate students, and the interested public are invited.

The theme for the upcoming conference will be "Technological Change and Cryptology: Meeting the Historical Challenges." All serious work on any unclassified aspect of cryptologic history will be considered. Proposals should include an abstract for each paper as well as biographical sketches for each presenter. Submit proposals to: Dr. Kent Sieg, the Symposium Executive Director, 301-688-2336, kgsieg@nsa.gov.

BOOK ON REGION 8 HISTORY BY MARTIN BASTIAANS

On the occasion of the Benelux Section's 50th Anniversary on 13 May 2009, Martin Bastiaans began digging in the Section's archives with the intention of compiling a history of IEEE's Region 8. In the course of his search, he consulted many sources of information. It is hoped that this article will inspire other IEEE organizational units to compile their own history, and also that this article will help them in their quest by showing what sources of information to look for and which they might find useful.

To begin with, Region 8 was fortunate in having an excellent article on Region 8's early activities: Jan Biemond and Bruce B. Barrow, "The Benelux Section and Early IRE/IEEE Activity in Europe," in Proceedings of the 2009 IEEE Conference on the History of Technical Societies (available in IEEEExplore at <http://dx.doi.org/10.1109/HTS.2009.5337847>) as well as an article by Robert C. Winton, "The Start of Region 8 and its Sections," in the *Region 8 Centennial Review*, issued with the IEEE Region 8 newsletter, no. 65, February 1984.

The other sources consulted were: Private archives of past Benelux Section officers, IEEE Region 8 Committee meetings' minutes, IEEE Region 8 newsletters, IEEE Board of Directors and ExCom meetings' minutes, Annual Reports of the IEEE Secretary, MGA Board (and RAB) meetings minutes (from February 1992 onwards) and their archives, Excerpts of the MGA databases (members and organizational units).

Presently, the book is about one hundred pages, not counting the transcripts of the minutes of the first Regional Committee meetings and other pages. The working title is "A Short history of IRE Region 9 / IEEE Region 8." Bastiaans is working to bring it to a final form for presentation at the April 2013 Region 8 meeting in Madrid and to transform it into a living document suitable for posting onto a Wiki-based platform so that other Past Directors of Region 8 can write their personal reflections and future Region 8 officers will be able to add new historic material. Meanwhile, oral history interviews with Past Directors are continuing to increase the knowledge of Region 8's history, and a special issue of Region 8 News is being planned as the 100th Region 8 Committee meeting approaches.

The first chapter of the book describes the history of Region 8 and its sections, referring to the Inter-Sectional Committee meeting (Benelux, France, Geneva, and Italy) on 14 February 1962 to form a new Region. The territory for the Region would be based on the European Broadcasting Area defined in the Radio Regulations of the International Telecommunication Union; this area includes the Western part of the USSR and the territories bordering on the Mediterranean. On 24 April 1962 the IRE Executive Committee approved the new Region, and one month later, on 24 May 1962, the IRE Board of Directors gave its final approval. The inaugural meeting of the Region 9 Committee was held 6 June 1962 in Geneva, Switzerland.

At that time, the Region was numbered as Region 9; in 1963 upon the merger with AIEE which formed IEEE, the IEEE Board of Directors renamed it as Region 8. The new Region 9 was subsequently divided into the present regions 9 and 10 in 1966, and IEEE's regions were given their present outlines in 1981.

The book contains in addition a wealth of information about Region 8's history during the past fifty years, such as the foundation of Sections (including geographic unit and membership statistics), the Region's Operating Committee members and Appointed Coordinators, personal reflections of some past directors and other Region 8 officers, Region 8 committee meetings, Region 8 conferences, IEEE award recipients in Region 8, and more.



THE INSTITUTE OF RADIO ENGINEERS INCORPORATED

August 7, 1962

To: Board of Directors
Section and Subsection Officers

From: Emily Sirjane, Office Manager

Subject: IRE Section Manual Revisions

The following actions were taken by the IRE Executive Committee under dates of April 24 and July 10, 1962:

- (1) Approval of the formation of a new Region, Region 9.
- (2) Approval of the establishment of a new Section, the United Kingdom Section.

The necessary corrections have been made to the IRE Section Manual, and you are requested to substitute the enclosed sheet for that page which immediately follows the territorial assignment of Region 8 in Section 20 of your copy of this Manual.

Enclosure (1)

PROGRAMS OF SUPPORT FOR SCHOLARS FROM THE IEEE HISTORY CENTER

The IEEE History Center offers two programs of support annually for scholars pursuing the history of electrical engineering and computing: **An internship for an advanced undergraduate, graduate student, or recent Ph.D., and a dissertation fellowship for an advanced graduate student or recent Ph.D.** The internship and the dissertation fellowship are funded by the IEEE Life Members Committee. The internship requires residence at the IEEE History Center, on the Rutgers University Campus in New Brunswick, New Jersey, USA; there is no residency requirement for the dissertation fellowship.

IEEE LIFE MEMBER FELLOWSHIP IN ELECTRICAL HISTORY

The IEEE Fellowship in Electrical History supports either one year of full-time graduate work in the history of electrical science and technology at a college or university of recognized standing, or up to one year of post-doctoral research for a scholar in this field who has received his or her Ph.D. within the past three years. This award is supported by the IEEE Life Members Committee. The stipend is \$17,000, with a research budget of up to \$3,000.

Reimbursable research expenses include economy class travel to visit archives, libraries, historical sites, or academic conferences, either to hear papers or to present one's own work. Hotel stay, meals while travelling, copying costs, reprints of scholarly articles, and books directly pertaining to research are reimbursable. Any research trip expected to cost more than \$1000 must be approved in advance by IEEE History Center Staff. Examples of non-reimbursable expenses include, but are not limited to: licensing fees for images for book version of thesis (book publisher should pay for those), computers or computer peripherals, digital cameras, clothing, and office supplies (paper, pens, printer cartridges, CDs, memory sticks, etc.).

Recipients are normally expected to take up the Fellowship in the July of the year that it is awarded. Fellowship checks are normally mailed to the Fellow quarterly in July, October, January, and April. For Fellows in the southern hemisphere who follow the southern hemisphere academic year, arrangements can be made to mail the checks in December (two quarters worth), March, and June.

Candidates with undergraduate degrees in engineering, the sciences, or the humanities are eligible for the fellowship. For pre-doctoral applicants, however, the award is conditional upon acceptance of the candidate into an appropriate graduate program in history at a school of recognized standing. In addition, pre-doctoral recipients may not hold or subsequently receive other fellowships, but they may earn up to \$5,000 for work that is directly related to their graduate studies. Pre-doctoral fellows must pursue full-time graduate work and evidence of satisfactory academic performance is required. These restric-

tions do not apply to post-doctoral applicants.

The Fellow is selected on the basis of the candidate's potential for pursuing research in, and contributing to, electrical history. Application forms are available on-line at http://www.ieee.org/web/aboutus/history_center/about/fellowship.html. The deadline for completed applications is 1 February. Applicants will be notified of the results by 1 June.

The IEEE Fellowship in Electrical Engineering History is administered by the IEEE History Committee and supported by the IEEE Life Members Committee.

IEEE HISTORY CENTER LIFE MEMBER INTERNSHIP

Scholars at the beginning of their career studying the history of electrical technology and computing are invited to contact the Center to be considered for a paid Internship at the Center's offices on the Rutgers University campus in New Brunswick, New Jersey.

The intern program seeks to provide research experience for graduate students in the history of electrical and computer technologies, while enlisting the help of promising young scholars for the Center's projects. The Intern generally works full-time for two months at the History Center on a Center project that is connected to his or her own area of interest. This time is usually during the summer, but other arrangements will be considered. Interns are also encouraged to consult with the Center's staff and its associates, and be guided to research resources in the area. The internship is designed for those near the beginning or middle of their graduate careers, but advanced undergraduates, advanced graduates, and, on rare occasions, recent Ph.D.s will also be considered. Special consideration is often given to scholars from outside the United States who might not otherwise have an opportunity to visit historical resources in this country.

The stipend paid to the intern is US\$3,500, but additional funds may be available to defray travel costs, depending on the intern's circumstances. This internship is supported by the IEEE Life Members Committee.

There is no formal application form. To apply, please mail

a curriculum vitae showing your studies in electrical history along with a cover letter describing the sort of project you would be interested in doing (see contact information below). The deadline for contacting the IEEE History Center is 1 March.

IEEE and Rutgers are AA/EO employers. Women and minorities are encouraged to apply for all positions. The IEEE History Center is cosponsored by the Institute of Electrical and Electronics Engineers, Inc. (IEEE)—the world's largest

professional technical society—, and Rutgers—the State University of New Jersey. The mission of the Center is to preserve, research, and promote the legacy of electrical engineering and computing. The Center can be contacted at: IEEE History Center, Rutgers University, 39 Union Street, New Brunswick, NJ 08901-8538, ieee-history@ieee.org, http://www.ieee.org/web/aboutus/history_center/index.html

THE BAKKEN LIBRARY TRAVEL GRANTS 2013

Scholars and artists are invited to apply for travel fellowships and grants, which The Bakken offers to encourage research in its collection of books, journals, manuscripts, prints, and instruments documenting the history of electricity, magnetism, electrotherapeutics, electrophysiology, and related topics. The awards may be used to help defray expenses of travel, subsistence, and other direct costs of conducting research at the Bakken. Awards are intended for researchers who must travel to the Twin Cities and pay for temporary housing in order to conduct research at the Bakken.

1. Visiting Research Fellowships are awarded up to a maximum of \$1,500; the minimum period of residence is two weeks.

2. Research Travel Grants are awarded up to a maximum of \$500 (domestic) and \$750 (foreign); the minimum period of residence is one week.

The next application deadline for either type of research assistance is **March 4, 2013**.

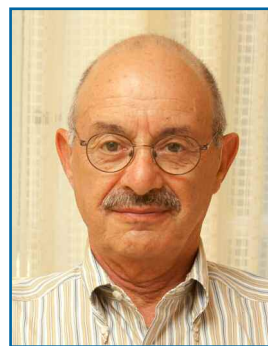
For more details and application guidelines, please contact: Juliet Burba, Chief Curator
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Minneapolis, MN., 55416
tel 612-926-3878 ext. 217
fax (612) 927-7265
e-mail burba@thebakken.org
www.thebakken.org

DONOR SPOTLIGHTS

LES VADASZ

The History Center is devoting considerable effort to pre-university outreach. The goal is educate students on the important roles that science and engineering have played in the long story of human development. Through a series of successful initiatives, the History Center has shown that themes of science and engineering can be integrated into the curricula of existing pre-university social studies courses. In many respects the History Center's pre-university focus complements the STEM education efforts that seek to get more young people to study science and engineering. Together with STEM, the History Center's societal focus provides a more holistic approach to raising an awareness, understanding, and appreciation of science and engineering among our youth. To help expand this pre-university outreach, Les Vadasz, through the Vadasz Family Foundation, recently gave the IEEE History Center a gift of \$10,000.

Les Vadasz was part of the team that launched the Intel Corporation. Born in 1936, in Budapest, Hungary, Les left his homeland during the Hungarian Uprising and came to Montreal, Canada, where, in 1961, he got his Bachelor's degree in electrical engineering from McGill University. He soon found his way to Fairchild Semiconductor in California. There he worked with Gordon Moore, Robert Noyce, and Andrew Grove. When



Les Vadasz

they left to form Intel, Vadasz was the next person that they asked to join them. Vadasz soon headed up Intel's MOS design department which developed the first DRAM chip and later the first microprocessor. Les quickly rose through the management ranks of Intel. He retired in 2003 as both the Executive Vice President of Intel and President of Intel Capital, the investment arm of Intel.

Since his retirement, Les Vadasz and his wife, Judy, have split their time between Silicon Valley and Sonoma. They soon realized that Sonoma faced serious educational challenges. Driven by a sense of social obligation, he and his wife have responded to the cultural and educational needs of their community. Les Vadasz has taken a special interest in raising the science and math skills of Sonoma's youth.

The History Center is grateful to the Vadasz Family Foundation recognition of the Center's pre-university outreach initiatives and for its generous support of these efforts.

THE MAXWELL'S EQUATIONS MILESTONE IS A CELEBRATED AS A COMMEMORATIVE COASTER

Between 1860 and 1871, at his family home Glenlair and at King's College London, where he was Professor of Natural Philosophy, James Clerk Maxwell conceived and developed his unified theory of electricity, magnetism and light. A cornerstone of classical physics, the Theory of Electromagnetism is summarized in four key equations that now bear his name. Maxwell's equations today underpin all modern information and communication technologies. Maxwell built on the earlier work of many giants, including Ampere, Gauss and Faraday, but he himself was a giant who revolutionized the field of electrical and optical physics, and laid the groundwork for electrical, radio and photonic engineering, with his experiments, theories and publications. The unification of the theories of electricity, magnetism and light, which comes directly from Maxwell's equations, clearly sets Maxwell's work apart from similar achievements of the time.

Maxwell's Equations, 1861-1870 was dedicated as an IEEE Electrical Engineering Milestone in a ceremony held in Glenlair,

Scotland, on 13 August 2009. The IEEE History Committee established the The IEEE Milestones in Electrical Engineering and Computing Program during the Centennial year as an ongoing means to commemorate events of national and international significance in the history of electrical and electronics engineering. Visit ieeeghn.org to learn more about the donor supported IEEE Milestones Program.

To celebrate this important milestone, the IEEE Life Members Fund of the IEEE Foundation has made available a limited edition coaster depicting Maxwell and his equations. Maxwell's Equations is the sixth coaster in a series of limited edition coasters commemorating various historic IEEE Electrical Engineering Milestones. The first five depict Telstar, the Panama Canal, Japan's Bullet Train, the ENIAC computer and the Atom Smasher.

For more information on how you can receive any in the set of limited edition coasters, e-mail donate@ieee.org.

PLANNED GIVING BUILDS IEEE'S HERITAGE

As you review and update your estate plan, please consider the impact IEEE has had on your education, career and life. There are several ways you can inspire the future by including the IEEE History Center Fund of the IEEE Foundation in your plans. Some IEEE members bequeath a specific dollar amount or a percentage of the 'residue' – the amount remaining after paying all inheritances, debts and costs – in their will or trust. Others name the IEEE History Center Fund of the IEEE Foundation as the beneficiary of their life insurance or retirement plan. IEEE Development Office is available to share more information about these options with you. You can contact them by telephone at +1 732 562 3860 or e-mail at donate@ieee.org.

When you include the IEEE History Center Fund in your plans, please share the good news with the IEEE Development Office. This helps us plan for the future and recognize your generosity during your lifetime by inviting you to join the *IEEE Goldsmith Legacy League*, our elite legacy giving donor recognition group.

IEEE Goldsmith Legacy League is named in memory of Alfred N. and Gertrude Goldsmith whose planned gifts seeded the IEEE Foundation's ability to support the mission of the IEEE. Members of the *IEEE Goldsmith Legacy League* are *Forever Generous*. They are building tomorrow by leaving legacy gifts that will benefit future generations. In recognition of their special commitment, members of the *League* receive a keepsake coin and certificate of membership in a custom presentation binder, an invitation to attend the annual IEEE Honors Ceremony, the *IEEE Foundation Focus* newsletter, periodic updates on planned giving, as well as recognition in the annual *Honor Roll of Donors* and on the "Wall of Honor".

This article adapted from material provided by R&R Newkirk. It is not intended as legal advice. Consult your advisers.

ABOUT THE IEEE HISTORY CENTER FUND

The *IEEE History Center Fund* is one of the more than 130 funds administered by the IEEE Foundation. **IEEE History Center Fund** supports the activities of the IEEE History Center to record, archive, and educate the public about the nature of technology and its relationship, both past and present, to society.

Bequests to the IEEE History Center should be worded as follows:

...to the IEEE Foundation, Incorporated, New York, NY for the benefit of the IEEE History Center (further designation can be made to a specific program, such as Oral Histories or Global History Network)."

Beneficiary designations to the IEEE History Center should be worded as follows:

IEEE History Center Fund of the IEEE Foundation, Incorporated

As a tax exempt 501(c)(3) organization in the US, the IEEE Foundation relies on charitable donations to sustain and expand its efforts to provide philanthropic services to support the core purpose of IEEE – advancing technology for humanity. Donations are tax deductible to the fullest extent allowed by law in the US. For other countries, please check with your local tax advisor. To learn more, visit ieeefoundation.org.

BELL LABS MEMOIRS: VOICES OF INNOVATION

published by the IEEE History Center

BELL LABS MEMOIRS: Voices of Innovation



EDITED BY A. MICHAEL NOLL
AND MICHAEL GESELOWITZ

The innovative spirit and creative energy of Bell Labs during the directorship of William Baker are described in this new book by twelve people who worked there. The first-hand accounts are by: John Pierce, father of communications satellites; Manfred Schroeder, speech encoding; Walter Brown, developer of silicon semiconductors; Carol MacLennan, computers and the Ulysses spacecraft; Alan Chynoweth, materials research; David Dorsi, expert glassblower; Edward Zajac, submarine cables and economics research; Edwin Chandross, optical memories and organic materials (inventor of the now ubiquitous light stick); Italo Quinto, chauffeur to William Baker; Mohan Sondhi, inventor of the adaptive echo canceller; William Keefauver, Bell Labs' general patent attorney; and lastly, William Baker himself. Through their eyes and words, the culture of Bell Labs comes to life.

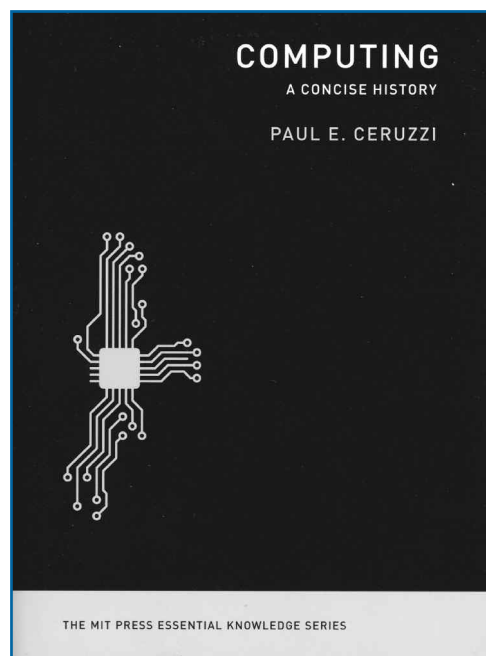
The research done at Bell Labs led to many devices and techniques that helped build our present world. Acoustic cameras, adaptive predictive coding, block diagram compilers, cryptography, diamond crystal research, digital communication, echo research, inverse filtering, light-emitting diodes (LEDs), magnetic bubble memories, microwaves, organic field effect transistors, pulse code modulation, synthetic speech, transistors, traveling-wave tubes, and vocoders are among the topics recalled by the contributors to this book.

Available from Amazon.com in hard copy, and also on Kindle at:

http://www.amazon.com/Bell-Labs-Memoirs-Innovation-Geselowitz/dp/1463677979/ref=sr_1_1?s=books&ie=UTF8&qid=1320151019&sr=1-1

CERUZZI, PAUL E.

Computing: A Concise History, MIT Press, 2012



With the rapidly increasing depth and breadth of literature in the history of computing, it would be hard to believe that someone would attempt to summarize the entire trajectory of computing in a single, small (two-hundred pages in a 5 inch by 7 inch paperback format). It would be even more surprising if that person were not a journalist or “popularizer.” Yet, such a summary has been attempted, and by no less a

scholar of the history of computing than Dr. Paul E. Ceruzzi, Curator of Aerospace Electronics and Computing at the Smithsonian Institution’s National Air and Space Museum, author of many important scholarly books and articles. And he has succeeded brilliantly.

Published as part of the MIT Press’ “Essential Knowledge” series (“short, accessible books on need-to-know subjects in a variety of fields,” this being the first one that is historic in nature), this is a book that one hopes will reach a wide, popular audience. It certainly will be useful as a textbook or ancillary text in a college-level history of technology course. At the same time, it will be a very enjoyable read for the more knowledgeable subscribers to this newsletter. Since the book is so short and so inexpensive, we will not spoil it by revealing the clever organizing structure that the author has devised to present the history of computing as a coherent narrative. Instead, we encourage everyone to obtain and read the book for themselves.

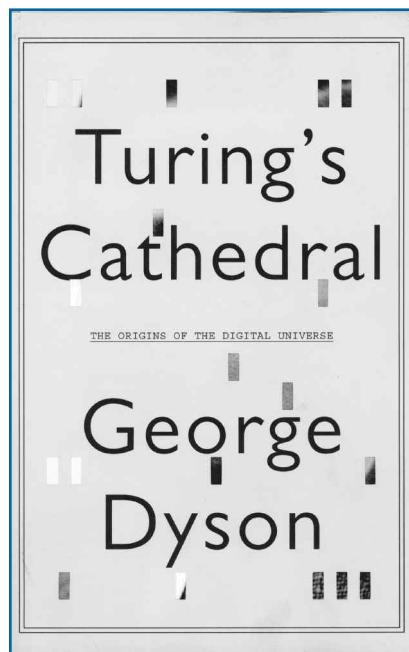
Part of the fun will be choosing to agree or disagree with this structure, and choosing to agree or disagree with the inclusion/exclusion of specific events in the historic chain, some exclusion of course being necessary given the short format of the book/series. That format also leads to only shortcoming that will be mentioned in this review: Computers are artifacts, designed, built and used by people, and the reader would love to see these things and persons, but the illustrations are limited to handful of small black and white images.

The book is, nevertheless, highly recommended!

Available from MIT Press, Cambridge, MA. Phone (617) 253-5646; Fax: (617) 258-6779. <http://mitpress.mit.edu> \$11.95, paper, ISBN-13 978-0-262-51767-6. xvi + 199 pages (including bibliography, index).

DYSON, GEORGE,

Turing’s Cathedral: The Origins of the Digital Universe, Pantheon Press, 2012



Turing’s Cathedral might equally well have been titled “Von Neumann’s Cathedral” as the book is primarily about him and the founding of the Institute of Advanced Study in Princeton, New Jersey, and Turing is mentioned on a dozen or so pages as the initiator of the idea that “it is possible to invent a machine which can be used to compute any computable sequence.”

The book begins with the biographies of the people who built the foundations of the cathedral (Dyson’s metaphor) by influencing Turing, in particular

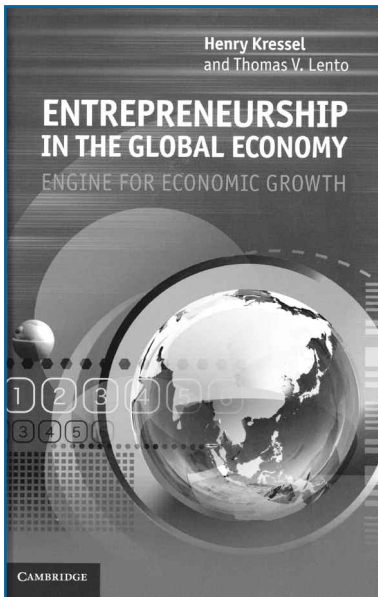
Oswald Veblen and Norbert Wiener. The chapter on the founding of the Institute for Advanced Study in 1932, and especially the departmental politics involved is a sobering cautionary tale of organizational dynamics. The squabbles over office space, and the pointless intellectual divides between theorists and researchers who worked with practical devices (e.g. building computers) —or even the divide between theoretical and applied mathematicians— expose an unattractive and counterproductive aspect of academia. Dyson mentions a droll episode involving the IAS Director’s concern over the relative amounts of tea consumed, and the technicians being “especially unfair in the matter of sugar.” Von Neumann, because of the enormous respect he enjoyed from both camps, was kept busy bridging the chasm.

The computer project at the Institute for Advanced Study (the MANIAC) was intended to be an all-purpose, automatic, electronic computing machine, and Von Neumann argued that it was important that a purely scientific organization should build it. The computers being built by the government laboratories or by industry were limited by their intended purposes. According to Klari Von Neumann, John Von Neumann wanted a machine “which could answer as many questions as there were people to ask them.”

The details of the building of the machine, and the ingenuity used to overcome the early technical obstacles make up the second third of the book, while the final third treats the development of software and its importance in fulfilling Turing’s model. Throughout the book, the human personalities of the people who built the machine are richly described.

Available from Pantheon Press, 1745 Broadway, New York, NY 10019, www.pantheonbooks.com, hardback, \$29.95, ISBN 978-0-375-42277-5, xxi + 401, index, 41 illus.

KRESSEL, HENRY, AND THOMAS V. LENTO,
Entrepreneurship in the Global Economy: Engine for Economic Growth, Cambridge University Press, 2012



Kressel and Lento use their third book to encourage innovators to think in terms of global markets for their new products and services. This means working with a variety of political economies that are more regulated by government than an investor finds in the United States. Here, the authors frequently remind us, federal support for innovation remains essential through consistent enforcement of patent and other laws, massive investment in research and development, and funding for education.

The book is divided into three parts. Chapters 1 and 2 examine the reasons for the successful interplay of entrepreneurial culture, national policy, and high technology in developed and developing countries and regions therein; Chapters 3-9 offer case histories of successful global innovators exploiting that environment; and Chapter 10 concludes on the necessity of public-private partnerships in fomenting successful innovation. While the authors make a sound point on respecting the roles of government and individuals in creating economic value, the appeal of the book to readers of this newsletter lies in the case studies. All but the first one are of recent vintage, for Kressel draws on examples of success stories in which he has participated as a senior partner at the investment firm Warburg Pincus. The first relates to the Radio Corporation of America (RCA), where he worked for more than twenty years, and where David Sarnoff set an example of the immigrant American who led the company to major systems innovations by leveraging both the private and public sectors.

As a consultant and source on that chapter and a former colleague of Lento's, I should be pleased with this. The authors help redress Sarnoff's reputation, which has been tarnished since RCA's demise by accusations of wrongdoing in the Edwin Armstrong and Philo Farnsworth patent disputes, and by his role as a monopolist in an antitrust era. Kressel and Lento highlight Sarnoff's entrepreneurial opportunism following RCA's formation by some of the largest American companies, which they liken to venture capital investors, and his skill in navigating the company through competitive, antitrust, and innovative challenges, most notably the electronic and color television systems essentially adopted around the world for two generations. The authors point to the variety and value of electronics industries created as a result of his leadership. It's worth making some corrections, however. The telecom industries owe at least as much of their formation to AT&T as to RCA. There is evidence that Sarnoff spent close to seventy-two hours at

two wireless stations after Titanic's sinking. Sarnoff promoted the concepts and practice of radio and network broadcasting, but he clung to a non-profit model on both activities long after AT&T pioneered sponsored programming. His role in broadcasting a boxing match in 1921 lay in providing a transmitter and circulating the world's first audience ratings report to his superiors. The design focus of RCA's initial liquid crystal displays (LCDs) was not TV, as video was not yet practical; that was the long-term goal.

The rest of the examples cover technologies and industries so recent that they are far less studied by historians than Sarnoff and RCA. Of particular interest are the histories of Raza Microelectronics (RMI, now merged with NetLogic Microsystems) and its network processor chips; Eli Harari's SanDisk and flashmemory technology, whose floating gate EEPROM was recently recognized with an IEEE Milestone; and three international start-ups that service the Chinese telecommunications industry: Asialnfo, Harbour Networks, and RDA Electronics. The two remaining cases cover the Transammonia's success in the global commodity market and Ness Technologies, an Israeli-based IT services company that has expanded to central Europe and India.

The writing is smooth and reads quickly, in part because there is ample spacing of the text, and partly because of the positive, journalistic tenor that reflects a "first draft" of history. Kressel's accounts suggest not just that an innovator needs to think internationally, and the financing to act on those thoughts, but that he or she needs sound advice and introductions to the relevant parties in the new country and its industries. In other words, such entrepreneurs could benefit from the services of a well-connected investment firm. Nonetheless Kressel and Lento offer a rare glimpse of the cross-cultural, high technology innovation process from a venture capitalist's perspective. One hopes that Kressel will donate to an archive not only his papers but the proprietary analyses of technologies and industries that we see parts of in the book's figures and footnotes. One also wishes he'd written a denser book with more discussion of the decision and negotiating processes that mark the contingency and risks of entrepreneurship.

The focus of the case studies affirms a pattern identified by Kressel's Warburg Pincus colleague, William Janeway. He observed that venture capitalists have directed more than eighty percent of their investments to information and computing technologies (ICT) and medical and biotechnologies since 1985. The great successes lie in ICT for, while VCs have profited from their investments in healthcare and biotechnology, the biotech industry outside Amgen has lost money since 1975. VC investment in energy, "green" technologies, physics-based devices, and materials science has rarely occurred or succeeded for reasons of small markets, laws of physics, or technological immaturity. These counter examples suggest limits to the generalization of Kressel and Lento's argument beyond ICT, despite the success of Transammonia. They also remind us that the frequent assertions that technology is changing faster than ever applies largely to the digital economy, and not to most of the other technological systems with which we exist.

Available from Cambridge University Press, 32 Avenue of the Americas, New York, NY 10013-2473, +1 845 353 7500, www.cambridge.org/us/knowledge/isbn/item6807083/?site_locale=en_US, hardback \$45. ISBN 9781107019768. 278 pp., index.



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