

CHARLES BABBAGE INSTITUTE
CENTER FOR THE HISTORY OF INFORMATION TECHNOLOGY

NEWSLETTER

Winter 2002
Volume 24
Number 2

In This Issue:

CBI's Software History Resources

Literature on Information Age

2002-2003 Tomash Fellow

History of Computing: Software Issues

CBI Archivist Awarded Research Leave

News From the Archives

Frances "Betty" Holberton

ADAPSO Reunion

Recent Publications

Featured Photo: 36 Years Ago Today

Charles Babbage Institute Newsletter

Volume 24
Number 2

Winter 2002

Contents

CBI Resources for Studying the History of Software	3
Cortada Helps Lead New Focus on the Roots of the 'Information Age'	7
Piccinini Awarded 2002-2003 Tomash Fellowship	9
History of Computing Software Issues	10
CBI Archivist Awarded Research Leave	11
News From the Archives	12
Frances "Betty" Holberton	13
ADAPSO Reunion 2002	14
Recent Publications	15
Featured Photo: 36 Years Ago	17

***CBI Newsletter* Editor: Jeffrey R. Yost**

**Charles Babbage Institute
211 Andersen Library
University of Minnesota
222 21st Avenue South
Minneapolis, Minnesota 55455**

Email: cbi@tc.umn.edu

Ph. (612) 624-5050

Fax: (612) 625 8054

The Charles Babbage Institute for the History of Information Technology is sponsored by the University of Minnesota and the information technology community.

Charles Babbage Institute Newsletter is a publication of the University of Minnesota.

The *CBI Newsletter* reports on Institute activities and other developments in the history of information technology. Permission to copy all or part of this material is granted provided that the source is cited and a copy of the publication containing the copied material is sent to CBI.

© Charles Babbage Institute.

CBI Resources for Studying the History of Software

By Arthur L. Norberg

CBI has engaged in collecting documentation on the history of computing for more than two decades. By assembling and processing materials, developing on-line finding aids, creating bibliographical resources, conducting oral histories, placing information on the CBI Web site, and providing advice to individuals and institutions on such endeavors, the Institute has significantly enhanced scholarship on the history of computing.

Software has redefined and reorganized information processing in modern societies, quickening communication, extending distribution, and standardizing its packaging. Despite the transformation of information through software, few studies investigate the nature and context of its development. Part of this absence may extend from the perception that historians lack the resources to pursue this history. In fact, considerable resources for studying software history are available to researchers. Resources include professionally processed collections held by established repositories such as libraries, research centers, and corporate archives. Other materials remain unprocessed, unprotected, and inaccessible.

Over the last 20 years, CBI has acquired a range of collections, conducted and transcribed a number of oral histories, and accessioned a varied array of reference materials useful for documenting and interpreting the research, development, and applications of software, its various institutional contexts, and the software industry. Although we can safely estimate that CBI holds 500 linear feet of software history archives, this figure is probably low as a result of many such resources being interspersed within different types of CBI collections. What follows is a capsule account of these materials under several broad categories—technical records, business records, oral histories, user group records, and documentation generated from the CBI's Software History Project—meant to whet the appetites of researchers. More information can be found on the CBI Web site or by contacting CBI staff. A guide to CBI collections, containing an item level list of contents, is available at <http://www.cbi.umn.edu/collections/index.html>; a database with the transcripts of CBI oral histories is located at <http://www.cbi.umn.edu/collections/oralhistories.html>; and information and resources from the software history project are posted at <http://www.cbi.umn.edu/shp/index.html>.

Technical materials

CBI's technical materials on software fall under two categories: technical documents accumulated by organizations, such as the National Bureau of Standards (NBS) and CBI; and files related to specific software developments and institutions. Some of the latter are contained within collections of personal papers.

Technical Documents Accumulated by Organizations

After World War II, the NBS was charged with the task of following developments in computing. In response, NBS began to index and abstract books, journals, reports and other literature covering a broad range of computer-related topics beginning in the mid-1940s. Eventually the enormity of the task forced NBS to abandon this work in 1978. CBI's NBS collection contains reports, manuals, and publications from corporations, government agencies, and academic computing centers for the period 1960 to 1978. Even though the collection is about 50 percent reprints from published sources, the remaining materials consist of versions of unpublished and published accounts of projects many of which are in the software area. A few examples of unpublished material to give the flavor of the collection are: "Design of a Multiprogramming System for the MUMPS Language," Report 1975; "Program Description: The Morphological Dictionary Adaptor Program (DICTOR)," Berkeley Report 1966; "Foreign Developments in Machine Translation and Information Processing," Department of Commerce Report 1963; "Multi-programming Supervisor," Lincoln Laboratory manual 1967; and "COMPUTE—A Time-Sharing Desk Calculator Program," NASA Report 1968.

CBI assembled a collection of glossaries on various aspects of information processing. The materials come from many different companies and institutions, and offer information on terms used by standards setting groups, software and hardware terms, and company and government glossaries over the last half century.

Technical Documents in Personal Papers

Several examples can be used to highlight materials in personal collections. Take as an example the Herbert Bright papers. At Philco, Bright was responsible for the planning design, development, distribution, and maintenance of all product-line software. This included a wide range of programs such as assemblers, compilers, operating systems, and generalized applications. While at Philco, Bright served as the Chair of the Philco Corporate Technical Committee on Computer Aids to Engineering and Research, TAC-63-8, from its inception in 1963 to 1965. As director of programming at Informatics, Inc., Bright completed systems programming studies and development projects, many of which are documented in this collection.

The Charles Bachman Papers (CBI 125) contain correspondence, calendars, internal reports, interoffice memoranda, publications, presentation materials, articles (in both published and unpublished form), notes, schematics, flow charts and other papers detailing software development, specifically database software.

In the Alan Perlis Papers (CBI 64), there are files containing information on the programming languages ALGOL, APL, and LISP, and several compilers, including the IT compiler. The Frances E. Holberton Papers (CBI 94) also include important materials on programming languages, including FORTRAN and COBOL (see related article on Holberton).

A recent addition to the CBI Archives is the Martin Goetz Papers (CBI 159) and ADR Software Division Records (CBI 154). Goetz's major professional interests, namely the software industry, patent and copyright protections for software, separate pricing for software and hardware, bundling, anti-trust issues and IBM, are reflected throughout the collection. These interests overlapped significantly with the interests of ADR and its Software Products Division, which Goetz headed for the bulk of his tenure with ADR.

Business records

Mention has already been made of Goetz's files on ADR and its activities in the computer software business. Another part of the Bachman papers contains files on Dow Chemical (1951-1960); General Electric (1960-1970); Honeywell Information Systems (1970-1981); Cullinane Database Systems/Cullinet (1972-1986); and Bachman Information Systems, Inc. (1982-1996).

Among the other collections at CBI for the history of software, one has received perhaps the most attention: the Auerbach Associates Collection. Auerbach Associates, Inc.,



Isaac L. Auerbach

founded by Isaac L. Auerbach in 1957, was one of the earliest systems design and software companies formed in the United States. It grew to become a major consulting firm in the computer industry and was known for its series of subscriber publications relating to industry overviews, market analyses, computers, peripherals, and software. The collection contains private consulting reports commissioned by government agencies and corporations on software, hardware, and information technology industries (some of which are restricted).

To offer only one other example, in CBI's Honeywell materials, there are documentary gems on the development of Multics from 1965-1982. The records include the second *Multics System--Programmer's Manual*; and a series of Multics Technical Bulletins that describe procedures, applications, and problems, especially concerning security.

Software history materials are sprinkled throughout all the business collections of CBI. Most often they have to do with strategic issues or product and system development projects.

Oral histories

A particularly strong part of the CBI collection on the subject of software developments is the oral history collection. Well over 15 percent (of over 300 interviews) of the collection is specifically devoted to software topics, and more are being added from the

Software History Project. The interviews were recorded from the 1980s to the present, and describe topics from the past 50 years.

A selected set of interviews focusing on software follows: Walter Bauer (Informatics), Margaret Loftus (Cray Research software), Douglas Ross (SofTech), Bernard Galler (University of Michigan computing developments), Dale LaFrenz (Minnesota Educational Computing Corporation), Peter Patton (Lawson Software/software industry and patenting), Mark McCahill (Gopher), James McCormack (McCormack and Dodge), Mike Schumacher (CDC software developments), Vinton Cerf (DARPA/Internet), Robert Goldberg (ICON), Ralph Griswold (ICON). Many other interviews touch on software topics as part of a larger array of concerns, such as the interviews with Heinz Zemanek (IBM Europe), Paul Armer (Rand), and Saul Amarel (AI at Rutgers University), to name just a few. Most of these are available online.

User groups, etc.

Bachman also kept careful files on his association with the Association for Computing Machinery (ACM) (1971-1982); American National Standards Institute (ANSI) (1978-1983); International Federation for Information Processing (IFIP) (1974-1975); International Telegraph and Telephone Consultative Committee (CCITT) (1977-1980); and the International Standards Organization (ISO) (1977-1982), all of which had to do with software issues.

Francis V. Wagner's subject files (CBI 6) include correspondence, notes, reports, manuals, newsletters, symposium and conference proceedings, photographs, and other materials relating to the Association of Independent Software Companies, the Conference on Data Systems Languages (CODASYL), FORTRAN Automatic Coding System, IBM 701 programming, IBM 709 System committee, SHARE, the Universal Computer-Oriented Language (UNCOL) developed by SHARE, Informatics General Corporation, computing at North American Aviation, and the UNIVAC 1960 LARC Seminar.

Joan Margaret Winters began working in Computer Services at Cornell University in 1970. She later became Coordinator for User Support, a position that included managing the office's consulting and educational functions. While at Cornell, Winters also designed and implemented SPINDEX II applications for the Department of Manuscripts and University Archives. In 1980 Winters took a position as a scientific programmer in SLAC Computing Services at the Stanford Linear Accelerator Center.

In the mid-1970s Winters became active in SHARE, and in 1976 she joined SHARE's Human Factors Project, a group dedicated to educating members of SHARE and employees of IBM about the importance of human factors in the design of hardware and, especially, software and conducting research into human factors and software appraisal tools. Her collection contains electronic mail printings, subject files, notes, conference information, session reports, and conference evaluations that document Winters' involvement in SHARE. Several SHARE projects (such as the FORTRAN

Project and especially the Human Factors Project, which emphasized computer usability and improved human-machine interfaces), study groups, committees, and a task force are documented in the subject files.

Isaac Auerbach's personal papers (CBI 52) include documentation of Auerbach's activities in several professional associations, especially IFIP, and his consulting and other business activities. The IFIP records include materials about the biennial congresses and document the growth and activities of the federation. The records also document its relationship with other professional organizations.

CBI's International Computing Collection is a selection of documents about hardware, software, systems, and installations in countries other than the United States, as well as descriptions of other countries' computing technology (regardless of where those descriptions originated). The collection also includes surveys, comparisons and descriptions of two or more countries' computer technology.

Software History Project

An added feature of CBI's program is a three-year NSF-sponsored project, "Building a Future of Software History," to create and disseminate new resources in software history. A major component of this project is an online software dictionary project designed to produce an authoritative resource for information about the history of software. Areas covered in the dictionary are operating systems, programming languages, programming techniques, scientific applications, business applications, graphics, networking, and database software. Other project components include a soon to be launched electronic journal of software history, *Iterations*, and a software history oral history initiative.

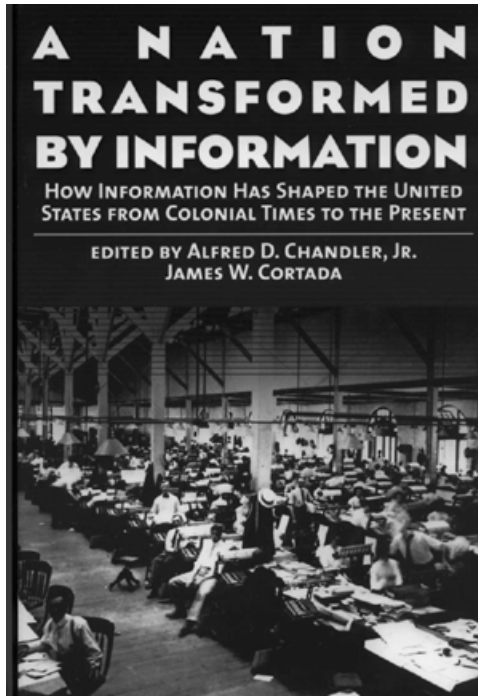
Conclusion

These examples are only highlights for the history of software in the extensive collection available at the Charles Babbage Institute. We continue to search for other materials to strengthen these holdings and for collections to complement them. Some specific areas of search at the moment are business records of software companies, more market research documents, programs and projects to do with security, and materials that reveal the details of social impacts of information processing. The search is never ending and takes patience to accumulate significant historical material. Meanwhile, the information technology activity races on making the task that much more challenging.

Cortada Helps Lead New Focus on the Roots of the "Information Age"

While the contributions of historian James W. Cortada's many reference, history, and management books are considerable, two recent studies deserve special attention, in large part because they represent the first wave of what likely is a growing trend of significance to the history of computing. This trend is to analyze the social, cultural,

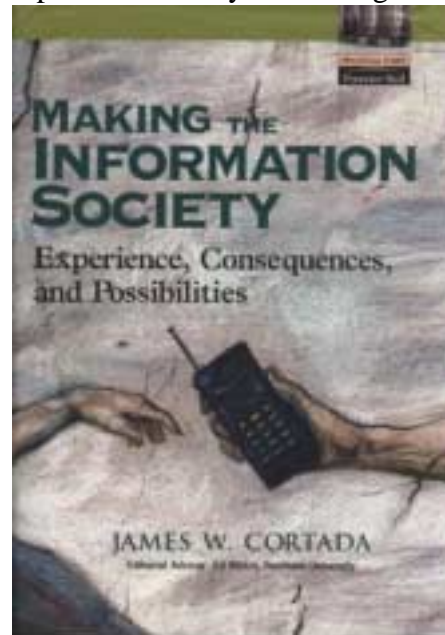
economic and intellectual aspects of information within the context of the many different technologies over the centuries that have served as tools to process and disseminate it.



Dr. Cortada, an IBM executive and Chair of the Charles Babbage Foundation, is not new to providing leadership in broadening the domain of the history of computing. Cortada's *Before the Computer* (Princeton University Press, 1993) led the way in analyzing important structural elements and organizational capabilities that early business machine manufacturers (IBM, NCR, Burroughs, and Remington Rand) benefited from (albeit to different degrees) in transitioning into the computer manufacturing trade. This book remains the standard on the topic. More recently, he has sought to uncover the roots of Americans' understanding and embracement of information machines from the colonial period to the present in a co-edited volume with leading business historian Alfred D. Chandler, Jr., *A Nation Transformed by Information* (Oxford University Press, 2000), and a monograph, *Making the Information Society: Experience, Consequences, and Possibilities* (Prentice-Hall, 2002).

Chandler and Cortada's volume brings together essays from a distinguished set of historians and management scholars, each with a long background of research and writing in the particular areas and topics they analyze. In spite of the essays following a number of different pathways, the overarching theme of the growing technological infrastructure for transmitting information, and the foundations and significance of this infrastructure, remains remarkably strong throughout the volume. The authors address the role of numerous technologies and institutions from the printing press, U.S. Post Office Department, and telegraph to the telephone, computer, and the Internet. In the concluding chapter, Chandler and Cortada help synthesize Americans' three century long penchant for developing and capitalizing on a wide range of information technologies and the significance of this to our broader history.

In *Making the Information Society: Experience, Consequences and Possibilities*, Cortada expands the discussion of Americans' embrace of information technologies into new realms. He articulates the special receptiveness Americans have to information



technology and how they have leveraged this in all different aspects of their lives from work and politics to religion and leisure. Throughout the study, drawing on the style of his many management books, he offers practical lessons that can be drawn from this experience.

Cortada and Chandler's work contributes to a small but growing literature focused on the history of information and society over centuries. Other important recent works in this area include John Seely Brown and Paul Duguid's, *The Social Life of Information* (Harvard Business School Press, 2000); Sociologist Manuel Castells' monumental trilogy, *The Information Age: Economy, Society, and Culture* (Blackwell, 1996, 1997, 1998); and Historians Michael Hobart and Zachary Schiffman's *Information Ages*. Brown and Duguid provide a powerful argument for focusing on the social networks/contexts of information and information technology. They highlight the important roles networking technology can play in complementing social networks and practices, as they dispel a number of myths about the information technology revolution. Castells' trilogy is similar in its emphasis on the importance of social relations and culture, but has a more international focus as it details how "global informational capitalism" displaced industrial capitalism. Hobart and Schiffman's broad intellectual history presents three distinct information ages: classical (defined by the invention of writing), modern (shaped by the development of the printing press), and contemporary (characterized by digital computers and cyberspace). These authors argue that while the current information age has accelerated the pace of change, the first two actually had far greater impact on human thought and culture.

Complementing his research concentration on the long history of information in America, Cortada is currently completing a research project on the history applications of computers/software in the manufacturing, process, transportation, wholesale and retail industries. A slice of this major study, a historical examination of software applications in the petroleum trade, will appear as an article in CBI's soon to be launched electronic journal: *Iterations: An Interdisciplinary Journal of Software History*.

Jeffrey R. Yost

Piccinini Awarded 2002-2003 Tomash Fellowship



The Charles Babbage Institute is please to announce Gualtiero Piccinini as the 2002-2003 Adelle and Erwin Tomash Fellow.

Piccinini, born in Milan, Italy, graduated from the University of Turin in 1993 with majors in philosophy and cognitive science. Piccinini was intrigued by cognitive science, but found the field to be problematic in ways cognitive scientists

were ignoring. Most problematic in his mind was the unresolved controversy about the meaning and status of the assumption that the brain is a computer.

Interested in exploring this issue from an historical perspective, Piccinini enrolled in the doctoral program in the history and philosophy of science at the University of Pittsburgh in 1996. He has since received a number of honors, including the Andrew Mellon Predoctoral Fellowship (2001-2002).

Piccinini's dissertation project is focused on the history and philosophy of "computationalism," or the idea of the brain as a computer. His research concentrates on the work and ideas of Alan Turing, John von Neumann, Warren McCulloch, Norbert Wiener, and others who led the development of a new methodology for studying cognition based on the construction of mechanical models inspired by the modern computer.

Piccinini already has conducted extensive research on the papers of Alan Turing at King's College Library, Cambridge, published two articles on Turing's ideas in the journal *Minds and Machines*, and presented papers at Dartmouth, Carnegie Mellon, and at a number of scholarly conferences. In the coming year he plans to conduct research in the Warren McCulloch Papers at the American Philosophical Institute, the Norbert Wiener Papers at MIT, the John von Neumann Papers at the Library of Congress, and more than half dozen collections at the Charles Babbage Institute.

The Charles Babbage Institute is honored to present this award each year to advance dissertation research in the history of information technology, an award named in recognition of the long-term support that Adelle and Erwin Tomash have provided to the Institute and its programs.

Jeffrey R. Yost

History of Computing: Software Issues Published by Springer-Verlag

The proceedings of "Mapping the History of Computing: Software Issues" held in Paderborn, Germany, in April 2000 has just been published by Springer-Verlag. This conference was sponsored by the Heinz Nixdorf MuseumsForum and co-sponsored by the Charles Babbage Institute and the University of Paderborn's Heinz Nixdorf Institute. The volume, edited by Ulf Hashagen, Reinhard Keil-Slawik, and Arthur Norberg, is entitled, *History of Computing: Software Issues*. The essays review the current understanding of the history of software and set an agenda for future research by identifying key elements of software and comparing and contrasting these with artifacts in other disciplines. The book analyzes a wide array of problems and questions related to scientific, engineering, economic, and sociological aspects of software.

CBI Archivist Awarded Research Leave

CBI Archivist Beth Kaplan has been awarded a three-month research leave by the University of Minnesota Libraries.

During the leave, Kaplan will pursue her current interest in archival responses to computer technology. Her project has a working title of “Electronic brains, archival minds: archivists and technology in the postwar era.”

The emergence of postwar computing technology profoundly altered the world of archivists and librarians, and this study will explore the ways in which information professionals perceived and responded to these changes. It will also examine the ways in which the scientists and engineers who created these technologies became interested in what they perceived as the problems and concerns of librarians and archivists.

There is a deeply rooted tension between the archival mission (inherently conservative because of its preoccupation with preservation of the past) and common understandings of technology as a synonym for progress. This tension was most starkly apparent in the early postwar period. But to what extent was the archival response to technology unique in the postwar period, and to what degree did those early responses persist and come to characterize an enduring archival “mindset,” or set of attitudes toward technology generally? And how might this analysis of our professional past be productively applied to challenges posed by current technologies that have redefined the archival profession, specifically electronic records and record keeping systems?

Research materials will include several CBI collections, among them the papers of Calvin Mooers, whose wartime work at the U.S. Naval Ordnance Laboratory and other government agencies preceded his development of a system called “Zatocoding” which proposed (in his own words) to replace human archivists and librarians; the papers of Claire K. Schultz, who worked as a corporate librarian in the late 1940s before she joined Sperry Rand's Univac Division and later served as a president of the American Documentation Institute; and the Government Computing Collection, which contains a wealth of publications, prepared by or gathered by a range of government agencies during the period relevant to this project, concerning the application of computing technology to libraries and archives.

Kaplan will travel to the University of Wisconsin-Milwaukee, which houses the organizational records of the Society of American Archivists. The SAA Archives includes materials that document the establishment in 1965 of what appears to be the first SAA committee on automation, its charge and activities, and the committees and task forces that grew out of it. Also available are the records of the board of editors of the society's journal, *The American Archivist*, which began to publish articles on “automation” as early as 1948. Through the SAA records, Kaplan hopes to trace the

institutional response to, and institutionalization of, technological change and its place in the archival profession in the United States.

Kaplan also will consult other pertinent archival collections at the MIT Archives and the National Archives in Washington, DC.

Kaplan will take this leave in early 2003. During that time, CBI Assistant Archivist Carrie Seib will serve as Acting Archivist, and the archives will remain open to researchers but may limit other functions.

News From the Archives

Collections Newly Available for Research

Several archival collections have been recently processed and are now available for research. This list of collection titles links to finding aids (collection guides) on the CBI Web site. Please consult the CBI archives with any questions about these or other collections.

Applied Data Research, Software Products Division Records

Martin A. Goetz Papers

ADAPSO Records

American Society for Information Science and Technology (ASIST), Minnesota Chapter

Association for Computing Machinery (ACM) Special Interest Group on Graphics (SIGGRAPH), Conference Publications

Digital Equipment Computer Users Society (DECUS) Proceedings and Publications, CBI 150

Information for Donors

A brief "information for donors" insert is now available for the new archives brochure. Please contact the archives if you would like to receive a copy.

Expansion plans for oral history database

Plans to expand the current CBI Oral Histories Database into a multi-institutional collaborative resource are underway. CBI archives staff members are engaged in preliminary discussions with the Archives Center at the National Museum of American History, the National Cash Register Archives at the Montgomery County Historical Society, and the University Archives at Carnegie Mellon University. (Editor's note - see article in last issue?)

Frances “Betty” Holberton



Frances “Betty” Holberton (Center) at David Taylor Model Basin

Frances Elizabeth “Betty” Snyder Holberton, a leader in early computer/software programming, died of a stroke on December 8, 2001, at the age of 84. Ms. Holberton, a pioneer in programming the central control unit on the ENIAC for the U.S. Army Ballistics Research Laboratory in the mid 1940s, wrote instruction code (C-10) for the UNIVAC for Eckert-Mauchly Computer Corporation/Remington Rand in the late 1940s and early 1950s. She went on to help design and develop the standards for two of the most important programming languages, FORTRAN and COBOL, while serving a long and distinguished tenure as a mathematician at the U.S. Navy’s David Taylor Model Basin (1953-1966) and the National Bureau of Standards (1966-1983). In 1983 she retired from the National Institute of Standards and Technology, the successor to the National Bureau of Standards. For her many accomplishments in computer programming, on March 15, 1997, she received the Augusta Ada Lovelace Award of the National Association of Women in Computing, the highest honor given by the organization. Ms. Holberton is survived by her husband John Baughan Holberton; her two daughters, Pricscilla Holberton and Pamela Holberton; and two sisters and a brother.

The Charles Babbage Institute is the proud holder of the Frances E. “Betty” Holberton Papers. This is a rich collection of reports, correspondence, notes, and publications that detail certain aspects of the development and establishment of standards for a number of leading programming languages including, FORTRAN, COBOL, CODASYL, ASCII, and Ada. The papers also represent a significant source of information on companies and organizations where Ms. Holberton worked (Eckert-Mauchly Computer Corporation, Remington Rand, and the National Bureau of Standards) and some of the machines that she helped program (UNIVAC, BINAC, and SEAC).

Jeffrey R. Yost

ADAPSO Reunion 2002

The Software History Center (SHC) is sponsoring a meeting May 3-4, 2002, at the Monarch Hotel in Washington, D.C. to explore and celebrate the history of ADAPSO, a trade association for computer software and service firms that was established in 1961 and is now called the Information Technology Association of America (ITAA). The meeting is co-sponsored by ITAA, the Charles Babbage Institute, *IEEE Annals of the History of Computing*, and the Smithsonian National Museum of American History. The SHC invites all current and former members of ADAPSO/ITAA to participate (for additional information on the reunion and the registration process see <http://www.softwarehistory.org>).

As part of the event, on May 3rd historians of computing will conduct oral histories with approximately fifteen founders/leaders of programming services and software product firms of the 1960s and early 1970s. This ADAPSO Reunion Oral History Project is sponsored by the SHC and is being coordinated by David Allison, of the Smithsonian-National Museum of American History. The oral histories will investigate both the history of ADAPSO, and more broadly, the business, managerial, and technological context of the early software industry. All of the oral histories will be transcribed by the SHC and deposited at the Charles Babbage Institute. They will be available to researchers in both print format and as PDF files on the CBI Web site.

On May 4th a series of workshops will be held in the morning and afternoon to discuss issues and programs that ADAPSO pursued. Each of the workshops will be co-moderated by a former ADAPSO member and an historian of computing. All the sessions will be transcribed and subsequently distributed to participants.

Recent Publications

Allan, Roy. *A History of the Personal Computer: The People and the Technology* (London: Allan Publishing, 2001).

Bassett, Ross. *To the Digital Age: Research Labs, Start-Up Companies, and the Rise of MOS Technology* (Baltimore, MD: Johns Hopkins University Press, 2002).

Campbell-Kelly, Martin. "Software Preservation: Accumulation and Simulation" *IEEE Annals of the History of Computing* 24:1 (Jan.-Mar. 2002) 96.

Cassidy, John. *Dot.con: The Greatest Story Ever Sold* (New York: HarperCollins, 2002).

Cortada, James W. "Researching the History of Software from the 1960s" *IEEE Annals of the History of Computing* 24:1 (Jan.-Mar. 2002) 72-79.

Freeman, Chris. "A Hard Landing for the 'New Economy'? Information Technology and the US National System of Innovation" *Structural Change and Economic Dynamics* 12:2 (July 2002) 115-139.

Haigh, Thomas. "Software in the 1960s as Concept, Service, and Product" *IEEE Annals of the History of Computing* 24:1 (Jan.-Mar. 2002) 5-13.

Goetz, Martin. "Memoir of a Software Pioneer: Part 1" *IEEE Annals of the History of Computing* 24:1 (Jan.-Mar. 2002) 43-56.

Grad, Burton. "A Personal Recollection: IBM's Unbundling of Software and Services" *IEEE Annals of the History of Computing* 24:1 (Jan.-Mar. 2002) 64-71.

Hashagen, Ulf, Reinhard Keil-Slawik, and Arthur Norberg, eds. *History of Computing: Software Issues* (Berlin: Springer-Verlag, 2002).

Humphrey, Watts. "Software Unbundling: A Personal Perspective" *IEEE Annals of the History of Computing* 24:1 (Jan.-Mar. 2002) 59-63.

Johnson, Luanne. "Creating the Software Industry: Recollections of Software Company Founders of the 1960s" *IEEE Annals of the History of Computing* 24:1 (Jan.-Mar. 2002) 14-42.

McKelvey, Maureen. "The Economic Dynamics of Software: Three Competing Business Models Exemplified Through Microsoft, Netscape and Linux" *Economics of Innovation and New Technology* 10:2-3 (2001) 199-236.

MacKenzie, Donald. *Mechanizing Proof* (Cambridge, MA: MIT Press, 2001).

Manovich, Lev. *The Language of New Media* (Cambridge: MIT Press, 2001).

Pugh, Emerson W. "Origins of Software Bundling" *IEEE Annals of the History of Computing* 24:1 (Jan.-Mar. 2002) 57-58.

Spars, Debora. *Ruling the Waves* (New York: Harcourt Brace, 2001).

Waldrop, M. Mitchell. *The Dream Machine: J. C. R. Licklider and the Revolution That Made Computing Personal* (New York: Viking, 2001).

Tedlow, Richard S. *Giants of Enterprise: Seven Business Innovators and the Empires They Built* (New York: HarperCollins, 2001) [includes chapters on Thomas J. Watson, Sr. and Robert Noyce]

Compiled by Jeffrey R. Yost

Featured Photograph

36 Years Ago



Two R.E.S.I.S.T.O.R.S. in the Computer Barn

In late 1966, a group of young people in Hopewell Township, New Jersey, formed a computer users club called R.E.S.I.S.T.O.R.S. (Radically Emphatic Students Interested in Science, Technology, and Other Research Studies). The group held meetings in a barn owned by Claude Kagan, a research leader at Western Electric Engineering Research Center in Princeton, New Jersey. Group members experimented and learned programming skills on computers stored in the barn, including a Burroughs Datatron 205 and a Packard-Bell 250. Among the group's early projects was a computerized dating service. By 1971 the R.E.S.I.S.T.O.R.S. had moved their headquarters to the Electrical Engineering Department at Princeton University, where they worked on a Digital Equipment Corporation PDP-8.

In 1968, the group sponsored a program to introduce computer concepts to young people from depressed areas of Trenton, New Jersey. Students selected spent the summer in Hopewell Township with the families of the R.E.S.I.S.T.O.R.S. and worked in the computer barn.

The R.E.S.I.S.T.O.R.S. participated in several Spring Joint Computer Conferences in the late 1960s and early 1970s, where they exhibited their ideas and programming work, ran

a discussion center, sponsored technical sessions for pre-college age students, and conducted student tours. They exhibited their programming work at an Association of Computing Machinery convention in 1970. Also in 1970, with the guidance of Claude Kagan, the group produced a primer on Calvin Mooers' Text Reckoning and Compiling (TRAC) language.

Carrie Seib