SIGNAL PROCESSING HISTORY

The year 1948 saw its share of landmark events in the technologies of communications. Claude Shannon's mathematical theory of information inaugurated a new era of analysis of communications systems. An early color-TV standard developed by CBS won approval from the FCC, beating out rival systems proposed by RCA and CTI. Magnetic recording was developed to the stage where programs could be aired from tape, and the transistor was officially announced by its inventors at Bell Labs. In the same year, a special subgroup of the Institute of Radio Engineers was organized to focus its attention on the unique problems of audio electronics. Although observers of these events would have been hard pressed to remark on their connection, we recognize in hindsight a significant coincidence. Over the years, the interests of the audio engineers would spread and the power of the techniques used in communications technologies would expand, so that as time passed, the people and the technologies would grow toward each other. This trend reached a climax in 1991 when the IEEE re-christened its former Professional Group on Audio as the Signal Processing Society (SPS), and it is the intriguing story of this convergence that is the subject of the History Center's newest research project.

Working in cooperation with the SPS, the History Center has begun work on a narrative history of the society and its technologies. The Center's plan is to develop a booklet, consisting of perhaps 50 pages, that covers the highlights of the signal processing story.

The booklet will be richly illustrated, and its narrative will be supplemented by biographical sketches, technological descriptions, and historical notes. Plans call for the booklet to be released in 1998, on the occasion of the Society's 50th anniversary.

The Signal Processing Society traces its history back to the formation of the Audio Group of the IRE, the professional society that was to become the IEEE in 1963. Organized in 1948, the Audio Group was the pioneering unit of the IRE's then-new professional group system. Prior to World War II, the IRE did not require structures to support the specialization of its members. Although regional organization had been an important feature of the IRE, coherence in the field of radio engineering, and the common education and methodology of its practitioners, meant that the IRE's members shared enough common technical ground that they could all comfortably cohabitate a single society. After the war, however, the Institute recognized an "amoeba-like multiplication of applications of radio and electronics [that had] led to a divergence of fields of interest so great that the broadcast engineer has in common with the computer engineer mainly only the fundamental phenomena of the electron tube—and even that interest is an indirect association...the audio man and the microwave man are a billion cycles removed from each other." (from an article in the December 1948 issue of the Proceedings of the IRE describing the new professional group system) The response was to form a system of professional groups that is the direct predecessor of the IEEE's present system of technical societies.

The first group organized was the Audio Group, established on June 2, 1948, and chartered to focus on "technology of communication at audio frequencies and the audio-frequency portion of the radio systems." Over the years, the purview of the group evolved to include a wider range of technical applications. Known as the Audio and Electroacoustics Group between 1966 and 1973, the Acoustics, Speech, and Signal Processing Group (and then Society) between 1974 and 1990, and the Signal Processing Society thereafter, the group changed frequently to remain close to the interests of its members. These changes in name reflect the transformation of the society from one focused on a specific form of communication technology to one that treats communications at a more general level—a change that is itself reflective of the penetration of signal processing...
Staff Notes

The newsletter reports on the activities of the Center and on new resources and projects is entirely written by graduate students. It is published three times each year by the Center for the History of Electrical Engineering.

NSF History

William Aspray and Andrew Goldstein, working in collaboration with Bernard Williams of BDL Publications, have just published an article in Vite Mathematica, a volume published by the Mathematical Association of America. The article, entitled "The Social and Intellectual Shaping of a New Mathematical Discipline: The Role of the National Science Foundation in the Rise of Theoretical Computer Science and Engineering," focuses on the NSF's role in promoting and funding areas of computer science, through both broad analysis and detailed case study.

Many federal agencies sponsored extramural research programs in computing. In particular, the Advanced Research Projects Agency (ARPA), now known as DARPA, was a major source of funding for universities and other laboratories, putting plentiful defense dollars into large-scale, high-risk research. With far less money at its disposal than ARPA, however, the National Science Foundation (NSF) was itself an important source of support for projects that were markedly mathematical in nature. In fact, the NSF had a long tradition of supporting interdisciplinary work, and its budget was sufficient to make it possible to conduct this work.

The NSF has played a significant role in the development of computer science, and it is important to recognize the contributions of the NSF to this field. However, it is also important to recognize that the NSF has not always been successful in its efforts to support computer science research.

Abate Addresses Life Members

On April 30, Jane Abate was the speaker at the Electro '96 Life Member Luncheon. She spoke on the history of the Internet, beginning with its origins in the Defense Department's ARPANET and describing the network's phenomenal growth and evolution from a small experimental research tool to a popular medium for communication and entertainment. Along the way the Internet has pioneered new technologies such as packet switching and linking and World Wide Web, and the invention of e-mail as exemplified by the World Wide Web. A lively question-and-answer session followed the talk, demonstrated the continuing interest and importance of IEEE Life Members in advanced computer communications.

LEONEMARIE, Inc.

Janet Alveb was a participant in the University of Pennsylvania's Historical Symposium, held in honor of the 50th anniversary of the Moore School lectures on computer science. The Moore School Lectures gave out the ENIAC project and dissertations, the knowledge that research yields through intensive discussion of the latest ideas in the field. In the spirit of the Moore School Lectures, the May symposium brought together two dozen historians from the United States and Europe to discuss and debate current issues in the history of computing. Alveb presented a paper entitled "A Tale of Two Nets: Early Data Communications Experiments in England and America," in which she drew on her recent archival research in England to contrast the invention of packet switching computer networks in the two countries.

LEONEMARIE update

On May 13, William Aspray welcomed his last day as Director of the History Center. He has resigned his position here to take over as Director of the Computing Research Association (CRA) in the fall.

Dr. Aspray's seven years was the longest tenure as Director of the Center in sixteen year history. In his time here, Dr. Aspray accomplished much; overseeing a new Directions from the Center. The New York office to Rutgers University, expanding the full-time staff to its present complement of six, and building a balanced program for the Center, highlighted by the History of IEEE Technologies project (former Power and Control, all while making his own output of historical books and articles.

The History Committee has announced the formation of a search committee to assist in finding a new Director from the Center. The search committee is now active.

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by appointment.

New Book

by Aspray

Look on the shelves of your local bookstore for the new book by Aspray, William R. Campbell-Keeler: A History of the Information Network. This book traces the history of this all-important technology from the mid-1970s to the present. Although the book emphasizes the business and technical side of the computer's development, it also devotes space to issues of mass interest, including the PC and the Internet. The work is being published by Basic Books (perhaps with the cooperation of IEEE Press) and should be available before the end of the summer. We are expecting a vigorous marketing effort from the publisher, including extensive reviews and wide distribution.

Graduate Assistants

During the 1996/97 academic year, the Center enjoyed the services of four graduate students as the Rutgers graduate program. Bringing them with them a wealth of research experience and a wide store of knowledge, they provided research assistance and contributed to ongoing Center projects.

Jill Anderson completed her second year at the Center. She received a B.A. in history from Carleton College and an M.A. in American history from Vanderbilt University. She recently began her dissertation on the relationship between poverty, aesthetics, and masculinity in the early nineteenth century.

Rene Burmeister received a B.A. in math and history from Reed College and a M.A. in history from the University of Minnesota. She is beginning work on her dissertation on nineteenth century history of medical professionalism.

Stephen Robertson received a B.A.(Hons) in history and a B.A.(Hons) in political science from the University of Otago in Dunedin, New Zealand. He is beginning his dissertation on the history of children's sexual innocence in New York City between 1880 and 1970.

Charles Young received a B.A. in journalism and a M.A. in history from the University of Wisconsin. Currently he is publishing a paper on Hollywood depictions of Korean War POWs and planning a dissertation on Cold War culture.
YAGI-UHA IS MILESTONE

An antenna that radiates power in all directions equally may sometimes be appropriate, but in the vast majority of cases it is preferable to confine the radiated waves to a particular plane or a particular direction. Directional antennas do this, and one of the most important types is the Yagi-Uda antenna. It combines a single driven-antenna with an array of parasitic elements. By carefully adjusting the length of the parasitic elements, that radiate after receiving power from adjacent elements (forming what is called a 'claw'-coupled parasitic array). This design makes it possible to achieve high directivity with a compact antenna. The Yagi-Uda antenna has been extremely important in numerous applications, such as radio, television, and shortwave radio, involving the higher-frequency ranges (especially in the range between 100 and 2000 megahertz).

Hideyuki Yagi, born in 1886, received an engineering degree from Tokyo Imperial University and then continued his studies in Germany, England, and the United States. During World War I, Yagi initiated a radio research program at Tohoku University in Mitya, Japan, and in the early 1920s, his advanced students was Shin- taro Uda. In 1926 Yagi and Uda jointly published a paper describing the new antenna. The work came to the attention of the American Chemical Institute, which, after receiving a letter of recommendation from Yagi, gave an award for his work. The power of the Yagi-Uda antenna is attributable to its high directivity, which is useful for many applications in communications and electronics.

FELLOWSHIP AWARDED

The 1996-97 IEEE Fellowship in Electrical History has been awarded to two co-winners, Christophe Lecuyer and Andrew Robertson.

Christophe Lecuyer, completing his dissertation from Stanford, will now focus on the history of electrical manufacturing and the rise of silicon Valley between the years 1948 and 1972. Lecuyer's ambitious plan is to write a book, which examines how the military's influence shaped the structure of the electronics industry and the design of radio and semiconductor devices. He believe is that the military has played a vital role in the development of new products and in the evolution of work organization in the tube and semiconductor industries.

Robertson, who is pursuing a Ph.D. from Harvard's History of Science program, is studying the transfer of new technologies between the United States and Japan in the period 1920-1970. Contesting that industrialists, bureaucrats, and academics interpret control technology differently in the two societies—America, social scientists and control engineers produced a cybernetic interpretation of the self that defined the individual in terms of a complicated feedback system existing in an information stream, while in Japan, academics and bureaucrats viewed control technology as the material and technical bases for national growth and prosperity—Robertson uses the history of control technology in Japan to understand the development of control systems in the United States.

We expect both research projects to produce valuable results that can stimulate considerable debate about a wide range of issues. The two co-winners will split the $15,000 fellowship on a predetermined basis. The fellowship is made possible by the generous support of the IEEE Life Member Fund.

BIBLIOGRAPHY


In 1987 Albert Abramson published The History of Television, 1880 to 1943 (McFar land & Company) which is comprehensive and well-documented history of television. Also included in the text is Albert's appreciation of Zworykin which is also exceptionally well-documented: Abramson draws on a wide range of primary sources, including Zworykin's personal papers, and on interviews with many television pioneers. Zworykin was a key figure in the development of television, and his life and work are closely tied to the development of electronic technologies.


In his earlier A History of Control Engineering, 1900-1950 (1979), Stuart Bennett provides a comprehensive and well-documented history of control systems, and the development of control systems. Bennett's work is based on extensive research, including interviews with many control engineers, and provides a thorough understanding of the history of control systems.

In 1996, the IEEE Industrial Application Society annual meeting was held in Denver. The IEEE awarded Charles Wright the U.S. Army Construction Engineering Laboratory Award, and he also received the IEEE's highest honor, the IEEE Life Member Fund. The award was in recognition of Wright's many contributions to the field of electrical engineering, particularly in the areas of radar research and railway technology.

Radar Research

In June, the Center hosted David Wickler, a historian with the U.S. Army Construction Engineering Laboratory in Champaign, Illinois. Wickler came to the Center seeking assistance with his Air and Space Defense research project on the Cold War. The study, funded by the Department of Defense Legacy program and due for publication in 1997, will provide critical resources for the study of wartime and Cold War problems. The study is particularly interested in understanding the technical and political aspects of radar research and its impact on the development of modern radar technology.

WRIGHT EXHIBITS

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Bibliography

This book is the translation of the first four chapters of a 15-chapter Japanese work, having the same title, published in 1987. The first four chapters—"Bath of electron tube", "Development of vacuum tube industry", "Receiving tubes", and "Transmitting tubes"—follow developments from the turn of the century to the 1920s and are abundantly illustrated with drawings, photographs, and charts. Sources of information are given. The book takes an international perspective, yet all of the chapters give attention to developments within Japan, thus providing much information not otherwise available in English.

The Newsletter’s "Bibliography" section was prepared with the assistance of Prof. Thomas J. Higgins of the University of Wisconsin–Madison.

Books


Articles


And Don’t Miss…

A number of other interesting historical writings have recently been completed. Antonio Boio has just finished a doctoral dissertation entitled "Professionalism Against the State: French Electronic Policy in Historical Perspective." And at the 1995 Business History Conference, Pierre Mounier-Kuhn gave a paper entitled French Cotton Manufacturers and their US Partners, 1950-1970."
Bibliography

Radio Monographs
A series of monographs on special topics in the history of radio are available from the Pittsburgh Antique Radio Society.
- The U.S. Patents of John H. Hammond, Jr. by David W. Kraeuter (1994)
- The U.S. Patents of Reginald A. Fessenden by David W. Kraeuter (1993)
- A Bibliography of Frank Conrad by David W. Kraeuter (2d ed. 1990)
- Radio and Television Reminiscences (columns from the "Pittsburgh Civician") by Raymond M. Bell (1995)

History

In 1922, construction began in Grinnell, Iowa, on a new radio station to establish superior communication links with the United States. At the heart of the Grinnell station was an Alexanderson alternator, the basic invention that had been patented in 1904. The station's transmitter was designed and built by Dr. Ernest W. Alexanderson, who had been a professor at the University of Wisconsin.

During the 1930s, the station's output increased to meet the growing demand for radio programming. The station's transmitter was upgraded to handle the increased power requirements, and the station's staff grew to accommodate the growing number of listeners.

During World War II, the station played a crucial role in broadcasting news and information to the American public. The station's staff worked long hours to ensure that the station's output was reliable and that the programming was informative and engaging.

In the post-war years, the station continued to grow in popularity. The station's programming included a wide range of content, from news and music to sports and entertainment.

Today, the station is still broadcasting, and its history is an important part of the history of radio in the United States. The station's staff continues to work hard to ensure that the station's programming is informative, engaging, and entertaining for its listeners.
TESLA ARCHIVES

A unique opportunity for museums and repositories of electrical history has recently emerged. The firm Boyle and Anderson of Denver, Colorado, which owns an archive on Nikola Tesla believed to be the largest collection in the world, has opened its collection for bid acquisition.

The archive is in three parts:

1. Twenty-four lots of Nikola Tesla correspondence, manuscripts, and documents, ranging in date from February 21, 1894 through October 31, 1942. Some of the letters are signed. The colorful items in his career are represented, including a letter in French to a woman admirer, and a 46-line poem entirely in his own hand, "Fragments of Olympian Gossip," humorously observing a number of past scientists and philosophers such as Archimedes, Fermat, Newton, and Kelvin.

2. Sixty bills and receipts for supplies provided to Tesla from various vendors, addressed to both his Denver and laboratory in New York City and his experimental station in Colorado Springs.

3. A collection of more than 750 photographs of and about Nikola Tesla and his work. The images concern Tesla's life and work in laboratories, apparatus, celebrations, and commemorative events following his death. Captioning and supplemental historical notes are included. The photos are contained in six 28 cm by 28 cm binders, plus one additional binder that measures 38 cm. (all having transparent envelope-pockets) weighing just over 18 kilograms and occupying 76 cm. of shelf space.

POCKET CALCULATORS

For the engineer, few pieces of electronic equipment can match the electronic calculator as a symbol of technological change. Seemingly overnight, the calculator swept through labs and offices in the early 1970s, rapidly replacing the engineer's long-trusted slide rule, the slide rule. Even for the public-at-large, the calculator made an impressive impact. It was one of the earliest direct exposures to digital electronics, and, in retrospect, can be seen as a precursor to the age of the personal computer. Indeed, the famous story is told of how Steven Wozniak sold his Hewlett-Packard programmable calculator to scrape together enough money to launch Apple Computers. More than just a symbol, however, the calculator was a breeding ground for technological change. The first widespread non-military use of Ra was for calcula- tors, of course, the motivation for the 1940s, the world's first microcomputer, was a desktop calculator.

The legacy of this important device is celebrated and preserved by the International Association of Calcula- tor Collectors. With members in over fourteen coun- tries, the Association trades information, hosts events for the calculator. The group explores develop- ments in the calculator's technical and commercial history, often looking beyond strict technical history to consider matters such as the design of the case- the point of human interface—to understand the path of calculator history. A quarterly journal, articles on the early history of calculators, spotlights on key manufacturers, columns on pricing trends and unique calculator models share with listings of opportunities to acquire collectible pieces. For more information, contact Elizabeth Back, the Bakken, 3537 (postal address LACC, P.O. Box 354, Tuscon CA 85081), http://www.buff.edu/maers/calcul.html

X-RAY EXHIBIT

The Baldon Library and Museum in Min- neapolis is celebrating the centenary of X-rays with an exhibit that opened March 23. Instruments and books from the Bakken's collection on display include induction coils, control panels, X-ray tubes, X-rays from the early part of this century and an arc lamp (the X-ray filter, ca. 1950), used to X-ray the proper fit of shoes. Books, trade catalogues, and articles from the early days of X-ray, including Roentgen's "Eine neue Art von Strahlung," are on view. In addition, a poster exhibit from the Radiology Cen- tral Society, Inc. covers the wall of one gallery. It features a detailed time- line that carefully traces the history of X-rays from 1885 to 1995 in the fields of diagnostic medicine and cancer treat- ment. For more information, please contact Elizabeth Back, the Bakken, 3537 (Postal address LACC, P.O. Box 354, Tuscon, CA 85081), http://www.buff.edu/maers/calcul.html

GERMAN IT MUSEUM

In October, a new experiment in information tech- nology heritage will be launched in Paderborn Ger- many. The Heinz Nixdorf Museum Forum (HNFM), named after one of the pioneers of the German com- puter industry, is scheduled to open its doors. More than four years in the planning, the HNFM will employ a unique organizational structure to attempt to pre- serve and explain the epistemological changes associated with information technology.

The new idea is a two-track approach. The HNFM will have a traditional museum, with a 7,000 sq. meter exhibition space that will have more than 1,000 objects, relating to calculating machines and computers, writing and printing, accounting and office automation. The classical museum approach will be blended with the use of advanced media, such as interactive com- puter stations and reality tours, to produce a multimedia experience. Decidedly international in scope, the displays will include material on such topics as information technology pioneers and the role of Silicon Valley. There will also be a computer his- tory library and archive for researchers to use.

In addition to the convention display space, howev- other, the HNFM will feature the "Paderborn Podium," a forum for discussing the opportunities and risks of technological development in this area. As a major contribution to a future for the information society which is humane and geared to ethical val- ues, the HNFM forum will be a first-rate convention center, boasting state-of-the-art equipment such as large screens, interpreters and trained staff to aid with planned events. The HNFM forum rounds out the institution's commitment to focusing on the social implications and cultural meaning of information technology.

For more information, contact the Directors Nixdorf Park, 40266 Pader- born, Germany, tel. no. ++49 5251 3066 00, http://www.hnfm.de.

SIGNAL PROCESS HISTORY continued from page 1

techniques into more and more applications. The his- tory that the Center will write will be an intriguing web of institutional and technical history, revealing much about how the engineering profession cultivated the emerging technologies of signal processing. Although, as a historian, the Center expects it will discover that the story of how the audio engi- neers grew to identify themselves as signal process- ing engineers is made up of a complex interplay of technical change and professional identity-making.

In addition to the booklet, the Signal Processing His- tory Project includes an oral-history component. Rec- ognizing the value and appeal of capturing techno- logical pioneers in conversation about their own con- tributions, the History Center will conduct oral histories with some of the leading figures in signal pro- cessing technologies. These interviews will be edited and deposited in the archives of the Signal Process- ing Society.

The Signal Processing History Project represents an opportunity for Center historians to gain a deeper understanding of the development of signal process- ing technologies. This research is expected in turn to enrich the treatment of these technologies in the Center's current project, the three volume history of electrical engineering called History of IEEE Tech- nologies (HIT, formerly called Power and Control), an opportunity that is greatly welcomed by the HIT authors. In today's information age, when the field of signal processing has grown to the point where its techniques can be found deeply embedded in a wide variety of electrical technologies, this heightened awareness of signal processing will contribute meaningful insight to many aspects of that important project.

The Signal Processing Society has organized an ad hoc committee for the purpose of guiding the History Center in its work. The committee is chaired by David Munson (University of Illinois) its other members are Jonathan Allen (MIT), Dan Dodgen (MIT Lincoln Laboratory), Tariq Butt (University of Strathclyde, Scotland), Don Johnson (Rice Univer- sity), and Joel Trussell (North Carolina State Uni- versity). Staff support is supplied by Merry Kowal- czik, the Executive Director for the Signal Processing Society. It is through the Society's Board of governors that special funding was made available to the Histo- ry Center to undertake this work. The Society's grant, $35,000 spread over 1996 and 1997, is provided in addition to the generous endowment support that the History Center has received from the Signal Process- ing Society in the past. The Society is now ele- vated to the level of Senior Partner of the History Center, the first of the IEEE Societies to achieve this status. The Center is anticipating that the Signal Process- ing Society's leadership will galvanize other IEEE societies to join in to what will ultimately become an Institute-wide historic program.
Whinnery
Oral History
John R. Whinnery, well known for his innovative work in microwaves and optoelectronics, has recently completed recording an extensive oral history with the regional history office of the Bancroft Library of the University of California at Berkeley. The interview, which is 273 pages, covers Whinnery’s youth, his work at General Electric, Hughes Aircraft, and Berkeley, where he was Dean of the College of Engineering between 1959 and 1963. Also discussed is his collaborations with Simon Ramo; service on governmental, scientific, and industry boards; and the NASA Apollo program, among other topics.

The Whinnery volume is available for study at the Bancroft Library and UCLA’s Department of Special Collections. Copies of the transcript, bound and indexed, are available from the library for $69 (plus $4 S&H). For more information, contact Regional History Office, 486 Library, University of California, Berkeley CA 94720, tel. no. 510 642-7395.

Fellowship Available
Applications are currently being accepted for the 1997-8 Fellowship in Electrical History. Funded by a grant from the IEEE Life Member Fund, the Fellowship is for 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 for up to one year of independent research for a recent Ph.D. graduate in the same field. The stipend is $15,000.

The Fellowship Committee evaluates applicants on the basis of a complete description of the proposed research, college transcripts, letters of recommendation, and additional information supplied on the application form. Students with undergraduate degrees in engineering or the sciences as well as those having degrees in the humanities are invited to apply. The deadline for receipt of applications is 1 February 1997, and three copies of the entire application package must accompany the original. Applications forms are available from the Center.

Electron’s 100th
A correspondent writes to remind us that 1997 will mark the 100th anniversary of JJ. Thomson’s discovery of the electron. He asks if any group is planning to recognize this historic milestone with a formal ceremony or event. His own ideas for a commemoration include an international conference, publications, exhibits, issuing a postage stamp, radio and television programs, and establishing an award in Thomson’s name to recognize the best research and application of the electron. People interested in helping to organize one of these projects, or some other sort of commemorative measure, are invited to contact M.B.S. Char, 27 11th “A” Cross Road, Parsy Layout, S.P. Extension, Bangalore-560 003, India.

PARTNERSHIP PROGRAM
We are grateful to the organizations and individuals listed below who provide generous support to the Center in the form of operating, endowment, and project funding. If you or your organization are interested in joining our Partnership Program, please contact the Center.

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- Joseph F. Keithley • Magnetics Society
- Eiji Ohno • Sematech • Takashi Sugiyama
- Tokyo Electric Power Company • Toshiba • Yokogawa Electric Company

We are also grateful to the thousands of individuals and institutions who make annual contributions to our Friends Fund.