

# **CHARLES BABBAGE INSTITUTE**

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## **CENTER FOR THE HISTORY OF INFORMATION TECHNOLOGY**

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# Director's Desk

Everywhere I look, the history of computing is becoming larger and more diverse, more expansive in its scope, and more important in the wider world. What a time this is for the field and for CBI!

Signs of these trends are literally all around us. In the reading room, we have a stream of visitors doing research on new as well as familiar topics. It's likely the case that our heaviest research volume results from our collections of papers from corporations such as Burroughs and Control Data and professional associations such as DPMA and ACM (see Lora Bloom's article on the ACM processing project in this newsletter). A walk-in visitor happened upon our periodical literature in home computing and spent a pleasant morning there. Researchers are also using CBI collections to help understand the corporate social responsibility movement in which Control Data's Bill Norris and Bob Price played leading roles. Indeed, I've been drawing on our rich CDC archive in preparing a series of oral histories I'm conducting this spring with Bob Price, who started out programming on the ERA 1101 and retired as CEO of Control Data. The Burroughs papers were central to Bernardo Batiz-Lazo's research on ATMs in the banking industry (reported in this newsletter).

Bernardo also notes the value of another new collection, the James (Jim) W. Cortada Papers—research files for his *Digital Hand* trilogy (2004-8). These papers present an unparalleled view of 16 manufacturing, transportation and retail industries (*Digital Hand* volume 1); 16 additional financial, telecommunication, media and entertainment industries (volume 2); as well as tax management, military applications, law enforcement, schools and higher education, and federal and local government (volume 3). Did I mention Jim's case studies of Social Security, the Census Bureau, and the U.S. Post Office? We have a hunch that the Cortada collection, with its systematic examination of research materials for these industries, will be heavily used for years to come.

Hardware, software, networking, and services—these are familiar enough research topics. Then one day last month a scholar of American religious movements, not a computer historian at all, spent time with the correspondence of Bill Norris. It turns out that Norris had engaged in a decade-long conversation about the nature of the Cold War and the ethics of technology transfer. International standards-setting in software is another on-going research topic. CBI's expanded shelves now have 200 books on Soviet computing and engineering. And with the recently acquired Carl Machover collection, CBI greatly extends its rich collections on computer graphics—of compelling interest to computer historians as well as art historians.

At CBI we are committed to broadening the history of computing. In an age when computing has become “pervasive,” we need to be collecting research materials on many new topics. At the same time, we are also committed to deepening our understanding of familiar topics in the history of computing. Just last week I talked with one of the engineers for the National Bureau of Standards' SEAC, a pioneering effort in stored-program computing. He hopes to track down the logic diagrams for SEAC held in our

Margaret Fox papers. As I mentioned, it's a great time for the field and for CBI. Intrigued by how you might help? I cordially invite you to join the roster of our wonderful CBI Friends <[www.cbi.umn.edu/about/friends.html](http://www.cbi.umn.edu/about/friends.html)>. The CBI Friends provide us with support for our core activities so that we can successfully solicit externally funded projects such as our NSF history of FastLane or our ACM headquarters archive project. Many thanks to our past, present, and future supporters!

*Thomas J. Misa*

## **CBI reveals “Minnesota’s Hidden History in Computing”**

The Charles Babbage Institute has conducted a year-long lecture series on the theme of “Minnesota’s Hidden History in Computing.” From the 1950s through the 1980s, Minnesota was a leading region in the United States for computing. Companies active here—Engineering Research Associates, Sperry-Univac, Control Data, Cray, Honeywell, IBM–Rochester, and others—were national leaders in the computing industry.

The Fall *Newsletter* reported on the first two talks. In September we surveyed the state’s computing accomplishments, exploring whether Minnesota might reasonably have claimed the mantle that California’s Silicon Valley later did so successfully. And in October we examined the founding and legacy of the Engineering Research Associates (ERA).

ERA helped create the modern computer industry. Through mergers it evolved into the Univac Division of Sperry-Rand (and later Unisys). ERA personnel were key founders of the notable Control Data Corporation as well as the Cray dynasty, subjects of the November talk. The one-name answer to how Control Data created the world’s fastest computers is, of course, Seymour Cray. Yet the actual story is richer than this, if only because Cray required substantial resources for his computer development projects. Organized in 1957, and originally financed with \$1 stock sold door-to-door, Control Data grew within a dozen years to be a billion dollar a year concern. While it was always most famous for its supercomputers, such as the Control Data 6600, and for innovative educational computing with its PLATO terminals, the company needed a sizable stream of revenues to fund these prestige products.

Steady revenues from its peripheral products, such as drum memories and tape drives, and later on from its data centers and services, gave Bill Norris and Seymour Cray the financial muscle for these projects. This talk also unveiled CBI’s interactive Google site for helping document photographs that are part of CBI’s massive CDC corporate archive (please contact Stephanie H. Crowe <[horow021@umn.edu](mailto:horow021@umn.edu)>).

The much-storied Univac also has a prominent place in Minnesota's computer history, explored in the December talk. Univac is sometimes considered a "Philadelphia story" with the company's origins traced to J. Presper Eckert and John Mauchly's pioneering computer company from that city. Yet the Twin Cities also came to have a strong presence in Univac, after a series of corporate mergers connected the ERA concern with Eckert and Mauchly's company, to become the Univac Division of Sperry Rand. While Norris, Cray and others spun off Control Data, the Twin Cities Univac came to be a classic Minnesota computer company with strong government business. Two landmark projects, the Naval Tactical Data System (NTDS) and a pioneering air-traffic control system installed at more than 60 big-city airports, provided healthy revenues that resulted in Univac having no less than five office-and-factory complexes and more than 10,000 employees in the Twin Cities by 1968. In 1986, the computer business of a trimmed-down Sperry Univac was merged with Burroughs to form Unisys.

In the fallout from the Sperry reorganizations, its aerospace division fell to Minneapolis-based Honeywell. For years, Honeywell was the state's largest employer and a leading contractor for high-profile military and aerospace projects. Honeywell had been founded to manufacture heating and industrial-process control equipment, and launched its military activities during World War II. The testing of aircraft controls led to autopilots, turbocharger controls, and flight-stick controls, activities it continued well into the postwar period for space and aerospace applications. Honeywell also had a number of high-profile computer partnerships, including ventures in early time-sharing, mainframe computing, and minicomputing as well as providing the switching computers known as Interface Message Processors (IMPs) for the ARPANET, the precursor to the Internet. So prominent was Honeywell as a military contractor that it sparked a long-running antiwar protest (the Honeywell Project) from the late 1960s through the early 1990s. For computer history, the landmark court case *Honeywell v. Sperry-Rand* (1967-73) settled who in legal terms invented the computer. Slide 25 of January's talk (available at the URL listed below) presents definitive evidence about who invented the modern computer.

In February, CBI's Jeffrey Yost explored IBM-Rochester's "Half Century of Innovation." Based on the research report he co-authored with Arthur Norberg, CBI's former director, Jeff set the stage by examining IBM's distinctive corporate history, noting that it is one of very few computer companies not to have grown by acquisitions. Rochester was chosen in 1956 to be a new site for manufacturing. It has subsequently developed considerable expertise also in engineering and development with such innovations as its AS/400 midrange computers, upper-end servers, and path-breaking computer game chips. (Rochester components power Nintendo's Wii, Sony's Playstation 3, and Microsoft's Xbox.) Yet to come in May will be a consideration of IBM-Rochester's central role in developing the Blue Gene supercomputer, for years the world's fastest. Norberg and Yost's *IBM Rochester: A Half Century of Innovation* can be found at [www.cbi.umn.edu/hostedpublications/pdf/IBMRochesterHistory.pdf](http://www.cbi.umn.edu/hostedpublications/pdf/IBMRochesterHistory.pdf).

David Rhees, executive director of the Bakken Library and Museum, gave the March lecture. He dealt with the origins of Minnesota's renown as a region for medical devices and electronics. He traced developments beginning with Earl Bakken's invention of the first wearable cardiac pacemaker utilizing only two transistors. The Minnesota industry,

after considerable growth and diversification, now produces implantable cardiovascular and neurological devices containing hundreds of thousands of transistors and sophisticated programming.

As this newsletter was going to press in mid-April, we are preparing a lecture on the University of Minnesota's Internet Gopher, an important precursor of the World Wide Web, popular in the early 1990s. Presentation slides and podcasts of these lectures may be found at <[www.umn.edu/~tmisa/MHHC](http://www.umn.edu/~tmisa/MHHC)>.

*Thomas Misa*

## News from the Archives

### Collections Update

In the past several months, CBI has acquired several exciting new collections. Earlier this year, Carl Machover donated to CBI over 100 cubic feet of his work files and book collection on computer graphics. Machover was a pioneer in the field of computer graphics, and the collection should be of great value for research in this field. A second accession should be arriving later in 2009, and processing of the collection is planned to begin this summer. Additionally, in February CBI received a large donation from the VIP Club, a local association of retirees from UNISYS and Lockheed Martin. Included in this collection are about 40 cubic feet of patent applications from Engineering Research Associates (ERA) and successors. The patent applications are also slated for initial processing this coming summer. Finally, CBI Archivist Arvid Nelsen has been focusing some collecting efforts in the area of social issues surrounding the history of information technology, and he has made some exciting purchases of books and journals in areas relating to political and social movements, gender, labor, and culture. A list of recent acquisitions in this area is available on CBI's website at <http://www.cbi.umn.edu/NewAcquisitions/index.html>.

Newly processed collections in the CBI archives include, among others, the most recent accession to the Calvin Mooers Papers (CBI 81) and the Control Data Corporation Computer-Based Education Records, which describe the history of CDC's PLATO program (CBI 80, Series 4). ACM Project Archivist Lora Bloom and student assistant Valerie MacDonald are well on their way to completing the processing of the records of the Association for Computing Machinery (ACM) [see related article], and that collection should be fully available for research by the middle of the summer. An up-to-date list of CBI's collections is at <http://www.cbi.umn.edu/collections/archmss.html>. New collections are also mentioned in our blog <http://blog.lib.umn.edu/horow021/cbi/> as they become available.

## Events and New Initiatives

CBI archives staff members are continuing to experiment with using emerging technologies to improve access to our collections. We have begun the cataloging of the Machover book collection on LibraryThing, a social networking site where members can share lists of their holdings. You can view CBI's collection at <http://www.librarything.com/catalog/CBI-History>. We have also recently used Google's mapping technology to create a map of Burroughs locations around the world. The map is available on CBI's website at <http://www.cbi.umn.edu/images/index.html>.

The CBI archives staff is also continuing outreach efforts to the University of Minnesota campus community. Recent events include participation in the Science and Engineering Library's annual Science Quiz Bowl, held in March in Walter Library, and, also in March, a First Friday presentation in Andersen Library about Erwin and Adelle Tomash and the founding of CBI.

*Stephanie Crowe*

# **Association for Computing Machinery: Arrangement & Description Project**

## **ACM Archives Processing Project Update**

The Charles Babbage Institute has received two shipments of the records of the Association for Computing Machinery from its headquarters in New York. The records will form the ACM Archives, which will be preserved and accessible for research at CBI. The collection consists of about 60 cubic feet of records, which date from the time of the founding of the ACM in 1947 through 2005. Records from the earlier time period are scattered, and the bulk of the material is from the 1970s through the 1990s.

The records are being processed by ACM Project Archivist, Lora Bloom, with the assistance of student Valerie MacDonald. A records arrangement scheme was devised which reflects the organizational structure of the ACM itself. Most of the materials were transferred from ACM records storage to CBI with a file system in place. However there were some materials loose with little evidence of their office of origin which have now been identified and added to the arrangement scheme.

A preliminary inventory has been prepared listing all the files, office of origin, general content notes, and inclusive dates of the materials. In the coming months, this finding aid will be expanded, finalized, and available on the CBI web site. Researchers will then be able to review via the Internet the list of ACM records along with a description. Additionally, a catalog record with a brief description of the collection will be added to the online catalog of the University of Minnesota Libraries. Subject and name search

terms will be included in the catalog record to allow researchers to discover the collection's presence as part of the collections of CBI. Although still not fully processed, the ACM records have already been of use to researchers. CBI/Norberg travel grant recipient David Nofre, from the University of Amsterdam, has used the records for his research project on the history of the ALGOL programming language. The ACM records have also been used by former CBI Director Arthur Norberg as part of his background research for oral history interviews of past ACM officials. The records include materials from both the membership governance and organizational administration of the ACM. There are presidents correspondence, executive committee and council meeting minutes, and elections and committee files. There are also files from headquarters staff including executive directors correspondence, project files of Membership, Publications and SIG services offices, and other administrative support files. Also included are a few historical files surrounding the origins and early years of the ACM, photographs of ACM officials and events, and examples of marketing and promotional literature.

The ACM Archives processing project is generously funded by the ACM. This financial support allowed for the hiring of processing staff as well as for the purchase of archival quality storage supplies. The ACM records find an excellent home at CBI. They complement and greatly extend the many existing CBI collections that document the development and activities of the ACM. While the ACM Archives represent the organization from the perspective of the headquarters office, other related collections at CBI document the ACM through individuals, special interest groups and other membership level activities. In total, the ACM related collections at CBI offer the most complete picture of this, the world's largest computing professional organization.

*Lora Bloom*

## **Appropriating America**

In mid-January 2009, CBI's Jeffrey Yost participated in "Appropriating America, Making Europe," a European Science Foundation sponsored conference held in Amsterdam. This history of science and technology conference addressed themes of appropriation, hegemony, Americanization, and co-development, among others, within a range of political, social, cultural, and business contexts.

The event brought together scholars from ESF-sponsored research groups EUWOL (European Ways of Life) and Soft-EU (Software for Europe), and was co-organized by the project leaders of these two groups Ruth Oldenziel (TU Eindhoven and University of Amsterdam) and Gerard Alberts (University of Amsterdam) respectively. Many other European and non-European scholars also participated, including a number of distinguished Americanists who gave plenary addresses: Rob Kroes (University of Amsterdam), Giles Scott Smith (Roosevelt Study Center), David Nye (Center for American Studies, SDU, Denmark), Mary Nolan (New York University), Jaap Kooijman

(University of Amsterdam), David Ellwood (University of Bologna), and Matthias Kipping (Schulich School of Business, Toronto, Canada).

There were also fourteen regular sessions where panels consisted of a mix of scholars from the two research groups and other scholars to enhance dialogue across specializations. Of the papers on the history of computing and software, many focused on IBM and the influence of this multinational on European developments. Authors included: Gerard Alberts “IBM as an American Icon,” Thomas Haigh (University of Wisconsin-Milwaukee) “A View of the Computing World as Seen From America in the 1950s and 1960s,” Petri Paju (University of Turku) “IBM in Post War Europe: Europeanizing an Icon of Americanization,” and Jeffrey Yost (Charles Babbage Institute, University of Minnesota) “Appropriation and (In)dependence: Examining the British Tabulating Machine Company (BTM), IBM, and Burroughs at the Advent of the Computer Industry.”

Other authors on the history of computing and software addressed a wide range of topics, from the influence of other US multinationals and circulation of knowledge in computer science to the work of international IT professional organizations. They included: Philipp Aumann (Deutsches Museum) “Appropriation Without Imitation: Cybernetics in Western Germany,” Frank Dittmann (Deutsches Museum) “The First Transatlantic Computer Communication Between East and West,” Sandra Mols and Marie d’Udekem-Gevers (Universite de Namur, Belgium) “Appropriating American Electronics: Bell Telephone’s Role and Informing of the Diffusion of Electronic Computing in Belgium, 1945-1960,” Pierre Mounier-Kuhn (CRNS and Sorbonne University) “From Bull-General Electric to Honeywell-Bull: Americanization by Multinationals, 1964-1985,” David Nofre (University of Amsterdam) “The ‘ALGOL Effort’: Early Computer Science in Post-War Europe, 1950-1960,” Corinna Schlombs (University of Pennsylvania) “The Automation Debate: Europeans Appropriating American Productivity Technology,” Ksenia Tartarchenko (Princeton University) “IFIP vs. IFIPS: The Early History of the International Federation for Information Processing as a ‘Trading Zone’ Between ‘Americanization’ and ‘Sovietization,’” and Frank Veraart (TU Eindhoven) “Modes of Interaction with America in Personal Computer Domestication in the Netherlands, 1975-1990.”

EUWOL and Soft-EU also held planning meetings focused on future publications.

## **McDonald 2009-2010 Tomash Fellow**

We are pleased to announce that Princeton University’s Christopher McDonald is CBI’s new Erwin and Adelle Tomash Fellow. McDonald received a Bachelor of Arts degree from Rice University, and a Master of Science degree from Purdue University, both in Computer Science. He was inducted into Upsilon Pi Epsilon, the Honor Society for the Computing Sciences. He is currently a doctoral candidate in the History of Science

program at Princeton. Prior to enrolling at Princeton, he worked in the computer industry for four years, first as a software consultant at Trilogy Software, then as a programmer for IBM's AIX operating system. Last fall, he was a teaching assistant for a course in the history of modern science and presented a paper on the history of the car radio at the Society for the History of Technology conference in Lisbon, Portugal.

McDonald's dissertation project concentrates on the history of the computer utility (widespread remote access/networked computing). Computer services enterprises (University Computing Corporation, Informatics, General Electric's GEISCO) in the 1960s increasingly took advantage and built upon research and development conducted on time-sharing and remote computing at MIT, RAND/SDC, and other research institutions in the 1950s to broaden opportunities and efficiencies with utilizing expensive computer resources by providing remote access. McDonald's research focuses not only on these technological and industry developments, but also on the broader political and societal implications of a computer utility—a model different, but holding certain similarities to access to electrical grids, or the electrical utility. He intends to explore the meaning of the computer utility model as a possibility for unleashing the power of computing to the masses—computer democracy (both broad access and increasing equality of opportunity for political participation). Generally, the notion of the computer as a potential democratic tool is associated only with the personal computer era beginning in the mid-1970s. McDonald's study of the computer utility will explore the different perspectives and visions (within industry, the academic world, and among journalists) for broad based computing a decade earlier.

The Tomash Fellowship is awarded each year to a doctoral student researching and writing a dissertation on the history of computing. CBI is grateful for the generous support of CBI founders Erwin and Adelle Tomash for making this fellowship possible.

*Jeffrey R. Yost*

## **Norberg Travel Fund Award Recipients**

We are pleased to announce the 2009 Arthur L. Norberg Travel Award recipients are Dr. Lars Heide and Dr. David Nofre. Each will receive a travel award to help subsidize their visit to Charles Babbage Institute to conduct archival research.

Lars Heide is associate professor at the Center for Business History at Copenhagen Business School. He is the author of numerous books and articles on computing and punched card tabulation, including *Punched-Card Systems and the Early Information Explosion, 1880-1945* (Johns Hopkins University Press, 2009). Heide will be conducting research for a broad-based project entitled, "Shaping Main-Frame Computer Industry and Western Society, 1945-1975." The project will examine how users and government contributed to shaping computing technology and the computer industry in the United States, Great Britain, France, and West Germany. Among the collections he plans to use

at CBI on a visit later this year are: the Edmund Berkeley Papers, Margaret Fox Papers, and the Burroughs Corporation Records.

David Nofre is a postdoctoral fellow at the University of Amsterdam on a multiyear European Science Foundation project entitled “Software for Europe: Constructing Europe Through Software” (Soft-EU). He completed his doctoral degree in the history of science in 2006 at the Autonomous University of Barcelona and has published a number of articles on the history of science. As part of Soft-EU, Nofre is conducting a project entitled, “ALGOL Compilers: University-Industry Co-Entrepreneurship.” He visited CBI in early April conducting research on numerous collections directly on ALGOL or providing significant context to ALGOL developments. These included the SHARE Inc. Records, the Isaac L. Auerbach Papers, IFIP Working Group 2.1 ALGOL Bulletin Records, and the George Ledin Jr. Papers, among others.

The Arthur L. Norberg Travel Fund is made possible by donors in honor of CBI’s founding director.

*Jeffrey R. Yost*

## **Research Reflections: History of ATMs**

Some years ago I was invited to redraft a teaching case study on Barclaycard, the first bank credit card in Britain. As with most adults in the developed world, I had been a user of debit and credit cards for many years. It thus seemed natural to investigate historical examinations of point-of-sale terminals (POS) and automated teller machines (ATM). Much to my surprise, I learned there was a dearth of academic work on ATMs. Contributions, particularly from an historical perspective, were few and far between. This was amazing not only because the ATM is ubiquitous in our adult life but because Barclays Bank consistently advertised the fact that they rolled out the first cash machine in the world in 1967.

That small fact turned into a proper study. This, plus the encouragement by Jim Cortada, as well as the second volume of his *Digital Hand* trilogy on computer applications in numerous industries, led to a large grant from the British Academy in 2005. The latter was quite helpful to map the origins of cash dispensers the United Kingdom. It immediately became evident that a lack of appropriate systematic studies had allowed the spread (particularly with the advent of the internet) of a number of myths and unsubstantiated beliefs about the origins of cash machines.

Archives at British banks and interviews with local engineers provided details as to the genesis of cash dispensing technology. In particular, these records revealed that a small technology firm, called Speytec, had been financed by the Midland Bank (then the second largest in terms of total assets) and at the behest of the bank, sold to the UK arm of Burroughs (its long term supplier of computer technology). Moreover, UK archives were

not altogether clear as to how the cash machines adopted on-line real time capabilities to convert into an ATM during the 1970s.

CBI's Norberg Travel Fund allowed me to travel to the US to visit CBI and conduct research using the Burroughs Corporation records. Research using this collection demonstrated how the design of the original Speytec team dominated Burrough's cash withdrawal designs up to the early 1980s.

The grant also provided the opportunity to examine a newly donated collection, the James W. Cortada Papers (i.e. his own research that supported the drafting of his *Digital Hand* trilogy). Not all of Jim's comprehensive collection made it to the trilogy. Hence this was not only an opportunity to approach the same source material with different research questions, but also to place it in greater context. Of particular importance was identifying discussions taking place inside and outside of bankers' industry publications. In summary, for the historian of technology and computing, the conversion of cash dispensers into ATMs tells of the diffusion of programming languages, database and database management systems as well as mini-computer equipment. From a business history perspective we see how retail financial intermediaries begin to experiment with new forms to manage retail branches as well as engage with customers. Yet in telling the history of ATMs one cannot escape the debate around the construction of electronic payment systems. This is particularly evident in US economic and monetary history because an alternative view to the use of technology as means to control costs of paper-based system then emerges. The research is now documenting when and how monetary authorities and banking regulators promoted the co-operation between intermediaries to provide payment services (and through this change the dynamics of competition from individual organizations to confrontation between groups promoting alternative standards).

*Bernardo Batiz-Lazo*

## Recent Publications

Beyer, Kurt W. *Grace Hopper and the Invention of the Information Age* (MIT Press, 2009).

Cortada, James W. "Patterns and Practices in How Information Technology Spread Around the World." *IEEE Annals of the History of Computing* 30:4 (Oct.-Dec. 2008): 4-25.

Ensmenger, Nathan. "Software as History Embodied." (Think Piece) *IEEE Annals of the History of Computing* 31:1 (Jan.-Mar. 2009): 86-88.

Grier, David Alan. *Too Soon to Tell: Essays for the End of the Computer Revolution* (Wiley/IEEE Computer Society, 2009).

Heide, Lars. *Punched-Card Systems and the Early Information Explosion, 1880-1945* (Johns Hopkins University Press, 2009).

Hicks, Marie. "Repurposing Turing's 'Human Brake.'" (Think Piece) *IEEE Annals of the History of Computing* 30:4 (Oct.-Dec. 2008): 106-109.

House, Charles H. and Raymond L. Price. *The HP Phenomenon: Innovation and Business Transformation* (Stanford Business Books, 2009).

Koanantakool, Hugh Thaweesak, Theppitak Karoonboonyanan, and Chai Wutiwiwatchai. "Computers and the Thai Language." *IEEE Annals of the History of Computing* 31:1 (Jan.-Mar. 2009): 46-61.

Leimbach, Timo. "The SAP Story: The Evolution of SAP Within the History of the German Software Industry." *IEEE Annals of the History of Computing* 30:4 (Oct.-Dec. 2008): 60-76.

McInerney, Paul-Brian. "Technology Movements and the Politics of Free/Open Source Software." *Science, Technology & Human Values* 34:2 (Mar. 2009): 206-233.

Medina, Eden. "Big Blue in the Bottomless Pit: An Early History of IBM Chile." *IEEE Annals of the History of Computing* 30:4 (Oct.-Dec. 2008): 26-41.

Montfort, Nick and Ian Bogost. *Racing the Beam: The Atari Video Computer System* (MIT Press, 2009).

Nandasara S. T. and Yoshiki Mikami. "Asian Language Processing: History and Perspectives." *IEEE Annals of the History of Computing* 31:1 (Jan.-Mar. 2009): 4-8.

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Tomash, Erwin and Michael R. Williams. *The Erwin Tomash Library on the History of Computing, Volumes 1-3* (Erwin Tomash and Michael R. Williams, 2009).

Van Oost, Ellen, Stefan Verhaegh, and Nelly Oudshoorn. "From Innovation Community to Community Innovation: User-Initiated Innovation in Wireless Leiden." *Science, Technology & Human Values* 34:2 (Mar. 2009): 182-2005.

*Compiled by Jeffrey R. Yost*

## **Featured Photo: ACM**

Photo: ACM display at National Computer Conference, 1979

Conference attendees chat at the Association for Computer Machinery (ACM) display at the National Computer Conference in 1979. The ACM featured their publications and promoted membership at various computer conferences. This photo is from the ACM Records currently being processed at the CBI. Other photographs in the ACM Records include images of meetings, conferences, and parties, primarily of attendees and speakers.