CHARLES BABBAGE INSTITUTE

NEWSLETTER

Vol. 22 No. 4
Summer 2000

CENTER FOR THE HISTORY OF INFORMATION PROCESSING

Production of the CBI Newsletter is supported by the Charles Babbage Foundation

History of ERA, Eckert-Mauchly, and Remington Rand

By Arthur L. Norberg

Editors Note: The following article by the Director of CBI is based on research he conducted for his soon to be published book. Support from NEH RO-21098-85 and NSF SES-8420481 is gratefully acknowledged. This article, along with two others in this issue of the CBI Newsletter, one reporting on a Unisys-sponsored study of Computer R&D management at Burroughs in the 1950s, and another on the history of medical informatics, represent some of the research being conducted by CBI staff.

Before 1946 digital computer activity was developmental and in a preliminary stage. After 1956, a short decade later, use of digital computers was spreading and a digital computer industry was beginning to flourish. This decade represents a critical period in the development of digital computer technology, often perceived today as unmatched by any previous technological development. Whether this perception is correct or not, and significant evidence exists that other technologies grew as quickly, the computer stimulated technical developments and modes of social behavior that made the computing enterprise into a major phenomenon. Scientific and technical developments just before and during World War II

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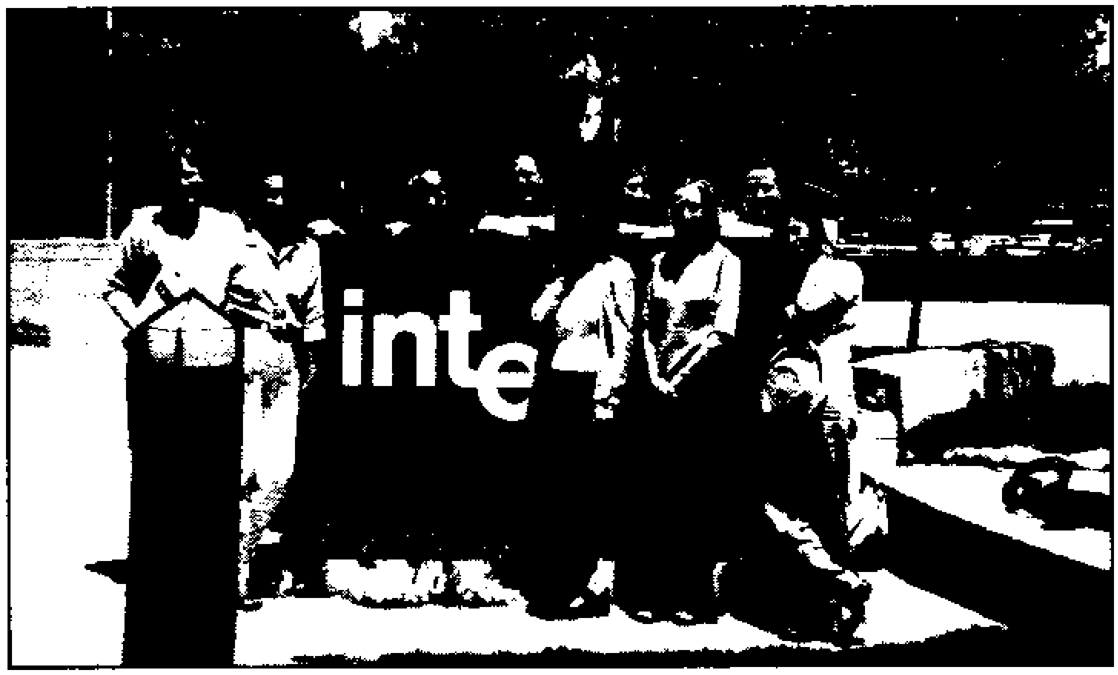
Intel Hosts Archivists Meeting



From left: Tracey Mazur (Intel), Rachel Stewart (Intel), Sue Topp (Motorola), Rayanne Waggoner (Apple), Paul Lasewicz (IBM), Elisabeth Kaplan (Charles Babbage Institute), Laurie Banducci (Gap Inc.), Anna Mancini (Hewlett-Packard), Keith Elliott (Intel), Adina Lerner (Disney). Not shown: Ed Eckert, Bunny White (Lucent).

The fourth annual meeting of high-technology industry and corporate archivists was held on June 22-23, 2000, hosted by the Intel Museum Archives and Collections in Santa Clara, California. CBI archivist Elisabeth Kaplan attended along with archivists, records managers, and curators from Intel, Hewlett-Packard, IBM, the Gap, Motorola, Apple, Disney, and Lucent.

A mix of formal presentations and roundtable-style discussion addressed topics including document imaging systems, strategies for archiving and managing email, best practices and resources for preservation of computer artifacts, the development of a shared information processing taxonomy and authority file, capturing company Web sites, the impact of digital photography on corporate archives, and a proposed standard for long term archiving of digital information.

Rachel Stewart, Intel Collections and Registration Manager, demonstrated Intel's document imaging system. The database contains approximately 130,000 images including photographs, press articles, and company datasheets. Meeting participants described their companies' image databases and discussed descriptive standards, the pros and cons of full text searching and Optical Character Recognition, the importance of metadata, appraisal criteria for documents for imaging, and problems relating to securing copyright of photographic images.

Appraisal and preservation of email is a matter of widespread interest and attendees described current practices at their respective corporate archives. Intel Corporate Records Manager Keith Elliott

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Recent Publications

Asakura, Reiji. *Revolutionaries at Sony: The Making of the Sony Playstation and the Visionaries Who Conquered the World of Video Games* (New York: McGraw-Hill, 2000).

Berlinski, David. *The Advent of the Algorithm: The Idea that Rules the World* (New York: Harcourt Brace, 2000).

Boslaugh, David L. *When Computers Went to Sea: The Digitization of the United States Navy* (Los Alamitos, CA: IEEE Computer Society Press, 1999).

Bunnell, David, Karen Southwick, and Adam Brate. *Making the Cisco Connection: The Story Behind the Real Internet Superpower* (New York: John Wiley & Sons, 2000).

Coopersmith, Jonathon. "Creating the Commons: Establishing a Civic Space for a New Form of Communications" *Business and Economic History* 28:1 (Fall 1999) 115-124.

Ferguson, Charles H. *High Stakes, No Prisoners: A Winner's Tale of Greed and Glory in the Internet Wars* (New York: Times Books, 1999).

Jessen, Kenneth Christian. *How It All Began: Hewlett-Packard's Loveland Facility* (Loveland, CO: J. V. Publications, 1999).

Kaplan, David A. *The Silicon Boys and Their Valley of Dreams* (New York: HarperPerennial, 2000).

Malerba, Franco., et. al. " 'History-Friendly' Models of Industry Evolution: The Computer Industry" *Industrial and Corporate Change* 8:1 (March 1999) 3-40.

Singh, Simon. *The Code Book: The Secret History of Codes and Code-Breaking Cryptography* (London: Fourth Estate, 2000).

Stauffer, David. *Business the AOL Way: Secrets of the World's Most Successful Web Company* (Oxford: Capstone, 2000).

Stross, Randall E. *eBoys: The First Inside Account of Venture Capitalists at Work* (New York: Crown Business, 2000).

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.

Charles Babbage Institute Newsletter is a publication of the Charles Babbage Institute, University of Minnesota, 211 Andersen Library, 222 21st Ave. S., Minneapolis, MN 55455 USA.The *Newsletter* reports on Institute activities and other developments in the history of information processing. Permission to copy all or part of this material is granted provided that the source is cited and a copy of the publication containing the copied material is sent to CBI.

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History of ERA and EMCC...

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set the stage for a range of new possibilities that both stimulated and required new computational devices. Arithmetic routines for business and scientific and engineering research provided specifications for solutions to problems the new computing machines tried to meet; early success indicated that the new machines would allow a previously unaddressed set of problems to be approached. And out of this came a new world that, over the next five decades, and maybe beyond, contained new opportunities and new tensions. The seeds of these opportunities and tensions were present in the efforts of the men and women in this emerging enterprise in the decade beginning in 1946.

The combination of academia, industry, and government was responsible for the rapid development of digital computing, and the combination had its most significant effect in the decade 1946 to 1956. The interaction and combination displayed different characteristics after the mid-1950s. After 1956, these characteristics are much like those of any industry doing business with government. Volume buying encouraged standard setting rather than design specifications. The military purchased similar designs to serve many purposes, rather than single designs for one purpose. The ability to do this came as a result of that first decade.

This research project explores the developments of the critical decade 1946-1956. First, the overriding objective is to illustrate what made this decade so important in the history of computing. Second, to build an effective fully-electronic stored-program digital computer required several new developments in storage components, input-output systems, and programming concepts. The study explores these developments by focusing on two new firms established in 1946, Engineering Research Associates, Inc. (ERA) in St. Paul, Minnesota, and Eckert-Mauchly Computer Company (EMCC) in Philadelphia, Pennsylvania. Their work necessitated a major financial partner, a role assumed by the U. S. Government. Hence, in analyzing this decade, the study explores the interaction between the companies that participated in these developments and the government. It investigates the institutional context of technological change, how innovations developed under navy and army auspices were transferred to civilian use, and how, when new technologies were introduced, people in and out of the defense establishment responded to them.

Five special characteristics stand out in this first decade: (1) the special interaction of academia, government, and industry; (2) the shift from calculating machines and punched-card storage systems to automatic computers; (3) the unreliable nature of small, slow early computers; (4) the fact that machines were often designed specifically for either scientific or commercial needs; (5) that government contracts stimulated research programs in the nascent computer industry.

A major portion of this work will be taken up with a study of ERA and EMCC- their origins, development, contributions, and interactions with others from 1945 to 1951. Their origins are quite different. ERA emerged from a secret navy need in cryptology; EMCC emerged out of a strong desire on the part of its founders to bring new computational machinery into the commercial manufacturing world. EMCC never deviated from this objective to provide machines to customers across the economy. ERA's objectives can be just as simply stated, but the company was buffeted on all sides because of involvement with the military. When ERA decided to go commercial in a manner similar to EMCC, it encountered the same problems as EMCC. By 1950-51, both companies were having problems with financing and had to resort to transfer of control to backers in order to survive. This carried the threat of absorption and both companies were acquired by Remington Rand by the end of 1952.

The navy's cryptology unit expended some effort before and during World War II on new mechanical techniques for analyzing data. The purpose of this unit requires that cryptology work on intelligence about another country be kept secret. Thus, up to now we have only a few glimpses into the nature and influence of this work. These glimpses provide some evidence of the effect of this work on the growth of the United States computer industry. By the middle of 1945, navy personnel were convinced that the effort to enhance analysis techniques by new data processing concepts should continue and these techniques should make as much use as possible of the newly developing computing ideas. In the navy, this work was done primarily under the direction of the Communications Supplementary Activity--Washington (CSAW). CSAW was composed of a hastily assembled group of cryptologists, mathematicians, physicists, engineers, and chess and bridge masters. Foiled at keeping this prime group together after the war as civilian employees to pursue such work under direct supervision, the navy assisted in the establishment of a private company, comprised of many of those same men, to perform the same investigations with classified contracts. This company was Engineering Research Associates, Inc. (ERA).

ERA influenced the field in ways both similar to and different than EMCC and MIT's Whirlwind project. Among the

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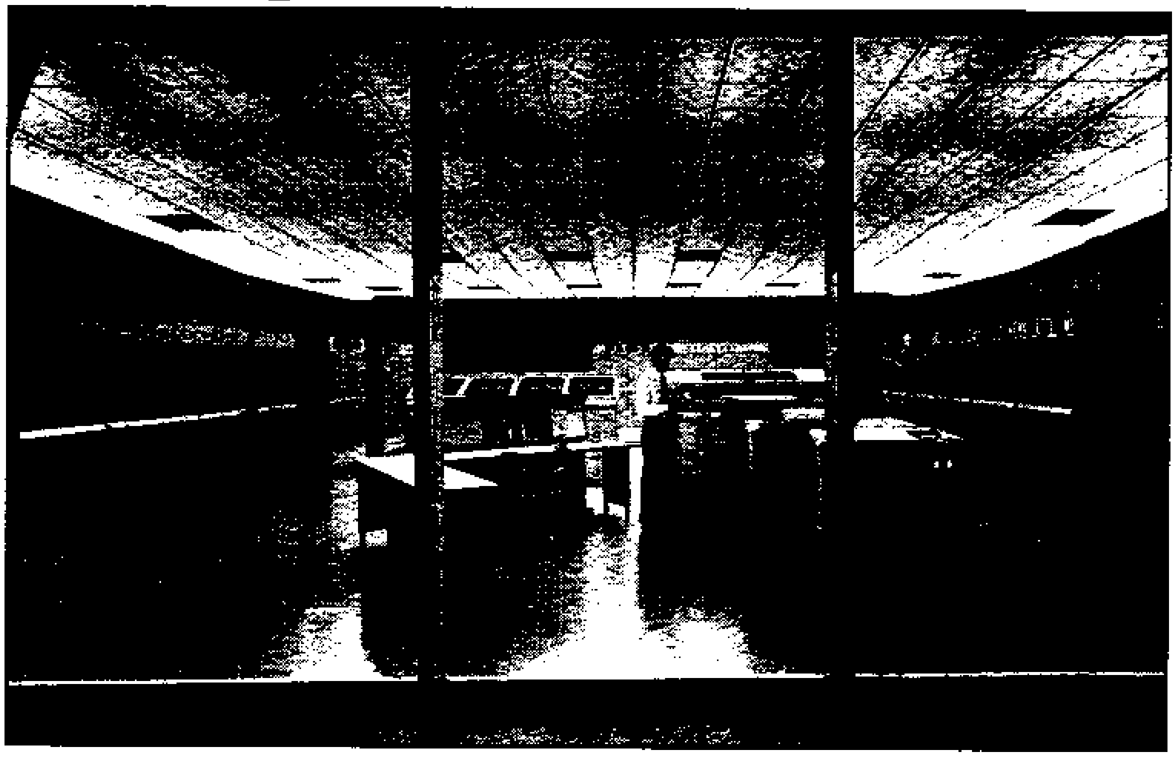
Early Computer Development at Burroughs and BTM



Burroughs 220

Late in 1999 the Unisys Corporation provided a grant to the Charles Babbage Institute in support of a research project on the history of the Burroughs Corporation. CBI Associate Director Jeffrey Yost examined aspects of the firm's strategic decision-making and R&D management in computing during the 1950s. He took the opportunity to compare developments at Burroughs to those at the British Tabulating Machine Company (BTM), analyzing the opportunities and challenges faced by business machine firms in the United States and United Kingdom as they contemplated and later entered the computer industry. In August, Yost will present research from this project in Munich at the International Meeting of the Society for the History of Technology (SHOT).

Materials within the Burroughs Corporate Collection held at the Charles Babbage Institute were critical to this study. The HOBO (Hollerith-Burroughs) Reports on meetings between Burroughs and BTM to form a joint venture in the early 1950s for developing digital computers for data processing applications provided insights into the early perspectives of the two firms on the possibilities and risks in the emerging computer industry. Both firms were cautious about committing scarce resources to computer development at this time, and though they both continued engineering work to produce one-of-a-kind computers for scientific applications in the early 1950s, they soon abandoned the joint venture. Strong demand for both companies' lines of traditional business machines was a critical factor to the two firms' respective decisions.

Burroughs and BTM perceived IBM, the worldwide leader in the business machine field, as their primary competitor, fearing the commercial threat of IBM's traditional office machines as well as the firm's potential dominance of the computer trade. By mid-decade, their fear of the latter was beginning to be realized as IBM quickly developed into the international leader in computers. In response, both Burroughs and BTM adopted similar acquisition strategies to attempt to catch up.

In 1956 Burroughs acquired the ElectroData Corporation, a Pasadena computer manufacturer that was spun off two years earlier from a division of the Consolidated Electrodynamics Corporation. ElectroData had produced the Datatron 205 computer and was com-

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Testing Physicians' Limits

Medical Informatics and Diagnostic Decision-Making

By Philip L. Frana

The idea that medical technologies have promoted physical, emotional, and intellectual "distancing" in the past, that is, a growing divide between caregiver and client, is well-known and popularly accepted. Yet this way of thinking about the introduction of technologies into medical spaces is of relatively recent origin and does not reflect the many other ways that powerful medical technologies, particularly medical-computer applications, have been evaluated in the past. Medical informatics, defined today as "the application of computers, communications, information science, engineering, and technology to medical care, medical education, and medical research," is one useful and illustrative case in point. In the late 1950s and throughout most of the 1960s physicians, medical educators, and researchers embraced the movement toward the exploitation of computers to collect and organize burgeoning stores of medical knowledge and provide significant decision-support in their interactions with patients and students. Skepticism toward certain applications of medical informatics as agents of "distance" did not emerge until the late 1960s.

Joel Howell in *Technology in the Hospital* (1995) notes that medical machines are today implicated as the source of all sorts of "evils," including the devaluation of patient narratives of their own afflictions, the privileging of machine-generated medical data, and the transformation of the primary-care physician into a remote research scientist. Much less well understood is the role and evaluation of computers as medical instruments of change in the middle of the century. Here, the development of so-called "diagnostic-assistance programs" is considered as one particular area illustrating different views of medical technologies.

Although the term "medical informatics" does not appear in published sources until the mid- 1970s, conscientious efforts to apply "computer medicine" in developing programs to aid in patient diagnosis began two decades earlier. The first diagnostic computer programs emerged from patient health questionnaires and tables of medical diagnoses. Around 1954 F.A. Nash, a London director of x-ray services, invented a slide rule-like device called a Group Symbol Associator which allowed physicians to line up a patient's symptoms with major symptom-disease complexes and derive a diagnosis. Essentially, the device used propositional calculus to parse various combinations of symptoms. In the process, Nash reduced thousands of pages of traditional diagnostic tables to a machine slightly less than a yard in length.

Burroughs 205

At about the same time, Keeve Brodman of the New York Hospital-Cornell Medical Center began applying the Cornell Medical Index-Health Questionnaire to the automation of medical diagnosis. The index collected data teased out of two hundred "yes/no" questions answered by three thousand undiagnosed patients. Brodman used an unspecified "conventional" digital computer to evaluate the data against the records of six thousand other patients whose symptoms and diagnoses were already known. This "Medical Data Screen," Brodman reported, could correlate symptom complexes with the right diagnosis over forty percent of the time (the figure later rose to seventy percent).

Dr. Homer R. Warner at the University of Utah took a different approach to computerized medical diagnosis in 1960. Warner exploited his access to a Burroughs 205 computer to diagnose congenital heart diseases at Salt Lake's Latter-Day Saints Hospital with Bayesian statistical estimation. Bayesian estimation calculates the probability of the validity of a proposition based on a prior estimate of its probability plus any new and relevant data. It is very close to what Alan Turing described as the factor in favor of the hypothesis provided by the evidence. The mathematical theorem was developed by the Reverend Thomas Bayes of England and published posthumously as "An Essay Towards Solving a Problem in the Doctrine of Chances" in 1763. Bayes' theorem had already been "rediscovered" several times before it fell into Warner's hands, eliciting commentary from such luminaries as Pierre-Simon Laplace, the Marquis de Condorcet, and George Boole.

Warner and his staff used the theorem to determine the probabilities with which an undiagnosed patient with definable symptoms, signs, or laboratory results might fit into previously established disease categories. The computer program could be used over and over as new information presented itself, establishing or ranking diagnoses by serial observation. Warner found that by applying Bayesian conditional-probability algorithms to a symptom-disease matrix of thirty-five coronary conditions, the Burroughs machine could perform just as well as any cardiologist. Other enthusiastic early adopters of Bayesian estimation included John Overall and Clyde Williams for thyroid disorders, Charles Nugent for Cushing's disease, Gwilym S. Lodwick for primary bone tumors, and Martin Lipkin for hematological diseases.

The celebration of computer-assisted diagnosis reached its highest pitch soon after the widespread application of Bayes' work. Dr. Jordan Baruch of Massachusetts-based Bolt Beranek and Newman Inc., for instance, lauded the technology as "literally more intelligent and more capable than any group of humans." Developers of programs incorporating Bayesian statistical methods in the 1960s celebrated computer diagnostics as tools for making medicine cost effective. Many medical educators hoped that the programs would ease the burden of medical students memorizing a crushing load of arcane medical information. Computer-assisted tools also held out the possibility of diagnosis by technician. And everywhere in the early debates over the merits of digital diagnosis one could hear physicians heralding the dawn of truly "logical" medical diagnosis, medicine as the Ancients had intended.

Confirmation of Bayesian estimation as a worthwhile and valid technique for medical diagnosis came from an unusual Public Health Service-National Bureau of Standards collaboration. Homer Warner had been introduced to the possibilities of Bayes' theorem by USPHS officer Lee B. Lusted who, with National Bureau of Standards (NBS) dentist and theoretical physicist Robert S. Ledley, quickly became a giant in the field of medical decision-making. Lusted and Ledley shared similar interests in digital diagnosis, and together hoped to realize the potential of the NBS's general-purpose SEAC computer. Ledley's first program automatically diagnosed diseases of the tongue, but more importantly, Ledley and Lusted began carefully scrutinizing the "reasoning foundations" of the "symptom-disease complex." Out of this, both endorsed the validity of probabilistic diagnostic methods like Bayesian estimation, arguing that they captured the essential variability of disease better than printed tables. Ledley and Lusted also discovered that enormous computational power was necessary to really get at the total number of conceivable symptom-disease combinations they wanted to evaluate. For example, just one specialized branch of medicine with three hundred defined diagnoses and four hundred associated symptoms could generate 2^{700} possible combinations.

While the power and speed of computers grew rapidly to meet this challenge, by the late 1960s many medical researchers and commentators began issuing distressed assessments of the present and future for diagnostic assistance programs. Though computer diagnosis had always been controversial in some respects, especially in terms of the new demands it put on physicians to learn to use the new technology, by the late 1960s criticisms of diagnostic-assistance programs began to mount. Critics disparaged digital diagnosis programs as cost-containment measures. Moreover, as "logical" as computers seemed to be, even "imperfect" humans could out think them.

For example, INTERNIST-1/CADUCEUS, one of the most promising digital diagnostic programs of the late 1970s and 1980s, got most of its diagnoses right. But it was maddeningly wrong just often enough to make it

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Burroughs and BTM...

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pleting development of the Datatron 220 at the time of the acquisition.

Throughout the decade following World War II the Burroughs Corporation had been very successful in obtaining Federal Government contracts to produce computing and other electronic equipment. Despite the technically advanced government sponsored research being conducted at the Burroughs Paoli Research Center near Philadelphia, including computer contracts working on the SAGE air defense and the ATLAS missile guidance systems, there was little coordination between this center and the ElectroData computer development laboratory in Pasadena. Records in CBI's ElectroData and Paoli Division collections indicate the missed opportunities for collaborative R&D efforts between the centers, and in some cases, the recognition of these unfulfilled possibilities by the firm's engineers and managers during the 1950s.

At BTM, ongoing efforts to combine with Powers-Samas, their longtime British office machine competitor, culminated in 1958 with the merger of the two firms to form International Computers and Tabulators Ltd. (ICT). As at Burroughs, integration of the two firms was a slow and difficult process, and much time was lost as IBM was strengthening its international leadership in the industry.

The cases of BTM and Burroughs in the 1950s demonstrate the complexity of coordinating international research and development joint ventures, the struggle to create advanced products in an emerging technology while preserving existing revenue streams, and the cultural and technical hurdles involved with assimilating R&D resources from acquisitions in a rapidly changing technologically based industry. Furthermore, Burroughs' inability to quickly gain a large market share in the computing trade relative to IBM, despite the fact that both firms received hundreds of millions of dollars in government computer contracts during the 1950s, highlights the significance of organizational capabilities and the greater relative importance of endogenous versus exogenous factors to a firm's rapid growth in an emerging high-tech field.

Jeffrey R. Yost □

History of ERA and EMCC...

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similarities are major inventions for storage techniques, commercialization in the early 1950s of a machine produced originally for a military purpose, and as a fountainhead for new companies. The principal differences are the manner of operation of the company: tight classification in the early years; production of a volume (published in 1950) that contained an assessment of techniques available in 1949 for design of computers that influenced developments worldwide; and a prudent, some might say ineffective, manufacturing and marketing strategy.

As a contribution to this history, the project provides a detailed study of ERA, from its inception to 1957 when it became a component of the new Univac Division of Sperry Rand. Most of this history has not been told previously, though some of the details have become part of other stories, such as the founding of Control Data Corporation in 1957. The story of ERA is compelling for several reasons. In at least one sense, ERA was a unique enterprise because of the nature of its founding and the close oversight it experienced. Over the past two decades, we have gained a good understanding of the role of government agencies in the emergence of the computer industry and of computer system design. The lacuna in this understanding is still ERA. The project offers: analysis of its founding, a study of the principal actors in technical developments, an examination of contributions to intelligence and commercial computing, evaluation of the decision to sell the company to Remington Rand, and discussion of the effects of ERA activity on that of other computing groups. In the early 1980s, such a study was hardly possible. Few documents seemed to exist, and it appeared as though oral history would be the only recourse. Since then, many documents have been uncovered at the Sperry company that are now at the Hagley Museum and Library, while Colin Burke's exhaustive naval history research at the National Security Agency and the National Archives uncovered additional documents about ERA.

In contrast to EMCC, IBM, and others, there was no single objective governing ERA activities in the company's formative period of 1946 to 1951. Indeed, among the large number of founders, several objectives were being promoted by small groups of people. Even though the company was reminded from time-to-time that their principal task was navy business, often developments for the navy were examined with a critical eye to commercialization. Burke has gone so far as to conclude that the tug of war between company personnel and navy overseers was the prime contribution to ERA's early downfall. Contrasting ERA with EMCC, which suffered a similar early downfall, reveals that navy pressure was only part of the problem.

To understand ERA, we must make a careful examination of how several conceptual relationships played out in the company. The study examines relationships between science and technology, research and development, invention and innovation, and military and civilian outlooks. While ERA did not begin as a computer company in the same sense as say EMCC did, the desire to be one lurked in the background and was ultimately achieved, both because and in spite of the navy. To appreciate these relationships and to understand how ERA moved from data processing to computer design, we need to examine in detail technical developments within ERA, and their contributions to and borrowings from the rest of the enterprise. At first sight, it may not appear that ERA was a pioneer in this industry--a number of contemporaries, among them J. P. Eckert, dismissed ERA, and several historians have seen it merely as a captive of the navy. ERA, however, deserves to be ranked with EMCC, Remington Rand, IBM, Hewlett-Packard, and Microsoft as an important early element in the great success of the computing enterprise in this last half century.

Exploring the successes and failures of the ERA and EMCC divisions, as well as their interaction with the Norwalk laboratory of Remington Rand, helps us to understand the issues. Comparing them with each other and with other activities has not been done previously.

Within Remington Rand, ERA and EMCC operated as separate divisions until the purchase of Remington Rand by Sperry Corporation. During this ostensibly free period, EMCC concentrated on commercial trade; ERA continued to serve the military market, though not exclusively. Sperry created the Univac Division and began a formalization of the activities of the two former divisions into civilian and military product producers. However, this did not happen smoothly within the new company. Old wounds were still raw, and infighting resulted in decisions about management personnel and reporting lines that were unsatisfactory to many. Groups formed in a less formal age felt threatened by the changes. Moreover, these men had ideas for new products that were not acceptable to the new management, and the groups began to dissolve. New companies were organized and the complexion of the industry began to change substantially. Indeed, the industry as we know it today began to emerge.

Of course, not all of the reasons for this new emergence are to be found within the machinations of the Sperry Rand Company. Other companies had not been sitting on their hands. IBM's overall objective was quite similar to that of EMCC: to obtain commercial customers for the new machinery. IBM followed an R&D strategy that was analogous to that of ERA and EMCC.

Tracing the influence of these various firms in the industry is not straightforward. The early period was very volatile. Information was passed readily from group to group. Government classification of projects meant that government personnel could decide to circulate or withhold documents as they chose. To their credit, they did not withhold the information, but instead circulated it broadly. This circulation and the influence of the documents on the thinking of others are difficult to measure, because it is difficult to know who saw what when. And we still have that most nagging of historical questions concerning when or whether a report received had an effect on someone else's work. This traditional puzzle for the historian is much more difficult here because of the rapid rate of growth of and large number

ERA, EMCC, and Remington Rand...

ERA R&D Laboratory at mid-century

of players in the computer enterprise.

Something clearly magnificent transpired in the first decade of this industry. No stored-program computer existed before it began; many examples existed after. No companies were involved in designing and manufacturing electronic digital computers before the decade began; several around the world engaged in the activity by the end of the decade. Applications were difficult to design in the early period because of small storage, but perhaps more important the companies did not think in the early years that this needed to be done. By 1958, this view had changed; we had entered the period when companies formed to independently fill this need. Work on component design, particularly semiconductors, began to contribute to technical aspects of computer design. And perhaps most significant of all, an active market existed in 1956, where only a decade earlier the market existed only in the minds of a few visionaries.

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Medical Informatics

Continued from page 5

impractical for use in the "real world." Digital assistance also freed clinicians from few of the routine decisions it was supposed to. Physicians on rounds showed reluctance in applying programs like CADUCEUS simply because they absorbed precious moments with tedious data-entry. Finally, diagnostic-assistance programs tested physicians' limits by distancing them from their patient's afflictions, reducing them to a series of weighted variables.

Crucially, physicians limited expectations for diagnostic-assistance programs fueled their reconfiguration as limited applications. That is to say, physicians' restrained desires led to more constrained uses. In this way, ironically, medicine derived unparalleled benefits from the technology. Physicians embraced computers as virtual Solomon's houses of diagnostic information, if not as independent organizers of medical content. Pharmacists accepted narrowly conceived assistance programs as helpmates against antibiotic resistance and incompatible prescriptions. The computer's ability to discern patterns in telemetry data proved another successful targeted application of digital diagnostic-assistance (increasingly softened by use of the moniker "decision support"). No hospital cardiac care ward today is without sophisticated monitoring equipment descended from early electrocardiographic equipment which did "point recognition" and established "ventricular gradients." Yet these telemetry machines are still operated by human technicians.

Clinicians and medical researchers since the 1970s have found ways to make digital diagnosis useful without becoming swallowed up by its most dehumanizing aspects. From its expectant infancy as a solution to social and professional needs to its awkward adolescence as a social and technological problem, diagnostic-assistance programs have charted an ambiguous and ultimately useful middle path between facilitation and consternation.

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Archivists Meeting...

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discussed aspects of Intel's Internet and email management program including selection criteria for disposition of email, automated implementation of retention schedules, and the ongoing education and outreach components of the program.

Participants also discussed models for long term preservation of digital photographs. This is an especially pressing concern for corporate archivists; corporations have in the past relied heavily on the photograph holdings of their archives for a variety of uses including publicity, advertising, and internal publications. As use of digital photography becomes increasingly the norm, archivists are seeking solutions to a widening "digital gap" in visual documentation of company history that will likely result in a dearth of images for future corporate use.

Kaplan described CBI's current NSF-sponsored software history project. Effective searching of the online historical dictionary will to a large degree be dependent on an authority file (standardized set of names and subject headings) specific to the field of information processing. Meeting participants discussed currently available resources, outlined the process by which they have created internal authority files at their respective companies, and expressed interest in collaborating with CBI to establish a shared set of authority files for information processing resources.

After the meeting, attendees enjoyed tours of the Intel Museum and the Tech Museum in San Jose.

Elisabeth Kaplan

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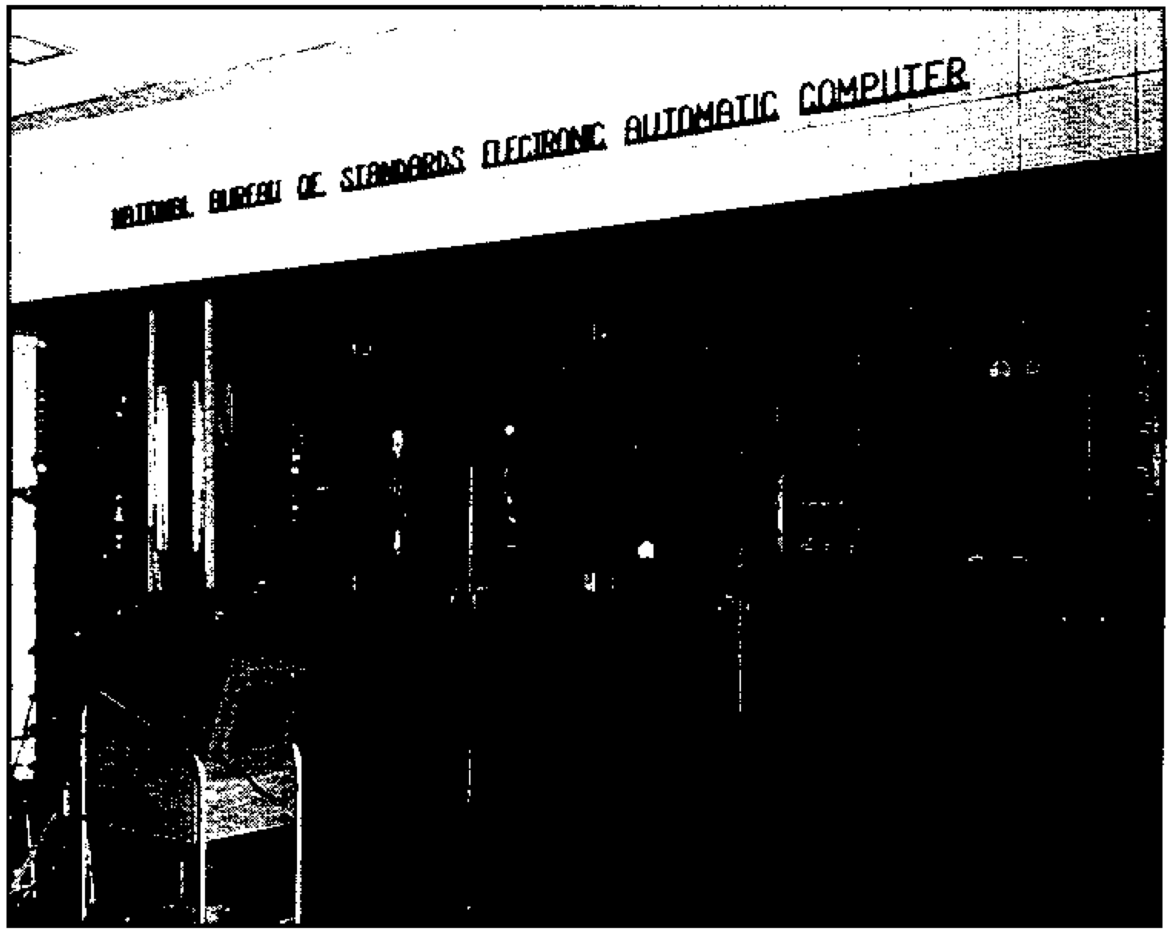
Fifty Years Ago

Initially known as the National Bureau of Standards Interim Computer, the Standards Eastern Automatic Computer (SEAC) was intended to fill the need for computing power at the NBS's National Applied Mathematics Laboratories until either Princeton's Institute for Advanced Study (IAS) machine or UNIVAC was in operation. The project to build this computer began in 1948 and was partially subsidized the United States Air Force. SEAC was demonstrated at the NBS in April 1950 and by May it was fully operational. It was the first practical stored program computer to be put into service in the United States. SEAC remained in service, with continual modifications, until 1964, having performed 70,254 hours of operation.



Standards Eastern Automatic Computer (SEAC)

30 Years Ago

In 1970 Hewlett-Packard Company announced the HP 2114B minicomputer, designed for data communication, instrumentation, and education systems. Hewlett-Packard billed the 2114B as "ideal for use in either general-purpose computer systems or in specific systems applications such as process control, automatic checkout, data acquisition and data communication." The 2114B sold for approximately $6000-$7000 and featured 16-bit word size, a 4,096 word memory, a 2.0 microsecond full cycle time, and 7 plug-in I/O channels.

Lynn Leitte □

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