CHARLES BABBAGE INSTITUTE

NEWSLETTER

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CENTER FOR THE HISTORY OF INFORMATION PROCESSING

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CBI Software History Conference at Xerox PARC

Charles Wang Keynotes Event

by Arthur L. Norberg

Charles Wang, Founder and Chair of the Board, Computer Associates International

The Charles Babbage Institute's conference, "Unbundling History: The Emergence of the Software Product," was held at the Xerox Palo Alto Research Center (PARC) on Friday and Saturday, September 22-23, 2000. The conference was made possible by the generous support of the Tomash Family Foundation and was co-sponsored by the Economic and Social Research Council and the Software History Center.

Charles Wang, Chairman of the Board of Computer Associates International, delivered the keynote address to the assembled participants on Friday evening. Mr. Wang, a native of Shanghai, China, came to the United States at the age of 8 and graduated from Queens College with a BA in 1966. He became a programmer at Columbia University later that year, saying that there he "found his life's work." Leaving Columbia after 4 years, he went on

Continued on page 2

"Unbundling History" Explores the Emergence and Early Development of the Software Industry

by Jeffrey R. Yost

On Saturday, September 23, 2000, the Charles Babbage Institute's "Unbundling History" conference provided case studies and analysis of the software business prior to IBM's unbundling, the context and meaning of the unbundling event, and the subsequent development of the industry.

The morning session, chaired by Charles Babbage Foundation President George Glaser, contributed important perspectives on emerging software products by leading figures of the early trade. Martin Goetz spoke on Applied Data Research's (ADR) Autoflow, John Postley on Informatics' Mark IV, and Duane Whitlow on Syncsort. These presentations furthered understanding of early software firms and their products and provided a valuable base of knowledge that informed issues raised throughout the day.

Martin Goetz, who founded and served as the president of ADR, outlined the history of Autoflow, giving perpective on the origins of the software business and his firm's competition with IBM. He noted that much of ADR's business in the first half decade after its founding in 1959 was focused on building systems software for RCA, Honeywell, Bendix, Sperry Rand, and the federal government.

In 1963, RCA approached ADR to develop an automatic flowcharting system, but then backed away. Other firms demonstrated little interest as ADR proceeded to develop a prototype that

Continued on page 4

Newly Designed and Expanded CBI Web Site Launched in November 2000

CBI is pleased to announce its newly updated, restructured, and redesigned site on the World Wide Web. Launched in November 2000, the new site is hosted by the University Libraries and developed and maintained by CBI staff.

Not surprisingly, the CBI archives has a long tradition of employing emerging technology tools to provide information about the history of computers, software, and networking. The CBI archives was among the first to implement the Internet Gopher (developed at the University of Minnesota) and by 1994, CBI was distributing information about its collections and programs on its own Web site.

Visitors familiar with the old CBI Web site will notice the dramatically different look and feel of its new incarnation. The new site attempts to present users with a streamlined overview of each of CBI's major areas on its table of contents page, with greater detail available on subsequent levels. New features include "What's New?," a section intended to keep CBI's Web visitors up to date with current projects,

Continued on page 7

Recent Publications

Bromley, Allan G. "Babbage's Analytical Engine Plans 28 and 28a—The Programmer's Interface" *IEEE Annals of the History of Computing* 22:4 (October-December 2000) 5-19.

Chamak, Brigette. "The Emergence of Cognitive Science in France: A Comparison with the USA" *Social Studies of Science* 29:5 (1999) 643-84.

Croarken, Mary and Martin Campbell-Kelly. "Beautiful Numbers: The Rise and Decline of the British Association Mathematical Tables Committees, 1871-1965" *IEEE Annals of the History of Computing* 22:4 (October-December 2000) 44-61.

Dodge, Nathaniel S. "Charles Babbage" *IEEE Annals of the History of Computing* 22:4 (October-December 2000) 22-43.

Holbrook, Daniel, et al. "The Nature, Sources, and Consequences of Firm Differences in the Early History of the Semiconductor Industry" *Strategic Management Journal* 21 (2000) 1017-41.

Ifrah, Georges. *A Universal History of Computing: From the Abacus to the Quantum Computer* (New York: John Wiley, 2000).

Kenney, Martin and John Seely-Brown, eds. *Understanding Silicon Valley: The Anatomy of an Entrepreneurial Region* (Stanford: Stanford University Press, 2000).

Langlois, Richard N. and W. Edward Steinmueller. "Strategy and Circumstance: The Response of American Firms to Japanese Competition in Semiconductors, 1980-1995" *Strategic Management Journal* 21 (2000) 1163-73.

Phillips, Ronnie J. "Digital Technology and the Institutional Change From the Gilded Age to Modern Times: The Impact of Telegraphy and the Internet" *Journal of Economic Issues* 34:2 (June 2000) 267-89.

Robinson, Herbert W. *In on the Ground Floor of the Twentieth Century Automation Revolution* (Fountain Hills, AZ: IMS Press, 1996).

Continued on page 7

CHARLES BABBAGE INSTITUTE
NEWSLETTER

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

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WANG

Continued from page 1

to sell software.

In his opening remarks, Wang paid tribute to many members of the software industry in the audience, referring to the conference as a gathering of the founders of the industry. This industry, for Wang, is a "victorious force." Because of this, he noted "we owe it to ourselves to look at our history, examine what we think we know, and then, hopefully, learn from all the different trials and the defeats." As part of this exercise, Wang began by examining his own start in the industry.

In 1974, Mr. Wang became the United States distributor for a small Swiss company called Computer Associates. He quickly became their top salesman; indeed, he sold so much software "the distributorship became an American tail wagging a Swiss dog." He and several associates bought out the distributorship and established Computer Associates International in 1976, a company that is to celebrate its 25th anniversary this year. From a four-person startup in a cramped office in New York City, Computer Associates evolved into one of the largest independent software companies in the world, with over 20,000 employees.

Wang described how in the early years, hardware makers had to supply software in order to make their systems useful. Every company had its own way of providing the software. Software then was a "dark science," and the result was a proliferation of many proprietary closed standards. Essentially, customers had no choice but to comply. This led to the so-called "account control," making the switching costs from one hardware system to another very high. This meant that the hardware companies had a strong disincentive to develop other software solutions or to make the computer systems more user friendly. Insufficient software in those days meant customers needed bigger computers; suppliers obtained more revenue that way. "By making systems software and programming languages as incompatible as possible, software remained proprietary, just like hardware."

Account control had an interesting impact on the user companies. Information technology (IT) departments became the first dominant source of software development, all based on complex proprietary systems. This ultimately led to a disconnect between the IT people and the people that ran the business. There evolved a costly tension between the individuals who managed the business and those who managed the computers. Much changed over the next several decades.

Wang cited two reasons for the change. First, one result of the IBM/U.S. Government lawsuit was a decision by IBM to "unbundle" its hardware and software, an event that made a software industry possible. Second, improvements in processing technology permitted smaller, less expensive computers. Use of computers rose everywhere. The software industry, and Computer Associates in particular, rode this rising tide.

Computer Associates' first product was called CA-Sort. CA-Sort was 25% faster and used 50% fewer resources than the IBM sorter available. By the end of CA's first year, there were some 200 users. In these early years, CA learned one of the realities of the software industry: every customer wants something just a little bit different than everyone else. To meet demand, CA's few employees experienced many "all-nighters" and wrote a great deal of code. They found they were

Continued on page 3

WANG

Continued from page 2

spending more and more time on consulting with customers about their needs rather than developing software. "Eventually we observed a condition that unknown to us had been described 60 years earlier as Pareto's Law: 80% of the potential value of any business activity can be achieved from just 20% of the effort." A number of companies wanted to convert names and addresses stored on magnetic tape to a common format for direct-mail letters. Every tape came in a different format. Eighty percent of their coding generated little incremental value; 20% fulfilled 80% of the customer's requirement. So they created a generic file converter to save time when they converted files for customers. "We concentrated on the 20% that would generate 80% of the result. It was crude, but it worked. If this solution helped us, we decided to make it available as a package, and it should help others. This led to a few sales and proved our technology."

Today, the company is based on a substantial set of over 800 products, with names like CA-Dynam, CA-Jasper +, CA-Universe, and CA-Unicenter. These products were either developed by the company or came to Computer Associates through its acquisition of over 200 firms during the past 25 years. Over the years, the company strategy has been to acquire many disparate technologies and integrate them into a seamless whole. Mr. Wang and his associates are masters at this strategy of growth through acquisition. In 1982, Mr. Wang made his first purchase, buying Capex Corporation. In 1987, Computer Associates acquired the Uccel Corporation; and in Winter 2000 folded in Sterling Software. Wang and his associates have made Computer Associates the third largest software company in the world, and in 1999, the company exceeded an income total of $6 billion. In his closing remarks, he noted that CA people have had a great time at the company. "It has been a crazy and wild ride!" Yet he feels they are still at the beginning because he sees the opportunities as "enormous."

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Software History Project Report

Since receiving a NSF award for "Building a Future for Software History" last fall, CBI has made significant progress on this project to lay a foundation for furthering understanding and scholarship in the history of software. The principal investigators and post-doctoral fellow have begun to construct an Internet-based knowledge network of software experts, business leaders, historians, and archivists. They have initiated work on an authoritative software history dictionary, conducted research-grade oral histories with software pioneers, and are now working to launch a peer-reviewed electronic research journal. All parts of the software history project are designed to prepare the ground for significant contributions to the history of science and technology, computer science, and the software industry.

In May 2000 the Charles Babbage Institute completed a six month national search for a software history project manager, hiring Philip Frana, a recent Ph.D. in the History of Technology and Science from Iowa State University.

Concurrent to this search, a bibliographic and historiographic effort by the principal investigators greatly expanded the list of software history references identified in the grant proposal. More than 1,600 primary and secondary sources have been identified, and will prove useful to the development of the

Continued on page 6

News From the Archives: Recent Acquisitions

Soviet Computing Collection, 1956-1991

CBI has recently acquired a collection of source materials on the history of Soviet computing. The materials were gathered by the Mosaic research group, which was established by Seymour Goodman in 1977 at Princeton University and housed for many years at the University of Arizona. Mosaic was an interdisciplinary collaborative effort to study the development and application of electronic digital computing in the Soviet Union. The effort produced an extensive series of published papers and spawned several dissertations.

The development of computing in the Soviet Union occurred in relative isolation and presented special problems to Western historians of computing; lack of readily accessible documentation was chief among them. Throughout the 1980s, Mosaic participants traveled several times a year to the USSR to gather information, conduct interviews, and make site visits. Together, they amassed an extraordinary amount of source material, most of which, for various reasons, is unavailable elsewhere in the world.

From this mass of documentation, approximately 40 cubic feet have been selected for preservation at the CBI archives. Materials include notes, correspondence, reports, rare journal articles, equipment reviews and catalogs, manuals, and books. In addition to providing a picture of the development of Soviet computing, they also record Soviet impressions of the development of computing in the U.S. English translations, done primarily by Mosaic members and the US government are available for much of the material.

The CBI archives hopes to augment this collection with contributions from other Mosaic members. Please contact archivist Elisabeth Kaplan for more information.

Addition to Calvin Mooers Papers

CBI is pleased to announce a recent addition to the Calvin Mooers Papers. The newly discovered materials were donated by the Mooers family and include a 1990 memoir, portions of which will be published in an upcoming issue of the *Annals of the History of Computing*. Also included are Mooers' notebooks from his time at the Naval Ordnance Laboratory (1943 - 1946), during which time he worked with John V. Atanasoff, as well as entries from his private diary in the same period. Mooers contributed two lectures to the seminal 1946 summer

Continued on page 7

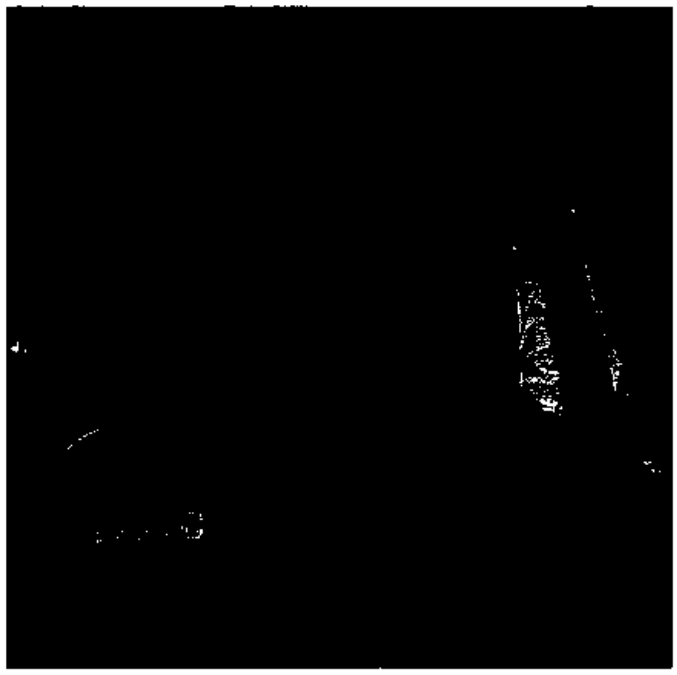
Unbundling History

Continued from page 1

was completed the following year and soon marketed to RCA 501 computer users. Shortly thereafter, ADR began to target IBM's lucrative market of 1400 series users with Autoflow, competing directly with the computer maker's bundled flowchart system. Goetz related the great challenge IBM's bundling presented to competition in the systems software field, and ADR's decision early in 1969 to sue the computer giant for illegal monopolistic practices. He concluded that ADR's suit, which IBM settled, and contemporaneous suits brought by the federal government were very significant to IBM's decision later that year to unbundle software.

John Postley, a former Vice President of Advanced Information Services, Inc. (AIS) and later, Vice President of Informatics, followed with a presentation by telephone. Postley detailed the development of the Generalized Information Retrieval Listing Systems (GIRLS), designed for the IBM 709 at AIS, and the refinement of the system in three iterations, MARK I, II, and III, for the IBM 1400 series. Soon thereafter, Informatics acquired AIS and introduced the highly successful MARK IV for the IBM 360 series of computers. MARK IV's advantage over other listing systems was that it could process and generate a number of separate, independent reports with a single run of the tape. Postley described MARK IV as the "first general use [software] product," winning the first million, ten million, and one hundred million dollar software product awards (based on sales) from Larry Welke. Welke, who served as president of Info Partners International and was a critical figure in promoting the development of the software trade through his firm's software product directories (a set of which he recently donated to CBI), served as a panelist at the conclusion of the conference.

The final speaker of the session, Duane Whitlow, discussed the history Syncsort, a highly successful data management program he developed in the late 1960s that optimized central processing and input/output efficiency. Shortly after developing Syncsort, Whitlow went to *Computerworld* to show off the product. It made the front page of the magazine. This, he related, guaranteed the product "exposure and respectability." Despite the publicity and technical success, Syncsort's early sales were stunted by IBM's pre-announcement of a new sort system, as well as other practices engaged in by the computer maker's powerful sales and service organization. His talk highlighted the ability of an individual software developer to create a superior software product to those designed by the dominant computer maker, and the difficult but rewarding task of marketing it.



Watts Humphrey

Commentator Luanne Johnson, President of the Software History Center, reiterated and expanded upon this theme by outlining how IBM's existing customer base, organizational capabilities, and aggressive practices presented great challenges to early independent software venders.

The next session, chaired by Ulf Hashagen of the Deutsches Museum, examined the history and ramifications of IBM's unbundling.

The first speaker, Watts Humphrey of the Software Engineering Institute at Carnegie-Mellon University, had served as the Director of IBM programming from 1966 to 1969, and later, as the firm's Director of Policy Development. Humphrey began by relating how the Consent Decree of 1956 tempered the firm's practices, and that even though the engineers and marketing staff may have been aggressive, senior management was strongly committed to preventing anti-competitive behavior. Humphrey gave special attention to analyzing the various issues influential to IBM's unbundling decision. In 1964, shortly after the announcement of the IBM 360, RCA announced its Spectra 70 system, which IBM feared would be able to run IBM's software. This would allow RCA to take advantage of IBM's enormous programming costs. As Humphrey put it, there was "no rational response IBM could make but to price their programs."

At the end of 1966 IBM implemented a task force "to determine how to unbundle, not whether to unbundle." This preceded the anti-trust action by the Justice Department by more than 2 years, and though Humphrey indicated that anti-trust concerns were a major factor in the unbundling decision, he expressed that the move was inevitable given the firm's recognition that plug-compatible machines were the wave of the future.

A new COBOL was the first unbundled IBM software product and the firm's experience with it quickly demonstrated that the transition would be slow, as it was competing against earlier versions of the company's own "free" software. There was also the difficult issue of how to phase out service on this software. The transition took several years.

Steve Usselman, a leading historian of technology and management and past IBM History Fellow, followed Humphrey. He agreed with the "conference's assumption" that unbundling "mattered quite a bit," but offered a significant degree of skepticism based on his analysis of counterfactuals related to the unbundling event and its contexts. Usselman challenged the notion that unbundling was critical to the development of the software trade and that IBM unbundled primarily out of fear of anti-trust litigation. The Department of Justice was not seeking to foster an independent software industry, but instead believed that bundling might give IBM an unfair advantage in hardware by enabling

it to obscure the true price of its machinery. Like Humphrey, he cited the importance of the RCA Spectra 70, and also brought up the earlier Honeywell Liberator emulator program (built to run on IBM 1401 computers), to highlight the changing environment that created the opportunity for other firms to reap the benefits of IBM's large investments in programming.

Usselman stressed the great irony of the IBM 360, that while the system built to perpetuate the tie of hardware to software succeeded in creating a large base of common machines, it also led to the unanticipated consequence of creating unprecedented opportunities for independents to sell their standard programs. Employing the counterfactual of IBM's continued bundling of software products past 1969, Usselman gave some theoretical and historical arguments against the idea that bundling represented an impenetrable barrier to entry.

Usselman concluded by analyzing the relative growth of the software products, software services, and hardware industries from the second half of the 1960s through the 1970s, noting that services was the big growth sector of this period. While he conceded that the unbundling decision might have hastened these developments, he emphasized that they would have taken place regardless of whether or not IBM unbundled.

Following Usselman, session commentator Burton Grad, a former software applications development manager at IBM, indicated how little support there was for programming that would not directly lead to more hardware sales at the firm during the 1970s. The 3% price drop of all IBM computer hardware (at the time of unbundling), Grad related, had a double digit impact on IBM's bottom line. He concluded by illustrating how the software side was not very profitable due to substantial cuts of applications programming staff and IBM's general lack of commitment to the software business.

Following upon this theme and directly prompted by a question from CBI Trustee Walter Bauer, the panel tackled the question of why IBM missed the early opportunities in software. Humphrey indicated that he tried to push the software business, but his pleas largely fell on deaf ears. Usselman, drawing upon a well-established historiography in the history of business and technology, related how large businesses are rarely successful at negotiating transitions into entirely new areas, and that the difficulties are most often associated with changing business models and organizational practices rather than with changing technology.

Left to Right: Walter Bauer, Peter Cunningham, Martin Campbell-Kelly, and Larry Welke

The final session paired a prominent analyst of the information processing industry, Peter Cunningham, and a leading historian of computing, Martin Campbell-Kelly, to examine the development of the software trade in the era following IBM's unbundling decision.

Cunningham, the founder, President, and CEO of INPUT, a firm that has provided marketing services, market research, and vendor analysis for software and other IT industries in the United States and Europe from its initiation in 1974, spoke on the last two and a half decades of the software industry in a talk entitled, "The Software Product Revolution." He discussed the complexity of unbundling, examining the extent to which unbundling actually occurred at IBM and other firms. He emphasized the importance of looking at whether or not hardware and software were actually separated in terms of their organization, and how they were priced. With regard to the former, he argued that computer companies never really separated their organizations or unbundled the software side of their businesses.

Cunningham then turned to a quantitative analysis of developments, providing data on the respective growth of different sectors of the software trade over the past three decades. He pointed out that a fundamental factor to the growth of the software industry was not unbundling but the large amount of funds that firms plowed back into research and development.

In most cases, the large computer vendors were reacting to software firms that were creating new types of software products based upon regular and extensive communication with their customers. The actions of one or two players in the computing industry did not determine the fate of the software trade.

Cunningham stressed that users have driven the industry, often in partnership with service providers. He related how unbundling remained an important issue in the 1980s and 1990s, and stated that the single greatest factor influencing the computer and software industries was that it was never regulated like telecommunications.

Martin Campbell-Kelly of the University of Warick followed, presenting an overview and analysis of his research on the economic history of the software industry. The number of works on the software trade is relatively small, and few provide extensive or reliable data on the size of the industry or the resources going into development. The best data on the trade is compiled at a small number of market research firms and typically is inaccessible to historians. Unlike many other industries, there are no tangible inputs in software development, and after 1975, the existing numbers cited on

Continued on page 7

Software History Project

Continued from page 3

software history dictionary and other initiatives of the project. Additionally, careful scrutiny and abstracting of all of the articles on programming/software from the first five years of *Communications of the Association for Computing Machinery* by project staff has produced a resource that will be of enduring value to the project.

The structuring of the project also benefited from outreach efforts initiated by the principal investigators and post-doctoral fellow. Charles Babbage Foundation advisors supplied the knowledge necessary for defining the scope of the software history dictionary. The ordering of fundamental terms by these advisors and research by project staff led to the designation of nine categories for the software dictionary: operating systems, programming languages, programming techniques, software engineering, scientific applications, business applications, graphics, networking, and data management. These categories define the range of individual entries being completed by committees of experts.

CBI staff also developed suggested project guidelines. These guidelines define the role of committee members and CBI staff on the project. They can be viewed at http://www.cbi.umn.edu/shp

The anticipated primary audience for the dictionary is individuals from the computing and software communities seeking authoritative information and historical contexts of software developments. Entries are being written by committee members, and edited and reviewed by expert advisors and CBI software history project staff to be comprehensible to educated non-specialists. Thus, the dictionary will be a useful resource for historians of technology and science, and other scholars, educators, students, and individuals interested in the field.

All parts of the dictionary will become freely available as a set of hypertext-linked documents containing approximately 1,200 entries on the Charles Babbage Institute Web site. Staff members have engaged in a series of planning meetings with University of Minnesota Library information technology specialists to design the storage, retrieval, and delivery mechanisms for the dictionary. Project staff are also developing a method for the effective searching of the online historical dictionary utilizing an authority file (standardized sets of names and subject headings) specific to the field of information processing.

The online software dictionary initiative was designed not only to produce a useful reference source, but equally important, as a methodological experiment utilizing electronic communication (e-mail and a web site) to involve a community of experts in a dialogue to produce resources for documenting developments in a designated area of the history of science and technology. To facilitate this type of interaction, the project staff adopted several intensive research and evaluation strategies to identify and involve leading authorities in the field of software history. Through analysis of existing literature and consultation with a number of experts, the principal investigators and project manager assisted in the launch of a pilot committee for operating systems, identifying and inviting to participate highly distinguished individuals in this area of study.

The operating systems committee, which is now engaged in the production of entries for the dictionary, includes the following distinguished individuals: CBF Trustee Bernard A. Galler, University of Michigan (Chair); Ashok K. Agrawala, University of Maryland, College Park; Michael J. Alexander, Arbortext; Marc A. Auslander, IBM; Edward G. Coffman, Jr., Columbia University; CBF Trustee Peter Denning, George Mason University; A. G. (Sandy) Fraser, AT&T Research Laboratories; James D. Mooney, West Virginia University; Alan Cary Shaw, University of Washington; Avi Silberschatz, Bell Laboratories; Andrew S. Tanenbaum, Vrije Universiteit; and Thomas H. Van Vleck, Encirq, Inc.

The graphics and database committees are currently being formed and will soon be followed by launches of the programming languages, networks, business applications, and scientific applications committees.

Many lessons have been learned in the organization and work of the operating systems pilot committee, lessons that have led us to generate alternative organizational strategies for the other committees. The dictionary entries are also proving a valuable guide in formulating a strategy for the oral history component of the project, which in turn, will inform the dictionary.

Other important outcomes related to this NSF project should be conveyed. First, the CBI software history project has underscored the persistent need to establish new historians in this underexplored area of information processing. CBI is helping to achieve this. Nathan Ensmenger, the current CBI Adelle and Erwin Tomash Fellow, is working on a dissertation at the University of Pennsylvania which will integrate the history of the software professions into the larger social and cultural history of information technology. Second, CBI, in its mission to establish an agenda for future research, co-sponsored one, and sponsored a second software history conference in 2000: "History of Computing 2000: Mapping the History of Computing -- Software Issues" in Paderborn, Germany (April 5-8), and "Unbundling History: The Emergence of the Software Product" at the Xerox Palo Alto Research Center (see article, page 1). Finally, the project yeilds contacts and information that aid in CBI's collection development efforts in software history.

The coalescence of software as professional discipline, science, and industry is an evolving process. "Building a Future for Software History" seeks to coordinate the diverse researchers and practitioners in the software community to set an agenda, build a professional and administrative lexicon, and find unity of purpose in the fields of computer science, history, and management.

Philip L. Frana
Jeffrey R. Yost

Unbundling History

Continued from page 5

expenditures of programming software are "often contradictory and do not make sense." This forces economic and business historians to focus only on the traded software industry, where there are traceable money transactions.

Campbell-Kelly also placed the economic history of software within the literature on disruptive technologies (studying the trajectories of new technologies, that in time, take over existing ones). Contrary to dominant perspectives, rules from other industries do apply to software. The case study approach, though it has been used with success to enhance understanding of the computer hardware business, is less suitable for software given the vast number of firms and individuals engaged in programming. Campbell-Kelly concluded with a plea to those in industry to save records, and at the appropriate time, consult with the archives of the Charles Babbage Institute.

A panel discussion followed with Walter Bauer, Larry Welke, Peter Cunningham, and Martin Campbell-Kelly. Bauer noted that the Computer Usage Company was the first to advertise itself as a software company, but that CEIR in 1960 was regarded as the first software firm. He indicated that there was no such thing as a "software product" in 1962, but remembered that he did try to develop "proprietary programming items," selling the same code to many customers despite the fact that there was little precedent for this. Welke spoke of some of the challenges Microsoft will face in the future resulting from the enormous base they have to try to cover with new products. At the conclusion of all three of Saturday's sessions, there was lively participation from the audience, most of whom, like the speakers, were distinguished individuals relating valuable experiences and perspectives from their involvement in the early history of the software business.

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Archives

Continued from page 3

lecture series at the Moore School of the University of Pennsylvania; the unedited transcripts of his talks and correspondence regarding the lecture series are also included.

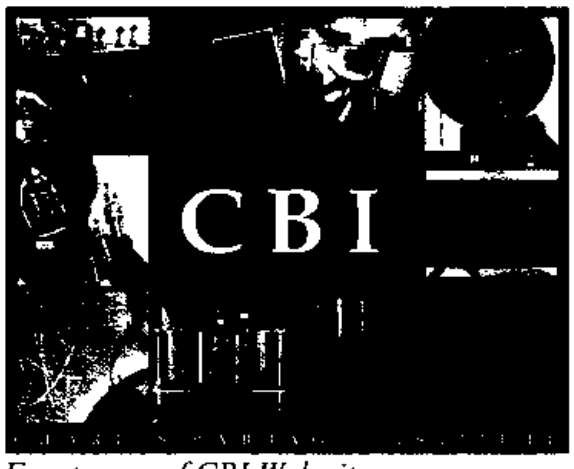
One of the topics documented in the Calvin Mooers Papers is the TRAC programming language. Mooers developed TRAC in 1964 and worked on it until his death in 1994. An interpreted string-processing language, TRAC was one of the first languages designed for keyboard interaction, and its development was partially motivated by Mooers' interest in improving information retrieval. In 1999, Mooers' daughters started the TRAC Foundation, a non-profit organization dedicated to the use and development of the TRAC programming language. The immediate goal of the foundation is to create an open standard and specification for TRAC language and to release a new version of TRAC under an open source license. Additional information about TRAC is available on the foundation's Web site. http://tracfoundation.org

The updated finding aid to the Calvin Mooers Papers is available on the CBI Web site at http://www.cbi.umn.edu/collections/inv/mooers.htm

Elisabeth Kaplan

CBI Web Site

Continued from page 1



Front page of CBI Web site

acquisitions, and opportunities. A new search tool, under the "Collections" section, provides users an array of options for finding information about CBI's archival holdings. Virtual exhibits, such as the expanded "Who was Charles Babbage?" are intended to entertain young researchers and to provide quick answers to some of CBI's most frequently asked reference questions.

The new CBI Web site is continually updated with new or expanded information. Plans for the coming year include the addition of full text of oral history interviews, a searchable database of 500 photographs from the Burroughs collection, reformatted finding aids, and additional virtual exhibits. Please visit the new CBI Web site at http://www.cbi.umn.edu and send comments to Elisabeth Kaplan at kapla024@tc.umn.edu

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In Remembrance: Leo Fantl, 1924-2000

Leo Fantl passed away on November 11, 2000 at the age of 76. Born in Teptliz Schoenau, Czechoslovakia in 1924, Frantl became an important early figure in business computing, helping to develop and implement many advanced payroll applications in the 1950s.

Following his service in the Royal Air Force during World War II, Fantl took a position at the J. Lyons Company Planning Department and was recruited for the LEO programming team. Fantl was responsible for calculating the first PAYE tax tables and developing specialized advanced payroll systems for the Ford Motor Company, Kodak, and other firms. Fantl went on to run Product Planning for English Electric LEO, and became the first Chair of the LEO service business. Fantl is survived by his wife Pat, his daughter, stepchildren and grandchildren.

Recent Publications

Continued from page 2

Rosenbloom, Richard S. "Leadership, Capabilities, and Technological Change: The Transformation of NCR in the Electronic Era" *Strategic Management Journal* 21 (2000) 1083-1103.

Spinning the Web: The History and Infrastructure of the Internet (Washington, D.C.: Congressional Research Service, Library of Congress, 1999).

Von Burg, Urs. "Plumbers of the Internet: The Creation and Evolution of the LAN Industry" *Enterprise and Society* 1:4 (December 2000) 705-14.

Comp. by Jeffrey R. Yost

Fifty Years Ago

The Data Processing Management Association (DPMA) was incorporated on December 26, 1951, as the National Machine Accountants Association (NMAA). Ten years later, NMAA changed its name to DPMA in hopes of expanding its membership beyond finance and accounting professionals. The change enabled the organization to encompass the broadening spectrum of data processing users. DPMA's membership comprised all levels of information management personnel. By 1962, DPMA had developed the Certificate in Data Processing program and offered the first examination for the Certificate in Data Processing (CDP). In 1970, DPMA augmented the CDP with the Registered Business Programmer examination. DPMA--now AITP, or the Association of Information Technology Professionals--is now one of the largest worldwide organizations serving the information processing and computer management communities. (DPMA Records, 1950-1989, CBI 88).

1951 National Machine Accountants Association National Meeting

20 Years Ago

In 1981, the Microsoft Disk Operating System (MS-DOS) debuted as the operating system for IBM's newly introduced personal computer, initially named "Acorn." The agreement between Microsoft and IBM began in July 1980, initially to provide a version of Microsoft's BASIC that would run on the Intel 8088. Instead, Microsoft purchased the 86-DOS software, from Seattle Computer Products. After some modifications, most notably the addition of a file allocation table, the product became MS-DOS and was bundled with almost every IBM personal computer.

Lynn Leitte

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