CHARLES BABBAGE INSTITUTE

CENTER FOR THE HISTORY OF INFORMATION TECHNOLOGY

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In This Issue:

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Director's Desk

With the passing of Erwin Tomash on December 10, 2012, the computer history world lost one of its oldest, strongest, and most foresighted supporters. As Jeffrey Yost makes clear in his biographical article, Erwin had a singularly lengthy and profound impact on our field. By my reckoning, he was involved in computing, one way or another, for an astounding seven decades: beginning with his 1943 graduation from the University of Minnesota in Electrical Engineering and his subsequent wartime work on radar, and continuing with numerous key roles including working for the pioneering Engineering Research Associates in St. Paul, through his executive activities at Dataproducts and other companies, and on to his founding of the Charles Babbage Institute, and his own active scholarly book collecting, just to mention the highlights.

It's worth pausing a moment, I think, to reflect on the leap of faith that Erwin took in the 1970s to create a substantial and durable means to cultivate computer history. Apple Computer was still cleaning up its garage, and the IBM Personal Computer was nothing more than a fuzzy dream. "Silicon Valley," named in 1971, was scarcely more than a half-dozen years old. Others were nearly as young. The latter-day web pioneer Marc Andreessen, future Google founder Sergei Brin, and recently named Yahoo CEO Marissa Mayer—all were barely out of diapers. People often ask me whether Erwin and his colleagues who founded CBI could possibly have foreseen the full sweep and significance of the computer revolution.

Whether anyone really could see the future with any clarity in the 1970s is uncertain. Even then, Erwin and others understood that computing was remaking business, government, and society—and that there was a need to understand this immense historical force.

Three years after Bill Gates and Paul Allen founded Microsoft in 1975, Erwin created the International Charles Babbage Society, which soon evolved into the Charles Babbage Institute. Perhaps the only other equally visionary act in the 1970s was Bob Bemer's prescient warning of the so-called Y2K problem, looking ahead four decades. (Gordon and Gwen Bell's Computer Museum in Boston was opened to the public in the 1980s and then later relocated and entirely re-organized into the present-day Computer History Museum in Mountain View, California.)

Erwin once told me that founding the Charles Babbage Institute was an "experiment" for him. If so, it was a very carefully conducted one. In reviewing CBI's founding documents, as I reported in the Fall 2012 newsletter, it is inescapable that Erwin and his advisors were setting up an institution that would be durable, strong, permanent. He'd gained experience on setting up and running start-up companies in the 1950s and 1960s and knew that getting the design right—and the people right—was important.

The great southern historian C. Vann Woodward famously discussed the "burden of history" in 1955, around the time Erwin was moving his family to southern California for a new phase of his business career. Let me assure you that the high-level people that Erwin assembled to launch the Charles Babbage Institute worked a powerful burden of history on me! How else could you respond when considering that such academic and

industry luminaries as Alfred Chandler, Joshua Lederberg, Arthur Humphreys, Walter Bauer and many others had helped design and launch CBI. How in the world, I thought, could we ever hope to match their ambitions and expectations?

Yet in looking back on CBI's more than three decades, there is quite a handsome record of achievement. As I write each year to our CBI Friends, thanks to their support the "core activities" at CBI are financially healthy and able to create a base for securing externally funded projects. Recently we've had grants from the National Science Foundation, the Association for Computing Machinery, and others. We have the world's largest collection of publicly accessible archival material on all aspects of computer history, as Jeffrey Yost has been documenting in his newsletter series "Exploring the Archives" and as CBI archivist Arvid Nelsen is impressively adding to this moment (we have two wonderful new collections that need just a bit of finalizing before we can announce them).

We also have an unsurpassed collection of research-grade oral histories with people across the computing field. With the interviews that we conducted for our NSF-funded project on the FastLane computer system, our total now exceeds 700 oral history interviews. Thirty more interviews will come from our on-going NSF-funded history of computer security. And we have been actively publishing cutting-edge scholarship: to date CBI staff have published 19 books and a very impressive collection of articles and book chapters. CBI's own Jeffrey Yost served two terms as Editor-in-Chief of *IEEE Annals of the History of Computing*, our field's leading scholarly journal. This spring Jeff and I are writing seven chapters for what will be book #20.

Yes—actually—we have done remarkably well over three decades. The Charles Babbage Institute, like the field of computer history, is growing, changing, expanding—flourishing. Everyone who has been involved in this remarkable enterprise can be proud of these achievements. I sincerely hope that we have met and indeed exceeded Erwin's hopes and dreams for computer history. If you'd like to become involved with the enterprise yourself—by joining the CBI Friends—drop me a line. Our job is making computer history!

Thomas J. Misa

Erwin Tomash (1921-2012)

Erwin at ERA 40th Anniversary

Computer industry pioneer and visionary co-founder (with his wife Adelle Tomash) of the Charles Babbage Foundation (CBF) and the Charles Babbage Institute (CBI), Erwin Tomash passed away on December 10, 2012. In the late 1940s he was an engineer at Engineering Research Associates (ERA), one of two firms that launched the U.S. computer industry. He later founded and led Dataproducts Corporation, a *Fortune* 500 computer peripherals and core memory firm, which for a number of years was the world's leading manufacturer of letter-quality, high-speed computer printers. Erwin and Adelle Tomash's insights and generosity in founding, supporting, and advising CBF and CBI have had a profound and continuing impact on the infrastructure for research and publication of scholarship on computer and software history.

Erwin was born in St. Paul, Minnesota, on November 17, 1921, to immigrant Jewish parents roughly a year after they moved the family from Moldavia, where his father had been a dried goods shop merchant in the town of Mogil'ov-Podol'skij (near the border of Romania and the Soviet Union). The family came to the United States to escape the changing environment in Moldavia after the Russian Revolution. Without capital for a shop, Erwin's father struggled to sell dry goods door-to-door in the Twin Cities before he was able to open a small corner grocery store after about a half decade. Erwin grew up in a family with four older siblings and modest means during the Great Depression. On multiple occasions the family had to shut down their store and relocate to a new location, each time living on the shop's premises. By his teens, his siblings had all left home to either work or start families. In his youth, Erwin attended public school as well as Hebrew school, and also worked in the family store. In high school he worked at other grocery stores as well. He remembered his upbringing as very disciplined, without much time for fun and games (stamp collecting, taken from letters that came to the store, was one of his few hobbies). Despite hardships, he recalled a happy youth and adolescence, and being blessed with a very close-knit and loving family environment.

Erwin attended Mechanical Arts High School in St. Paul, where he credits a course in ninth grade algebra as his first introduction to the idea he might want to study technical subjects, and possibly engineering. His other interests included history and politics, but his father pushed him toward learning a technical trade and he soon began to take courses

in electricity at the neighboring vocational school. Upon graduating from high school in 1939, Erwin took advantage of a National Youth Administration employment initiative, and he enrolled at the University of Minnesota to major in electrical engineering. With the NYA program, he worked in the University of Minnesota-wide Audiovisual Services that aided instructors showing slides or offering sound presentations. On weekends he worked at grocery stores, and later, as a sales clerk at a butcher shop. He was a commuter student, living at home throughout college, and would take streetcars and buses—or often to save money, "thumbed a ride"—to and from campus.

Erwin remembered the electrical engineering curriculum at the University of Minnesota consisting of two options—power and communications. He engaged in coursework in both areas—taking classes in power transmission and radio communications, as well as in mathematics and chemistry. Over time he found communications more interesting and he followed that track. Class-size was small and he typically would have twenty or so classmates. He graduated in electrical engineering with roughly 30 seniors in the spring of 1943.

In his junior year Erwin met his future wife Adelle Ruben, who was a freshman at the university. Adelle was born in St. Paul to Russian immigrant parents on June 28, 1925, and like Erwin, was of Jewish ethnicity and grew up with modest means. Despite the tightly bound Jewish community in Depression Era St. Paul, they had not met previously. Erwin and Adelle became engaged around the time of Erwin's graduation. With the U.S. at war, Erwin, just after graduating, applied to the officer recruitment program for both the Navy and the Army. The Navy turned him down based on an eyesight test, but he was accepted into the Army's officer program and was sent to the Army Signal Corps as a second lieutenant. He began with an instruction course in Fort Monmouth, New Jersey, where he and Adelle were married in the summer of 1943.

Adelle and Erwin Tomash

After Fort Monmouth, Erwin entered a six-month radar school (a joint Army and Navy program), split between instruction at Harvard University and MIT, where he studied circuit design, analysis of circuits, and pulse techniques. He excelled at this high-level

training and scored near the top of his class of roughly 400—performing better than many who had attended elite private colleges and universities. This instilled a great deal of confidence that Erwin carried with him through his military service and into his post-war career. Erwin's training in Massachusetts was followed by field radar school at Camp Patrick near Palm Beach, Florida, and additional training at other facilities. In June 1944 Erwin was deployed overseas.

Erwin served with great distinction in the U.S. Army during World War II and its early aftermath. He began in a Signal Corps Maintenance Unit where he set up and serviced radar systems. Later he organized and managed a supply depot near Marseille, France, which supplied critical electronic components to battlefront locales. For the latter, Erwin was awarded a Bronze Star.

After returning from the war, Erwin began graduate school at the University of Minnesota but was disappointed that the technical currency of the instruction did not match his military training in Massachusetts and his wartime work, and he left for an opportunity to join the Naval Ordnance Laboratory in late 1947. At his arrival, the laboratory was in the process of moving from the Washington, D.C., Gun Factory to White Oak, Maryland. There, Erwin indirectly worked for the head of the Acoustics Division, John Vincent Atanasoff, who had led the effort to build the Atanasoff-Berry Computer prior to entering wartime service. In 1948, disillusioned with military bureaucracy with regard to job/salary classifications and the mundane nature of his work assignments, Erwin interviewed with John Price, a classmate of his mentor at White Oak, who worked at the Engineering Research Associates (ERA) liaison office in Arlington, Virginia. Erwin was soon hired by ERA's Arlington office as a junior electronics engineer.

ERA had been launched in St. Paul, Minnesota, in 1946 by a group of scientists and engineers (led by Howard Engstrom and future Control Data Corporation leader William Norris) who had worked on code-breaking for the U.S. Navy during the war, along with ERA's primary financier, investment banker John Parker. This core group had extensive wartime experience with computing devices. In addition to other Navy contracts, ERA designed and built one of the first stored program digital computers in the U.S., the ATLAS, later commercialized as the ERA 1101. All this (including that the headquarters of ERA was his hometown) was not known to Erwin at the time he joined the young firm, as he did not yet have the security clearance to be informed of much of ERA's organization and activities.

Erwin's first assignment for ERA was in the computational technology field—helping conduct survey research for research director C. B. Tompkins. This was the basis for the seminal computing book, *High Speed Computing Devices* (McGraw Hill, 1950). In less than a year Erwin was granted his security clearance, after which he began to have frequent meetings with top research personnel at the newly formed National Security Agency, where he would consult to help make problems they had "computable." He also enrolled at the University of Maryland, receiving his Master's in Electrical Engineering in June 1950.

Erwin Tomash and Arnold Cohen

Key figures at ERA's headquarters, including chief engineer John Coombs, Arnold Cohen, and William Norris, encouraged Erwin to move to ERA's St. Paul facility. Anxious to transition beyond just producing research and consulting reports, and instead to engage in engineering design and development work, Erwin (and Adelle) moved back to St. Paul in 1950. His first task was to work on the Atlas II digital computer project (which was later commercialized as the ERA 1103/UNIVAC 1103). Erwin served as an engineer on this project headed by Jack Hill and Frank Mullaney. Many on the Atlas II development team, including Seymour Cray, would go on to become central figures at Control Data Corporation, a Minneapolis computer firm formed by engineers and managers leaving Sperry-Univac in 1957 (ERA was acquired by Remington Rand in 1952 and Remington Rand merged with Sperry Corporation in 1955 to form Sperry Rand—whose computer division was Sperry-Univac).

While the Atlas II project was a technical success, the Navy was displeased with the lack of documentation, leading William Norris to ask Erwin to take over and straighten out ERA's Technical Publications Department. Erwin liked projects such as this that involved solving problems by drawing on a mixture of administrative, managerial, organizational, and technical skills—all of which he possessed in abundance and would serve him well later as a corporate leader. Erwin viewed Remington Rand's 1952 acquisition of ERA with reservations, as did many of the engineers and managers of ERA. Remington Rand (and Eckert-Mauchly Computer Corporation which it had acquired in 1950) focused on commercial machines, while ERA had specialized in research and development and customized systems for the military and intelligence

communities. When Remington Rand executives visited shortly after the acquisition of ERA, they could not even inspect Atlas II operations due to lack of clearances. Only with reluctance was the UNIVAC 1103 authorized as a product due to the perceived overlap it might have with the UNIVAC I. The changing environment, and Erwin and Adelle's frustration with harsh Minneapolis winters and weather-related illnesses of their two young daughters, led Erwin to seek out possibilities in Southern California. In 1953 the Tomash family moved to Los Angeles, and Erwin successfully ran Remington Rand Electronic Computer Department sales office at 2601 Wilshire Boulevard for the next three years. Soon after arriving, he sold 1103 model computers to Convair, Boeing, Lockheed, and White Sands.

The 1955 merger with Sperry brought organizational upheaval to the combined firm. Shortly after the merger, William Norris was put in charge of the new Sperry-Univac (combined ERA and Eckert-Mauchly) computer division. At Norris's request, Erwin moved to the New York office and Norris proposed he become the sales manager for Sperry-Univac. Tomash was closely aligned with Norris, who was caught in a power struggle and, despite his title, had limited authority and was contested at every turn by the old line Remington Rand management. Ultimately this was the seed for Norris later deciding to leave to lead Control Data. The situation also led Erwin to leave Sperry Rand.

The rest of the Tomash family had stayed in Los Angeles during Erwin's year in New York. On a flight back to Los Angeles a chance encounter with a Telemeter Magnetics executive, George Brown, led Erwin to examine (in January 1956) and soon sign on as vice president of marketing with Telemeter Magnetics, a young Los Angeles firm that had launched pay televisions—coin set-top boxes using coaxial cable for transmitting signals—and was transitioning to focus on the computer memory business.

In 1953 International Telemeter (the company's original name) was launched, and it soon had wired the city of Palm Springs, California as a test-bed, and in many respects created a form of the first cable TV and pay-per-view systems. Having hired a first rate technical staff, International Telemeter sought contracts to boost technical capabilities that aided the set-tops, and also to expand into other revenue generating areas. They bid on computer projects for Livermore's LARC and a National Bureau of Standards' computer. The memory business quickly became the firm's focus, and in 1955, the company was renamed Telemeter Magnetics.

Six months after Erwin joined the firm, infighting between the firm's top leaders, Louis Novins and William Squires, led Novins to ask Erwin to sign on as the new president of Telemeter Magnetics, which by that time concentrated on producing and selling "boxes of memory" and memory cores. The first major order came from GE on the famed Electronic Recording Machine Accounting (ERMA) project—where Telemeter Magnetics won a subcontract to supply hybrid vacuum tube and transistorized memory systems. Following this, Telemeter Magnetics, which was 80 percent owned by Paramount, produced wholly transistorized devices. Most customers were original equipment manufacturers, including Sperry-Univac, Burroughs, and Collins Radio. Erwin asked Paramount to inject $1 million for expansion and received just $200,000, teaching him to grow cautiously and carefully manage cash flow. In late 1960 the pioneering magnetic tape firm Ampex acquired Telemeter Magnetics and as the

integration unfolded in 1961, Erwin, currently a vice president, was offered the role of heading Ampex's marketing operation, a job at the headquarters in Redwood City, California. Erwin saw Ampex was having some severe difficulties with their technology and operations, and did not want move his family to Redwood City. Further, he wanted to free himself from the vulnerabilities of being a salaried manager. He decided he wanted to launch a new company, or acquire a struggling company to turn around. He soon quit Ampex.

In 1961 Willis Drake, Erwin's old friend from ERA, communicated the challenges of a company he was at—Telex—and specifically, a problematic disk file project they had going in St. Paul. Telex was a hearing aid and phonograph company that had recently started a Data Systems Division. This division consisted of the roughly 25 staff members in St. Paul working on the disk file project for General Electric, a project that had been struggling for more than a year and had failed to deliver. Most of the St. Paul team had come from ERA/Remington Rand/Sperry-Univac. The division also consisted of ten or so employees in Detroit working on a low-end printer project. Erwin was interested in partnering to acquire the division if it could be completely independent from Telex. Lehman Brothers had initially agreed to invest $3 million to help make this happen, but this fell through and Erwin and minority investors put in approximately $250,000, while Bank of America, Continental Capital, and Greater Washington Industrial Investments each put in roughly equal amounts to get to $1.5 million. This bought approximately a 25 percent stake, while Telex shareholders received 75 percent out of the spin-off. With this, in early 1962, Data Products Corporation was born as a public company with Erwin as Chief Executive Officer. Shortly after founding the firm, Erwin changed the name to one word—Dataproducts. Other key figures at the start of Dataproducts Corporation included William Mozena (finance), Russ Dubois (marketing), Howard Rose (manufacturing), Graham Tyson (operations), Ray Stuart-Williams, Cliff Helms, and Irv Wieselman.

Erwin set up the headquarters of Dataproducts in a modest facility in Culver City, California. Around the same time as this deal, Erwin partnered with Walter Bauer and several others who were leaving Ramo-Wooldridge, a division of TRW, to start a computer services company but were having trouble raising capital. Bauer's enterprise became a wholly-owned subsidiary of Dataproducts: Informatics General Corporation. Bauer served as president of Informatics General (commonly referred to as just Informatics), with co-founders Werner Frank, Richard Hill, and Frank Wagner as part of the leadership team. Erwin's insight in recognizing the importance of the young computer services field, and suggesting and executing this partnership, proved highly lucrative for Dataproducts over the next half dozen years.

With Erwin as CEO, Dataproducts soon turned around the challenging disk file project for General Electric, and supplied similar disk file products to RCA, Ferranti, and ICT/ICL, as well as to several Japanese firms. The disk file operation remained in St. Paul for a half decade before being moved out to Southern California with the rest of Dataproducts. The revenue from the disk file business in the first few years facilitated both the expansion of the printer business as well as investment in Informatics.

Over time, Informatics General developed an impressive client base that included government departments and agencies, government contractors, many major

corporations, and other organizations in the U.S. and overseas. Besides providing programming services and systems integration to clients, Informatics soon added a software products business. In 1964 Informatics acquired the Advanced Information Systems Division of Hughes Dynamics (part of Howard Hughes' Hughes Aircraft). Hughes Dynamics AIS file management package evolved through several iterations into the Informatics MARK IV file management system. MARK IV, which was the first software product to achieve $10 million, $50 million, and $100 million in revenue, helped give birth to and define the dynamic and fast growing software products industry. Between 1966 and 1970 Erwin orchestrated Dataproducts divestiture in Informatics, resulting in roughly a $20 million dollar return on a small initial investment (less than $500,000) as Informatics went public in the late 1960s.

Dataproducts printer business took longer to get off the ground. Erwin believed the Detroit group lacked competency and were not making progress on a low cost ($5,000) printer, despite having effectively secured some orders. Erwin shut down the Detroit operation and restarted with more experienced engineers out in California. He felt the basic idea for the hammer actuator printer was solid, just that the execution had been poor at the Detroit facility. He put Clifford Helms in charge of the printer development group in California, which resulted in producing a much better design. Erwin recalled that it took roughly 18 months before they had the electronics in good order and the styling set for the printer, but then it was a "work of beauty." The early target market was limited primarily to the mainframe giants. The chief competitor was an established firm called Analex (headquartered in Boston), which had what little business there was in the young field of high-speed printers in the early 1960s when Dataproducts began. By mid-decade Dataproducts had a superior printer on the market and soon sold to Scientific Data Systems and to Digital Equipment Corporation; the latter became the firm's largest customer for printers. Unlike Analex's printers, Dataproducts printers only required monthly maintenance. Dataproducts aggressively and effectively marketed to Honeywell, Burroughs, Sperry-Univac, RCA, General Electric and others, and their printer business began to prosper. Dataproducts sold printers for roughly $15,000, significantly less than Analex had before the arrival of Dataproducts. Analex was forced to drastically slash their prices to retain business, which sent it into bankruptcy before it was acquired by Mohawk.

In addition to Dataproducts highly successful printer business, it added new product lines. This included getting into the core memory business in 1966, which Erwin had had extensive experience with from his Telemeter Magnetics and Ampex days. Dataproducts' core memory business was set up in Dublin, Ireland, to take advantage of European markets, cheaper labor, and government grants. Ultimately Dataproducts secured roughly one-third of the available core memory market throughout Europe. Dataproducts continued international expansion, opening up a core memory plant in Hong Kong as well as taking over one in the United States from Fairchild. By the early 1970s, Dataproducts, a dominant player in printers and substantial participant in the domestic and international core memory market, had moved to a much larger facility in Woodland Hills, California.

Dataproducts ground breaking for new headquarters in Woodland Hills, CA.

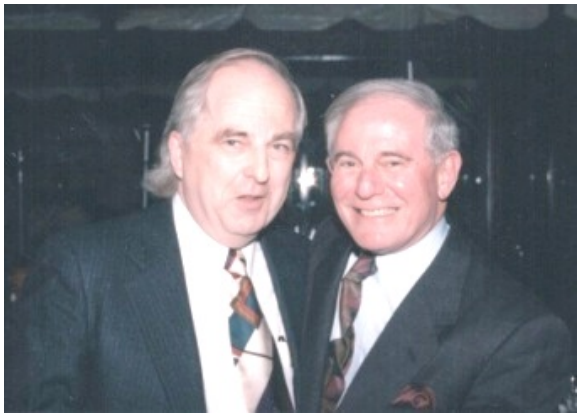
In the mid-1970s Dataproducts began to phase out of the core memory business (a surprisingly resilient business that, as Erwin joked, had been in its last five years from its beginnings), but it remained a leading player of computer printers for more than a decade, through a number of successive technologies, until it was acquired by Hitachi Kiki Co., Ltd. in 1990. The Dataproducts brand continued to be used by Hitachi until 2000.

In 1971, after navigating Dataproducts successfully through many technical and managerial challenges, Erwin resigned as CEO, and Graham Tyson stepped in to lead Dataproducts. Erwin continued to stay active with the leadership of Dataproducts for another decade and a half, but by the mid-1970s he pulled back from the extremely long work days dedicated to Dataproducts to also enjoy other pursuits—most notably creating an infrastructure for computer history.

Erwin not only achieved tremendous success in many roles (as engineer, sales manager, marketing manager, entrepreneur, and chief executive officer) and technologies (mainframe computers, core memory, computer services, software products, and printers) in the computer industry, he also interacted and developed life-long friendships with many other computer and software pioneers. In the mid-1970s he reflected on the industry to which he had contributed and witnessed so much. He had seen computers grow from being primarily tools for Big Science to data processing systems used throughout society for an ever greater scale and scope of applications. With his interest in history that dated back to childhood, he became increasingly interested in the history of computing technology and the IT industry. Up to that time few practitioners and virtually no scholars had engaged in researching and writing this history. Further, very few public source materials existed on the topic to conduct research.

Erwin considered the possibility of formally studying the history of technology and engaging in writing historical studies, as well as other ways he might have an impact on the history of computing. He spoke with a number of the leading figures in the history of science and technology, including the Smithsonian's Robert Multhauf, as well as leaders in the archives community. He joined and attended annual meetings of the Society for the History of Technology and the History of Science Society. With these encounters with scholars, curators, and archivists he was advised that establishing an academic research center and archives would likely have the greatest impact. This was the genesis of Erwin and Adelle's founding the International Charles Babbage Society in Palo Alto in 1978. In working with a number of computing pioneers, Erwin and Adelle planned for two organizations to evolve from this "Society" in the near future. The first, an advisory and fundraising group, which became the Charles Babbage Foundation, the second, a computer history research center and archives to be housed at a selected university, the Charles Babbage Institute.

Erwin headed the board of directors of the Charles Babbage Foundation, and Adelle served as the secretary and treasurer of the Foundation in its early years. Erwin's contacts and respect in industry and academe resulted in several dozen leaders from the computer and software industries, and some of the top computer scientists in the world, serving as Charles Babbage Foundation Trustees, with a fraction of these individuals also serving as members of the decision-making CBF board.



Arthur L. Norberg and Erwin Tomash

In 1979 Erwin asked CBF board member Walter Bauer to serve as chair of a site selection committee for the Charles Babbage Institute. Thirty-nine leading universities were considered, with the University of Minnesota and the University of Michigan as the two finalists. The University of Minnesota application stood out for having an established history of science and technology doctoral program (where the CBI director would also serve as a faculty member), coupled with provision for dedicated archival storage space in a special collections library facility. In 1980 the University of Minnesota was selected and the following year Dr. Arthur L. Norberg was hired as the Charles Babbage Institute's first permanent director. The Institute, a partnership of the University of Minnesota's College of Science and Engineering (then called the Institute of Technology) and University Libraries, is a place where professional historians and archivists work together to conduct and facilitate research in computer history and maintain and curate a world-class archives.

From the beginning Erwin and Adelle also established a fellowship for doctoral students conducting dissertation research on the history of computing. A CBI/Tomash Fellowship has been given to a leading graduate student studying computer history each year for more than three decades, and Erwin and Adelle have endowed the fellowship as a permanent program of CBI. This highly competitive Tomash Fellowship program has

supported the work of many of the leading scholars in the history of computing. Revised dissertations of Tomash Fellows are among the most renowned books in the history of computing, including: Paul Ceruzzi's *Reckoners: The Prehistory of the Digital Computer, From Relays to the Stored Program Concept, 1934-1945* (Greenwood, 1983), William Aspray's *John Von Neumann and the Origins of Modern Computing* (MIT Press, 1990), Frederik Nebeker's *Calculating the Weather: Meteorology in the 20th Century* (Academic Press, 1995), Janet Abbate's *Inventing the Internet* (MIT Press, 1999), Leslie Berlin's *The Man Behind the Microchip: Robert Noyce and the Invention of Silicon Valley* (Oxford University Press, 2006), Christophe Lécuyer's *Making Silicon Valley: Innovation and Growth of High Tech, 1930-1970* (MIT Press, 2007), Atsushi Akera's *Calculating a Natural World: Scientists, Engineers, and Computers During the Rise of US Cold War Research* (MIT Press, 2008), Nathan Ensmenger's *The Computer Boys Take Over: Computers, Programmers, and the Politics of Technical Expertise* (MIT Press, 2010), Eden Medina's *Cybernetic Revolutionaries: Technology and Politics in Allende's Chile* (MIT Press, 2011), and Anthony Gandy's *The Early Computer Industry: Limitations of Scale and Scope* (Palgrave Macmillan, 2012). Lécuyer's, Akera's, and Medina's books have recently won major awards. And recent Tomash Fellows are adding to this impressive list with new path breaking books with each passing year. Other Tomash Fellows have published seminal articles from their dissertation research.

Erwin, working with Arthur Norberg, also established oral history as a foundational and continuing program at CBI. This, too, is a three-decade old and continuing activity of the Institute. CBI now holds more than 400 research-grade oral histories of computer and software pioneers from industry and academe. Most of these oral histories were conducted by CBI historians as part of sponsored research projects. Erwin also conducted a handful of CBI oral histories with his computer industry peers, including the leader of the British computer giant ICT/ICL, Sir Arthur Humphreys.

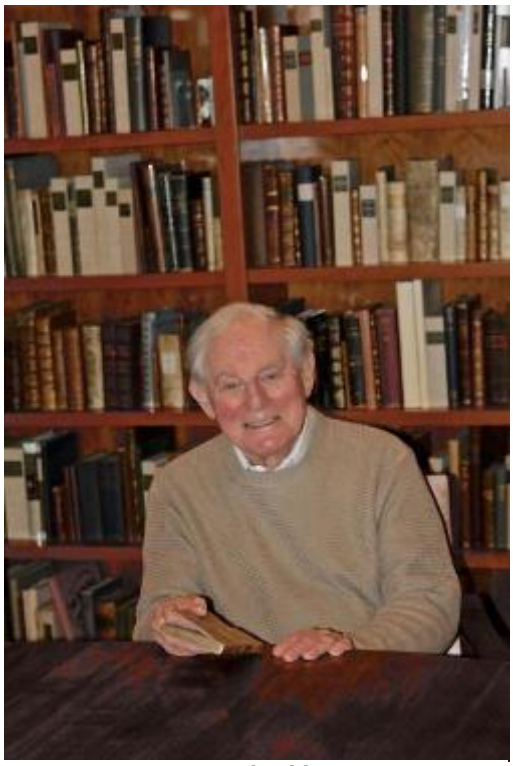
From the beginning, Erwin envisioned an institute active in research on computer history, as well as archival practices. Since its founding, CBI historians have led major research projects funded by the National Science Foundation, Defense Advanced Research Projects Agency, National Endowment for the Humanities, International Business Machines, and other funders. Research projects have been conducted on such important topics as the origins of academic computer centers, the computer industry, software history, the history of IBM Rochester, the history of NSF FastLane, and the history of computer security. Major research projects by CBI archivists on the CBI archives and archival methodology have been funded by the Society of American Archivists and the National Historical Publication and Records Commission. These include projects on collecting archives of high technology companies, and documentation strategies and practices.

Central to Erwin's original goals was that CBI would become a major computer and software history archives repository for historians, computer scientists, social scientists, students, and others interested in conducting research on computer and software history. Over the years CBI's talented archivists have built a highly diverse and expertly selected set of materials. CBI's more than 200 collections include major corporate collections (Burroughs Corporate Records, Control Data Corporation Records), trade organization records (ADAPSO, IBM SHARE), professional organization records (DPMA, ACM), and the papers of prominent computer scientists/computer professionals and industry

pioneers (Edmund Berkeley, Margaret Fox, Carl Machover, Alan Perlis, and Willis Ware). In 2000 CBI moved to its state-of-the-art facilities in Andersen Library, where scholars come from around the world to use CBI resources.

Erwin's interest in computing and computational history also led to his developing a passion for book collecting beginning in the late 1970s. Having contributed to the research of one classic book, *High Speed Computing Devices*, he began to visit Los Angeles book dealers to inquire about other works on computing and computation. He soon met a rare book dealer, Jonathan Hill, who lent him a copy of a book (to let him decide if he wanted to buy it) in which John Napier described his calculating "bones." Erwin was struck by the kindness, generosity, and trusting nature of this dealer—and quickly found this was common in the rare book world. Erwin soon decided to purchase the book, which was valued at $3,000 at the time. Over the next three decades he expanded his collection to include more than 2,600 books on pre-computer computation and mathematics, as well as a supporting collection of roughly 2,000 books on computers and software. The latter he donated in 2009 to the Charles Babbage Institute. The earliest book in the Tomash collection dates back to the twelfth century, with more than a dozen from the fifteenth century, and hundreds from the sixteenth and seventeenth centuries. Among the many treasures are Albert of Saxony's *Explicit tractatus proportionum* (1476), Galileo Galilei's *Difesa di Galileo Galilei* (1607), and Johannes Kepler's *Nova stereometria* (1615). Erwin partnered with computer historian Michael Williams in developing an annotated, illustrated catalog of this unparalleled collection of early works on computation and mathematics. A digital version of this masterful reference work is available on the CBI website at http://www.cbi.umn.edu/hostedpublications/Tomash/index.htm.

In the early-to-mid 1980s Erwin's passion for books also led him to launch Tomash Publishers, a partnership with MIT Press that led to the Tomash/CBI reprint series. Early classic, difficult to obtain works (books, manuals, and proceedings) in computer history, mostly from the 1940s and 1950s, were reprinted as attractive hardbound volumes with introductions written by leading computer historians such as William Aspray, Martin Campbell-Kelly, Peggy Kidwell, and Michael Williams. Among the sixteen titles in this series are Wallace J. Eckert's *Punched Card Methods for Scientific Computation* (1940, republished in 1984), The Harvard Computational Laboratory's *Proceedings of a Symposium on Large-Scale Digital Calculating Machinery* (1947, republished in 1985), and *The Moore School Lectures* (1946, republished in 1985). This influential project Erwin envisioned, managed, and subsidized brought well-selected classics to the hands of a quickly emerging field of computer historians and countless other interested individuals.



Erwin in his library
Photo courtesy of Tomash family

The unparalleled CBI archives, the past and present research of CBI staff and Tomash Fellows, and the Tomash/CBI Reprint Series are among the legacies Erwin and Adelle left to computer history. For Erwin's great insight to see the possibilities for computer history when few did, and his dedication, generosity, and vision to create and support a permanent infrastructure for our field to prosper, our memories of Erwin will always be deeply treasured and our gratitude beyond measure.

Erwin is survived by his wife, Adelle, two daughters, Barbara Tomash and Judith Diffenbaugh, three grandsons, and five great grandchildren.

Jeffrey R. Yost

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Cortada named CBI Senior Research Fellow

The Charles Babbage Institute is pleased to welcome James W. "Jim" Cortada to a new position as Senior Research Fellow. On December 31, 2012, Jim retired after nearly four decades working in a variety of positions at IBM, most recently as a consultant at the IBM Institute for Business Value in Madison, Wisconsin.

Readers of this newsletter will be familiar with Jim as prolific author in our field. In 2004-8 he published a major three-volume study with Oxford University Press, entitled *The Digital Hand*, which examined the experiences of nearly three dozen American industries with information technology. The study ranges across manufacturing, transportation, and retail industries (volume 1); financial, telecommunications, media, and entertainment industries (volume 2); and public sector industries such as federal, state, and local governments as well as K-12 and higher education (volume 3). Jim's detailed research files for *The Digital Hand* are available at CBI, and many researchers have found these an essential first stop. He also published in MIT's Essential Knowledge series a concise treatment of *Information and the Modern Corporation* (2011) and the lively *History Hunting: A Guide for Fellow Adventurers* (M.E. Sharpe 2012).

And did I mention that Jim, a PhD in European history, has a side career in Spanish and diplomatic history including such works as *Historical Dictionary of the Spanish Civil War, 1936-1939* (Greenwood 1982), *Spain in the Nineteenth-Century World: Essays on Spanish Diplomacy, 1789-1898* (Praeger 1994), *Modern Warfare in Spain: American Military Observations on the Spanish Civil War, 1936-1939* (Potomac Books 2011). He has been active in the IEEE Computer Society, the American Historical Association, and the IT History Society.

Jim's most recent book for Oxford University Press is *The Digital Flood: The Diffusion of Information Technology Across the U.S., Europe, and Asia* (2012). It is a pioneering global history of information technology, which will hopefully spur additional research in our field. Jim drew on his extensive IBM networks as well as reports from the World Bank and other NGOs. His research for this wide-ranging volume, with detailed case studies of 14 countries including entirely fresh treatments of India and China, among others, has kept booksellers around the world happily busy. As one of his dust-jacket blurbs notes, "The 333 information-packed footnotes on China and India alone make this a must-own volume."

In the still of a Minnesota winter, we moved quickly to have Jim begin his new position on 1 January 2013. We are looking forward to collaborations with Jim in publishing and research. He is leading an effort to gain a wider audience for computer history. For instance, computer history is gaining prominence in *Technology and Culture (T&C)*, the leading history of technology journal. In the Fall 2012 issue was Nathan Ensmenger's essay on "The Digital Construction of Technology: Rethinking the History of Computers in Society." And in the Spring 2013 issue of *T&C* you will find Jim's essay provisionally

titled, “How New Technologies Diffuse Around the World: Lessons from Information Technologies, 1940-2010.” CBI is pleased to facilitate Jim’s ongoing research in the history of information technology, and we hope to draw on his wide-ranging professional, scholarly, and publishing experiences in further developing our field.

Please direct email to Jim at his new address <jcortada@umn.edu>.

Thomas J. Misa

Rankin is Awarded Tomash Fellowship

Joy Marie Lisi Rankin, a doctoral candidate in History at Yale University, is the Charles Babbage Institute’s 2013-2014 Adelle and Erwin Tomash Fellow. Ms. Rankin has an AB from Dartmouth College, and a MA in Liberal Studies from Duke University. She has presented at the History of Science Society, at a number of other prestigious conferences, and has received numerous honors, including the 2012-2013 IEEE Life Members’ Fellowship in History and the Yale University Sheffield Scholarship.

In her dissertation, “Personal Computing before Personal Computers,” Rankin argues that students and educators created personal computing as a set of behaviors, practices, and techniques on academic time-sharing systems during the 1960s and 1970s, namely, the Dartmouth Time-Sharing System, the University of Illinois PLATO System, and several education-centered projects across the state of Minnesota, including the Minnesota Educational Computing Consortium (MECC). The users of these systems popularized the now-ubiquitous activity of sitting in front of a keyboard, typing, and responding to messages appearing on a text-oriented display, and they fostered communities of computing enthusiasts. Rankin employs the phrase “personal computing” not to suggest that time-sharing was merely a step along the way in the development of personal computers; instead, one goal of her project is to recover the deep and multifaceted history of time-sharing on its own terms, rather than as a forerunner to personal computers. Rankin’s dissertation draws attention to the important but little studied area of the history of technology in education. In the case of interactive computing, students and educators were some of the earliest groups of users, and they developed complex systems around time-sharing. Viewed in this light, the classroom becomes a rich site of inquiry, where students, educators, parents, corporations, devices, and hopes and fears about education and computing all meet.

Jeffrey R. Yost

CBI: Glimpses of the Founding, Part 2

In the Fall 2012 *CBI Newsletter*, I began an exploration of CBI's formative years. In that issue I provided some background to CBI's history, from its founding to the selection of the University of Minnesota as its permanent home in 1980. I supplemented the accounts published in *IEEE Annals of the History of Computing*, and in oral histories with Erwin Tomash and Arthur Norberg, with an examination of the archival records of the site-selection process. What especially struck me was the careful attention to conducting a nation-wide search for a university home for CBI. There was thoughtful planning that resulted in publicity in the trade journal *Computerworld*, a draft list of no fewer than 39 universities, and a detailed 25-page invitation for proposals sent out to the likely prospects. A dozen universities submitted full bids, and of the two finalists that received site visits from the high-profile CBI search committee, the upshot was that Minnesota won the competition.

It turned out that Minnesota's winning bid was only the start. There were months of negotiations to solidify the details of the CBI-Minnesota relationship. One thing is clear: both Minnesota, in the person of historian Roger Stuewer, and CBI, in the persons of Walter Bauer, Paul Armer, and Erwin Tomash, really wanted the relationship to be a successful one and to get the venture off the ground. They did so, quite famously, and a new phase of CBI began with the arrival of Arthur Norberg in the fall of 1981 as the first permanent director of CBI. In this article, I'll examine this transition period with an eye toward "lessons learned" in setting up a novel history enterprise. Who knows, it's just possible that, somewhere along the line, the CBI model might serve as a nucleus for another venture?

In 1980 there was a surprising amount of interest in computer history, which you can sample in Paul Armer's correspondence. He was a former Rand Corporation computer scientist, who had been working with Tomash for two years to launch the venture. He was an ideal clearinghouse. He heard word that Sperry Univac staff had written a 300-page book on their company, which also triggered a missive from none other than John Mauchly, who noted, somewhat telegraphically, "keep me posted on what you and Babbage are doing, please." Another early letter of support came in from Gwen Bell, director of the Digital Computer Museum in Marlborough, Massachusetts (an early incarnation of today's Computer History Museum). Frustrated with the existing state of the art, she noted that "the history of computing needs sorting out . . . I really applaud the CBI scholar program to give aid to people who will work in depth."

Board of Trustees Meeting Fall 1980

CBI itself was significant news in the early summer of 1980. CBI was moving from its location in Palo Alto, California, to the University of Minnesota, where Roger Stuewer would become its acting director. Roger had been the driving force behind Minnesota's bid, as my fall 2012 newsletter article described in some detail. A splashy press release sent out to the computing and history communities served as an announcement as well as a mission statement: the primary mission of CBI was "to study the history of information processing—its technical and socioeconomic aspects—and to promote increased awareness of the impact of the computing and information revolution on society." To do so, it would take up the archiving of records, the conducting of oral histories, and the promotion of these materials through wide-ranging research, teaching, and outreach activities.

"History of Computers Is Institute's Bailiwick," was the resulting headline for a full-page illustrated article published in the *San Francisco Business Journal* on June 16th. Paul Armer, the Institute's voice in California, noted several "very good reasons" to award fellowships to graduate students doing research in computing history, among them, to ensure "there are professors out there who know the field." At that time CBI was supporting William Aspray and Paul Ceruzzi, who went on to distinguished careers in computer history. And accenting the international dimension, Armer noted that CBI had just completed a six-hour interview with Czech computing pioneer Antonin Svobada. Perhaps the most important resource that Armer noted was the "invisible college" created by the *CBI Newsletter* circulating to 4,000 people and organizations.

"The Charles Babbage Institute will provide an entirely new interface with business and industry in the state, region, and nation," stated acting director Stuewer, adding that "the

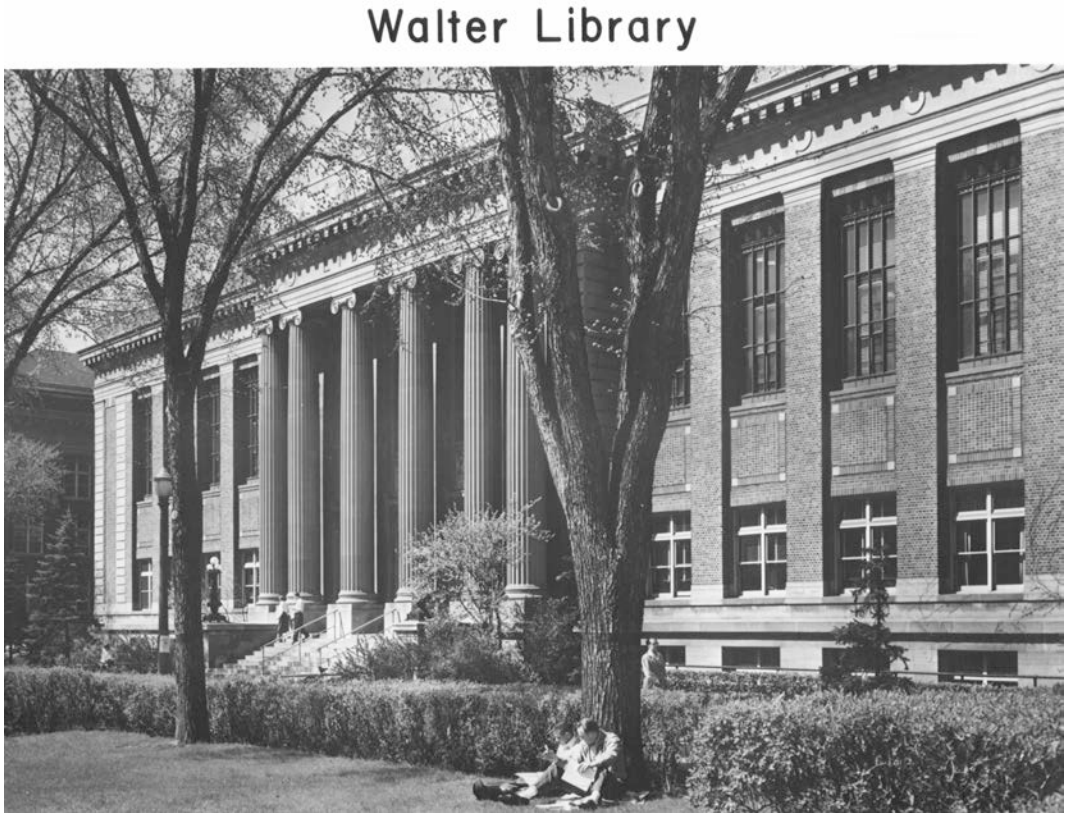
success of its program will depend on the involvement and contribution of many institutions and individuals around the world." In a bold gesture reported in the *Minneapolis Star* (14 July 1980) Stuewer suggested that "this will make the University [of Minnesota] the cultural center of the computing industry. We will be carrying out a teaching program, a research program, and visiting scholars will come to the university to conduct research."

Two thick folders of marked-up drafts detail the line-by-line negotiation that specified the administrative relationships between CBI and the University of Minnesota. Equally revealing is a seven-page vision statement that Roger Stuewer drafted in October 1980. In it, "The Plans and Programs of the Charles Babbage Institute," he spoke to an "entirely new opportunity" for historians to better understand the "information revolution from a broad technical-socioeconomic perspective." Roger then reviewed the remarkable history that led Erwin Tomash to found CBI.

Paul Armer, Al Hoagland, and Erwin Tomash signing AFIPS agreement 1980.

Roger noted that among Erwin's achievements were the assembling of a stellar board of trustees including such luminaries as William Baker of Bell Labs, James Birkenstock of IBM, and William Norris of Control Data. He and Paul Armer worked closely with the American Federation of Information Processing Societies (AFIPS), a consortium of 13 societies with a total membership of around a half million. AFIPS had just created *Annals of the History of Computing*, with the University of Michigan's Bernie Galler as its first editor, and AFIPS would handsomely support CBI in its early years, too.

As an aside we should note AFIPS had a very active history of computing committee that aimed to stir the pot; its leading figures were Jean Sammet and Daniel McCracken. CBI, already during its California years, was amassing an annual membership list and the two components—support for CBI and an annual subscription to *Annals*—were melded together. Contributors to today's CBI Friends program can easily recognize this formula for success.



This view of CBI's future home in Walter Library circulated along with the news of CBI's relocation to the University of Minnesota in 1980.

Stuewer and Armer spent months hammering out an agreement between CBI and the University of Minnesota. Roger, a historian of physics, struck an apt metaphor. "I felt at times that [Armer] and I were like the two electrons in a hydrogen molecule, oscillating back and forth around the two nuclei, trying, sometimes desperately, to hold them together in a stable configuration. It now appears . . . that the bond is a strong one." Indeed, beginning in November 1980 Paul Armer, who had been executive secretary of CBI in Palo Alto, relocated to continue this role in Minnesota. Space was being prepared for CBI in the handsomely appointed Walter Library.

Arthur Norberg, selected to be CBI's first permanent director, took up this position in the fall of 1981. Arthur was well known in the history community, having been at the Bancroft Library at Berkeley doing an oral history and archiving project and, more recently, at the National Science Foundation as a program officer. He was also an officer in the History of Science Society as was Roger Stuewer. Arthur would serve as CBI director during 1981-1993 and again during 1999-2006. His oral history in 2006, with Bill Aspray and Jeffrey Yost, respectively, former associate director of CBI and present associate director of CBI, looks back with insight and discernment. In a future edition, I'll have a closer look at these next formative years of the Charles Babbage Institute.

Thomas J. Misa

Archival sources for this article come from the Charles Babbage Institute Records (CBI 73), Charles Babbage Institute, University of Minnesota, Minneapolis.

News from the Archives

Books, Cataloging, Visibility, and Access

While CBI has long been known for the strength of its archival collections – the personal papers and organizational records of individuals and groups that have made profound advancements in computing – in recent years we have enhanced our holdings with the addition of several significant collections of books (including notable ones from the Tomash, Mahoney, Cortada, and Machover collections: see "News from the Archives," *CBI Newsletter* 31 no.2, Fall 2009). In order to provide access to new book collections in as timely a fashion as possible, we have employed archival finding aids – a detailed list that typically describes the structure and content of archival collections – in place of traditional book cataloging. Finding aids provide some great benefits to book collections. They provide a complete overview of a collection "at a glance" instead of one at a time as individual records in a catalog that might contain thousands and millions of titles. They can also provide biographies of the persons or histories of the organizations that formed the collections, describing the work that they did and providing critical contextual information regarding the formation of the collection. Yet, for these advantages they do not replace traditional catalog records, which can provide more detailed records about individual titles and which are shared nationally and globally through online "union catalogs" such as WorldCat. We are very excited to announce that the University Libraries have selected CBI's new, great book collections for a special initiative to expand the visibility and accessibility of these materials. Work began early in March and is expected to go for several months. We will provide an update of progress made in the next newsletter!

Sharing CBI's Resources with Broad Communities

As a collection dedicated to the history of computing and information technology, it is no surprise that CBI attracts a lot of historians of technology. Materials contained here, however, have appeal to a wide variety of audiences. The Control Data Corporation Records (CBI 80) contains correspondence, news clippings, and press releases that bring controversies and concerns of the Cold War to life. The Edmund C. Berkeley Papers (CBI 50) highlight significant global issues of the 20th century, including genocide and the specter of thermonuclear war. The Burroughs Corporation Records (CBI 90) contains nearly one hundred years of advertising samples, organized by year, that demonstrate both shifting and persistent corporate values. The still new "Social Issues in Computing Collection" of books, journals, pamphlets, "zines," and other print resources highlights the evolving hopes and fears sparked in the general populace and specific communities by the perceived promises and threats of the industry. The CBI Archives and Library staff has had opportunities in recent weeks to showcase these materials to groups as diverse as graduate students in Rhetoric and Writing Studies and to the Friends of the University of Minnesota Libraries and the Loft Literary Center. It is thrilling when people who thought that technological history was outside of their areas of expertise or interest realize that CBI can tell exciting stories of the profound impacts that the industry and its champions have made in the lives of real people and communities.

R. Arvid Nelsen

2013 Norberg Travel Grant Recipients

The Charles Babbage Institute awarded four Arthur L. Norberg Travel Grants for 2013. The recipients are Indiana University School of Informatics and Computing Associate Professor Nathan Ensmenger, Illinois Institute of Technology Humanities Department Assistant Professor Marie Hicks, CUNY Hunter College Film and Media Department Assistant Professor Carolyn Kane, and University of South Carolina History Department Associate Professor Joseph November.

Ensmenger will be visiting CBI to help research an article on the history of computer ethics, focusing on early abusers of computers. He plans to draw on the extensive computer crime files in the Donn B. Parker Papers. He hopes to publish this research in one of the leading computer science journals to give it the highest visibility to academic computer scientists and computer professionals.

Recognizing most of the (relatively limited) existing scholarship on women in computing has been on a few exceptional figures (such as Grace Murray Hopper), Hicks has designed a project to study "everyday women." Her goal is to trace the history of women's "own efforts to represent themselves and form active coalitions." She will be studying CBI's records of the Association for Women in Computing, and hopes to show that a continuum of gendered organizations has "shaped the history of computing and, as in many other professions, it has impacted the tenor, meaning, and outcomes of the work." Both Ensmenger and Hicks will also be using their research trip to gather primary sources on their topics for upcoming courses they are teaching.

Kane will be visiting CBI to research aspects of her forthcoming book *Chromatic Algorithms: Synthetic Color, Computer Art, Aesthetics After Code* (under contract with University of Chicago Press). Specifically she will draw on some of CBI's unparalleled computer graphics history materials (the Carl Machover Papers and SIGGRAPH Conference Publications) to "research the compression codes and algorithms developed from the late 1970s through the 1990s, engineered to reduced and make color graphics more efficient and 'user-friendly'."

November's recent monograph *Biomedical Computing: Digitizing Life in the United States* (Johns Hopkins 2012) broke new ground in tracing origins and analyzing key pioneers (such as Robert Ledley and Lee Lusted) in applying computers to medicine in the 1950s and 1960s. His follow on project that he will be visiting CBI to advance, is focused on "how computer use among life scientists and physicians went from what was essentially a fringe (though also elite) activity during the 1960s to something thousands of laboratories and clinics were engaged in by the late 1970s." He plans to draw on CBI's National Bureau of Standards Computer Literature Collection, Control Data Corporation Records, Auerbach Associate Market and Products Reports, and other collections for this research and to write an article or book chapter on the topic.

The Arthur L. Norberg Travel Grant Program is a fund created by donors in honor of the Charles Babbage Institute's founding director. To donate to this important fund to help scholars travel to use the CBI archives please visit our homepage or click here.

Jeffrey R. Yost

When Computers Were Amateur (Norberg Grant)

Editor's note: the following three articles are from 2012 Norberg Travel Grant recipients. They explore their research projects advanced by research trips to CBI in 2012.

It's increasingly easy for us to see the potential in amateur expertise, something that may have seemed oxymoronic even a few years ago. When we survey the many corporate-sponsored hack-a-thons, urban makerspaces, and do-it-yourself meet-up groups around the country, we see that amateurism is no longer defined by a lack (of skills, of resources, of professional credentials), but instead being defined by an abundance (of people, of community, of publicity).

As seemingly new as things like hackerspaces seem, the history of computing is rife with antecedents that can help us plot historical continuities throughout the 20th century. The Charles Babbage Institute holds the correspondences and ephemera of the Amateur Computer Society (donated by founder Stephen Barrat Gray). "Society" is actually a misleading name for the enterprise. It makes it sound like there were regular meetings, projects, and maybe a formal organizational board. In fact, its newsletter was the only thing that constituted the Amateur Computer Society. Membership in the Society meant little more than paying a few dollars each year and receiving the newsletter every few months, whenever the editor had enough content to send out the five or six pages of the new issue. But the seemingly meager constitution of this society is not to be scoffed at; in fact, the absence of more formal characteristics makes the Society all the more interesting. The newsletters were published from August *1966* until December 1976. And what was published in these newsletters should pique the interest of anyone who wonders how it is that computers have become something we carry around with us today, the things that we willingly share our memory with, in a brilliant realization of Alan Turing's original dream of uniting the human mind with the matter of the universe.

My project looks at these newsletters to examine the ways that the personal computer was imagined in the years before, and during, it became a household reality. Each newsletter focused primarily on updates on hobbyist projects around the world as well as questions, tips, and thought experiments from the loosely-diffused community. Locating the imagination around the personal computer is essential to understanding how amateurism can become a useful analytic in the history of computing; amateurism is so often about the fantasy, the spirit, or the dream of a project and less about the nuts and bolts of the machines themselves.

If it is true, as computer historian Michael Mahoney once said, that what makes the history of computing hard is that "it is not primarily about computers," we must locate the social and cultural actors that orbited around them. But more than that, I'd like to suggest, we must also locate the enthusiasm, the drive, and the excitement that made computers, in and of themselves, amateur.

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Pioneering Patents in the Computer Industry (Norberg Grant)

The Charles Babbage Institute's archival collection includes an overview and summary of United States patents obtained for information technology in the early years of the computer industry, the period prior to the mid-1970s. Review of that material provides useful insight into the evolution of computing and information technology in the United States.

Perhaps the most striking aspect of those early patents is the way in which they illustrate that before the mid-1970s the computer industry as we know it today did not really exist. Computing technology was widely used by that time; however, there were very few companies devoted to the development, manufacture or sale of computer equipment or software.

The pioneers of information technology patents were companies that integrated computational capability into specific applications. For example, Westinghouse was highly active in obtaining patents associated with technologies applied to computerization of power plant operations and the training of power plant staff. Major energy companies, such as Mobil Oil, Haliburton, and Chevron, patented a range of information technologies applied to the automation of the oil and natural gas exploration and production processes.

Some of the leading computer patent pioneers were companies that we no longer consider to be part of the information technology sector. For instance, the Singer Company, a business many associate with sewing machines, was one of the most active pioneers patenting a range of computing technologies, including those integrated into modeling and simulation applications. The Wurlitzer Company, a business known for its involvement in music, patented diverse information technology including computerized systems for controlling vending machine operations.

Major manufacturing companies were pioneers in computer technology patents. Ford, Boeing, Corning, and General Motors, for example, patented technologies to automate systems in their products, as well as the product design and manufacturing processes.

One of the more interesting illustrations of how the patents reflect the evolving information technology sector environment is provided by Pitney Bowes. The company established a significant portfolio of computer patents associated with its core business of postage meter equipment. It later extended its patents into a broader range of information technology associated with measurement devices. Ultimately, the rise of the Internet and global information technology networks began to undermine the company's original core business of postage meter products. Pitney Bowes established an extensive information technology patent collection as computing technologies, in general, threatened the company's original business.

Consumer electronics companies actively pursued patents in the early computer age. Companies including RCA, Casio, and Sharp obtained patents for information technology associated with their products, in an effort to enhance the capabilities of those products.

Information technology patent pioneers included companies that evolved into key computer industry participants, such as Hewlett-Packard and IBM. However, they also included companies that became successful but did not develop into dominant players in the information technology sector, such as National Cash Register and Xerox. The story of how information technology inventions pioneered by Xerox would ultimately form an important part of the technical foundation at the core of the success of companies such as Apple is well known.

Some of the early information technology patents anticipated dynamic new fields which would eventually blossom and prosper as computer technology advanced. When the Walt Disney Company patented early versions of digital animation technologies and methods in the early 1970s, few had the vision to recognize the ways in which computer technology would dramatically alter the entertainment industry.

Early computer industry patents highlighted inventors who would ultimately develop into major luminaries in the information technology world. For example, in the 1970s, Steve Wozniak invented data storage technology patented by Apple. Seymour Cray was one of the inventors of computer time-sharing technology patented in 1964 by Control Data Corporation, years before he founded his own innovative computer company.

Review of the pioneering information technology patents helps us to recognize that the roots of computerization extend back many decades, a period of time far longer than we often appreciate. For example, as we work today to make the health care process more effective and efficient, it is worth noting that a computer-based system to access patient medical records and information was patented by Searle Medidata in 1968. When we make our travel arrangements quickly and easily online we should reflect on the fact that a computerized system to support travel reservations was patented by The Teleregister Corporation in 1953.

Today, the patent environment in the information technology sector is complex and hectic. It is a highly specialized world, dominated by inventors and enterprises focusing on the hardware and software of the advanced computing age. In this setting, it is helpful to look back at the early days of the computer industry, as reflected by the pioneering patents.

In those early days, great emphasis was placed on the utility of the new technology. The early information technology patents illustrate the close connections, in that era, between the technology and its intended useful applications. Information technology was, at that time, valued for its ability to meet important user needs, not for its technical complexity or sophistication. As our computer technology grows increasingly advanced, we would do well to make special efforts to ensure that the connection between technology and useful applications is neither lost nor diluted.

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Origins of Computer Networks in History and Literature (Norberg Grant)

I came to CBI because of the mail. I study the ways in which the literature of the 1960s and 1970s negotiates the computer and especially the network, which emerges with the ARPANET in this same period. I was thrilled to receive CBI's Norberg Travel Grant; the grant enabled me to spend two weeks exploring the origins of the computer network in the correspondence, memoranda, and conference proceedings of the scientists and engineers who had actually theorized and built it. My work argues that the 1960s must be seen as the decade in which the network emerges as an object of scientific study, a conceptual model for both constructing and revealing social connection, and a potent image—also sometimes a source of paranoia—for the degree of interconnections between persons, disciplines, industries, and organizations. The network even connects distant historical periods, which is how I started thinking about the mail.

Thomas Pynchon's 1965 novel *The Crying of Lot 49* uses a mail network, a shadow postal system, to investigate the beginnings of the computer network and to consider what the consequences of such a network, as part of a media system, might be. I discovered at CBI that the postal system had been linked to computer networks since Charles Babbage himself reformed the Royal Mail using sorting and routing algorithms, a practice which all subsequent packet-switched networks followed.

Paul Baran, an inventor of the packet switching technology on which the ARPANET and the internet depend, had described this technology by means of a "postal analogy." This description is in volume seven of an eleven-volume Rand Corporation memorandum held in its entirety by CBI. Baran described his proposed network thus: "The switching process in any store-and-forward system is analogous to a postman sorting mail. A postman sits at each switching node. Messages arrive simultaneously from all links. The postman records bulletins describing the traffic loading status for each of the outgoing links. With proper status information, the postman is able to determine the best direction to send out any letters. So far, this mechanism is general and applicable to all store-and-forward communication systems."

This description bears an uncanny resemblance to the ways in which *The Crying of Lot 49* describes its secret mail network. At CBI, I discovered that at the same time Baran was developing the plans for distributed networked communication Pynchon was writing a novel about distributed networked communication. Because of the research I was able to undertake at CBI, Pynchon's themes, such as the galaxy, the postal system, the network, and the computer, began to seem much less esoteric and prescient. Instead, I demonstrate that they are scientifically accurate and current. Lawrence Roberts, also among the ARPANET's creators, recalls, "Packet switching technology was not really an invention, but a reapplication of the basic dynamic-allocation techniques used for over a century by the mail."

As often happens in archives, I went in looking for some specific materials, such as Baran's Rand memo, and came out with a wealth of resources for my current, as well as

future, projects. In the mimeographed records of Rand's annual symposium on computing, for the year 1965, I made another discovery: a group of conference attendees including Joseph Weizenbaum and A.G. Oettinger discuss historian Richard Hofstadter's essay, "The Paranoid Style in American Politics." "There now seem to be people who view the computer both as a tool and claim that the computer scientist wants to take over the world," Weizenbaum comments.

Over several pages of transcript, the men in attendance identify, and complain about, the various types of paranoia and prejudice they encounter from the public, and the judgment of a group they identify with "an intellectual anti-intellectualism." This condition "is a reflection of the alienation of the humanist and the liberally educated." For me, a liberally-educated humanist, this discussion represented an extraordinary archival find, not only because this group took up the question of what separated the "two cultures" of literature and science, but also because they used the same terms and described the same conditions identified by Hofstadter and Pynchon. So although they complain about "English Major types," their discussion helps prove my thesis, that the literature of the sixties and seventies is thinking about computers, and that computer scientists are thinking about the effects of their work for culture, broadly considered. For me, CBI's collection houses a vital zone of exchange for concepts, ideas, and forms that not only shape scientific progress, but enable the negotiations that take place across disciplines and across centuries.

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Computer Security History Workshop Call For Papers

SRI International scientist and noted computer security pioneer Peter Neumann was quoted last year in the *New York Time's* article "Killing the Computer to Save It," that he has "…been tilting at the same windmills for 40 years and…[he]…get[s] the impression that most of the folks who are responsible don't want to hear about complexity. They are interested in quick and dirty solutions." Neumann is now heading a major DARPA effort to select the very best computer security ideas from the past to better address today's challenges. Many computer security pioneers emphasize that most of the potentially useful (and often ignored) solutions to the nation and world's many computer security challenges have fruitful seeds in the more distant past (and that today's problems often resulted from yesterday's choices in structuring computing and networking).

The Charles Babbage Institute (CBI) is currently engaged in a three year National Science Foundation-sponsored project "Building an Infrastructure for Computer Security History." The project consists of conducting oral histories, creating a computer security wiki, and collecting and making available archival resources to document computer security's past. In conjunction with this project, CBI is hosting a workshop on computer security history on July 11 and 12, 2014 and is seeking paper proposals for the event. Preliminary plans have been laid to publish many of the revised papers from the workshop in a 2015 *IEEE Annals of the History of Computing* special issue on computer security.

All papers must be historical studies—ranging from the technical, scientific, political, legal, social, and cultural history of computer security (contemporary analyses of current issues will not be considered). Potential topics include, but are not limited to the history of pioneering work funded by the military; Bell-LaPadula, Biba, Clark-Wilson and other computer security models; TCSEC/The Orange Book/Rainbow Series; public key encryption/PKI; computer crime/criminal justice; hacking and hackers; intrusion detection; computer security companies; and the computer security industry. Preference will be given for papers on U.S. topics between the mid-1960s and the advent of the Web in the early 1990s.

Requirements and logistics

To be considered for workshop participation, authors should send a 500-750 word abstract detailing their proposed paper, which includes discussion of the key sources for the study. Authors must also submit a 2-page curriculum vitae. **Applications should be sent to cbi@umn.edu as PDF documents no later than Friday September 13, 2013**. For accepted proposals, full papers (6000 to 8000 words including footnotes) must be submitted for pre-circulation to the workshop's participants by June 15, 2014. Travel assistance will be provided to all accepted applicants, as well as lunches and an event dinner on July 11, 2014. See this CFP on our website at <www.cbi.umn.edu/research/cfp.html>.

Recent Publications

Burgun, Keith. *Game Design Theory: A New Philosophy for Understanding Games* (A.K. Peters/CRC Press, 2013).

Campbell-Kelly, Martin. "The RDBMS Industry: A Northern California Perspective." *IEEE Annals of the History of Computing* 34:4 (Oct.-Dec. 2012): 18-29.

Carpo, Mario. *The Digital Turn in Architecture, 1992-2012* (Wiley, 2013).

Cortada, James W. *The Digital Flood: The Diffusion of Information Technology Across the U.S., Europe, and Asia* (Oxford University Press, 2012).

Darwen, Hugh. "The Relational Model: Beginning of an Era." *IEEE Annals of the History of Computing* 34:4 (Oct.-Dec. 2012): 30-37.

Ensmenger, Nathan. "The Digital Construction of Technology." *Technology and Culture* 53:4 (October 2012): 753-776.

Gandy, Anthony. *The Early Computer Industry: Limitations of Scale and Scope* (Palgrave Macmillan, 2013).

Grad, Burton and Luanne Johnson. "Collecting the History of the Software Industry." *IEEE Annals of the History of Computing* 34:4 (Oct.-Dec. 2012): 86-88.

Grier, David Alan. "The Relational Database and the Concept of the Information System." *IEEE Annals of the History of Computing* 34:4 (Oct.-Dec. 2012): 9-17.

Haigh, Thomas. "Seven Lessons from Bad History." *Communications of the ACM* 55:9 (September 2012): 26-29.

Haigh, Thomas. "Five Lessons from Really Good History." *Communications of the ACM* 56:1 (January 2013): 37-40.

Lapsley, Phil. *Exploding the Phone: The Untold Story of the Teenagers and Outlaws who Hacked Ma Bell* (Grove Press, 2013).

McDonald, Christopher. "Western Union's Failed Reinvention: The Role of Momentum in Resisting Strategic Change, 1965-1993." *Business History Review* 86:3 (October 2012): 527-549.

Preger, Robert. "The Oracle Story, Part 1: 1977-1986." *IEEE Annals of the History of Computing* 34:4 (Oct.-Dec. 2012): 51-57.

Rowe, Lawrence A. "History of the Ingres Corporation." *IEEE Annals of the History of Computing* 34:4 (Oct.-Dec. 2012): 58-70.

Sterling, Christopher H. “Review Essay: Computer History Since 2002.” *Communication Booknotes Quarterly* 43:4 (November 2012): 145-162.

Vallianatos, Evaggelos. “Deciphering and Appeasing the Heavens: The History and Fate of an Ancient Greek Computer.” *Leonardo* 45:3 (2012): 251-257.

Wade, Bradford. “Compiling SQL into System/370 Machine Language.” *IEEE Annals of the History of Computing* 34:4 (Oct.-Dec. 2012): 49-50.

Wade, Bradford W. and Donald D. Chamberlin. “IBM Relational Database Systems: The Early Years.” *IEEE Annals of the History of Computing* 34:4 (Oct.-Dec. 2012): 38-48.

Compiled by Jeffrey R. Yost

CBI Photo Caption Contest

In the Fall 2012 *CBI Newsletter* we invited readers to propose another historically accurate yet “entertaining and lively” caption for a somewhat unusual photograph that we located in our collection. You can view this second image in our online photo database <purl.umn.edu/62858>. Our original label stated “A young man sitting on high stool with fingers poised on the keys of the typewriter attachment to the adding machine. Perhaps this is a prototype machine since the typewriter mechanism is supported by a very large frame with a triangular base and [t]he adding machine is mounted to this base underneath and in front of the typewriter component. The whole is supported by heavy, slightly tilted, triangular shaped, three legged table.”

“If only he can type as well as Burroughs can add.”

The photo was another one from our Burroughs collection. David Hemmendinger’s winning caption, “**If only he can type as well as Burroughs can add**,” is an allusion to the Neiman-Marcus ad for the Honeywell ‘kitchen computer’. David is professor emeritus of computer science at Union College, and has been active in SHOT meetings as well as with activities of the ACM History Committee. Honorable mention also to two anonymous respondents (you know who you are!).

We offer this third image that is in need of a historically accurate yet entertaining and lively caption, as before. It is not from the Burroughs collection. Prizes to be awarded this fall will include two forthcoming CBI books, one by Tom Misa and one co-authored by Jeff Yost. Please email your suggestions for captions to <cbi@umn.edu>. Thanks for your suggestions and support!