CHARLES BABBAGE INSTITUTE
NEWSLETTER
Volume 15, Number 2
Winter 1993

CENTER FOR THE HISTORY OF INFORMATION PROCESSING

High-Technology Business Archives and Museum Meeting

In February, a three-day "workshop" was held in Silicon Valley to share information among individuals involved in documenting the history of high-technology business, primarily the computer industry. The meeting involved curators, archivists, and records managers from Apple, AT&T, Cray Research, Digital Equipment, Hewlett-Packard, Intel, Microsoft, Motorola, Sematech, and Texas Instruments, as well as the Charles Babbage Institute, the Stanford and Silicon Valley Project, the Smithsonian, and the Tech Museum of Innovation. Impetus for the event came from discussions between West Coast computer firms interested in expanding their historical programs. Tom Stephens, records manager for Apple Computer, coordinated the meeting planning.

Much of the meeting was devoted to tours of local historical programs, beginning with the Hewlett-Packard Corporation Archives. HP's program began in 1978 on the 50th anniversary of the company's founding, and has thrived since that time. Archivist Karen Lewis and her staff described the circumstances that made the archives possible, and the programs they pursued to keep the archives a vital and growing resource for the company. The HP archives contains corporate records, photographs, oral histories, and artifacts, although there is no museum facility within the company. The philosophy of the operation is geared towards "living archives," which insists that an archives can and must directly benefit the goals of the company. Lewis described how the staff had

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New Trustees of the Babbage Foundation

At its annual meeting in October 1992, the Charles Babbage Foundation elected two new Trustees.

Fredrick W. Lang is chairman of the board of Analysts International Corporation. Lang received degrees in Electrical Engineering (1949) and Business Administration (1949) from the University of Minnesota and served as a commissioned officer in both World War II and the Korean War. In 1952 he joined Engineering Research Associates, Inc. and later was part of the UNIVAC division of the Remington Rand Corporation where he played a major role on the development of the FAA's air traffic control system. In 1962 he founded and served as president of Aries Corportion, a programming and software company. In 1965 he founded Analysts International Corporation.

Dr. Hasso von Falkenhausen is President and Chief Executive Officer of WorldCard International, GmbH, chairman of DataCard Corporation and general manager of Seedamm-Vermoegensverwaltungs, GmbH. After receiving a master's degree in industrial engineering from Cornell University in 1959, von Falkenhausen was a research associate and lecturer in Operations Research and Computer Applications at Technische Hochschule Darmstadt where he earned a Dr.-Ing. in 1966. He then joined McKinsey and Company, Inc., an international management consulting company, where he became a principal in 1970 and a director in 1975. In 1980 he became a member of the managing board of Robert Bosch GmbH. He has served on the board of DataCard since 1987. □

Current Research

A wide range of activities are underway in the history of computing. In this issue, four of our colleagues, Per Holst, Richard Lynch, Stuart Shapiro, and Michael Williams, report on their current projects. We invite other researchers to share their interests and current research in future newsletters.

The History of Differential Analyzers

Ever since scientists and engineers first formulated the laws of nature into mathematical equations, the need has existed for means of solving such equations. Great efforts were exerted trying to build instruments and calculating machinery that would verify observed effects and extend knowledge. A particularly difficult problem area was solving differential equations, especially nonlinear higher order ones.

In the period from the late 1800s to World War II calculating methods and machinery were proposed and built, based on mechanical, electrical, hydraulic, and chemical principles. It was in 1930, with Vannevar Bush's completion of the mechanical differential analyzer at MIT, that a real break-through was made. Bush and his team constructed a general-purpose programmable device that could carry out continuous integration with a reasonable accuracy. It could solve differential equations with relative ease. The era of differential analyzers had begun. It included realizations based on a variety of technologies and built on principles from mechanical and electro-mechanical engineering, electrical engineering, electronic analog circuit designs, as well as digital versions of electronic analog circuitry. Today

Current Research continued on page 3...

Recent Publications

The Information Society: Evolving Lanscapes. New York: Springer-Verlag, 1990.

Paul W. Oman and Ted G. Lewis, eds. *Milestones in Software Evolution*. Los Alamitos, CA: IEEE Computer Society Press, 1990.

Geoff Simons, *Evolution of the Intelligent Machine: A Popular History of AI*. Manchester, England: NCC Publications, 1988.

James Wallace and Jim Erickson. *Hard Drive: Bill Gates and the Making of the Microsoft Empire*. New York:Wiley and Sons, 1992.

Articles of Interest

Corrado Bonfanti, "C'era una volta il computer," *Media Duemila*, 10:10(November 1992): 84-91.

Martin Campbell-Kelly, "The Airy Tape: An Early Chapter in the History of Debugging," *Annals of the History of Computing*, 14:4(1992): 16-26.

Walter M. Carlson, "Transforming an Industry through Information Technology," *Annals of the History of Computing*, 15:1(1993): 39-43.

Mary G. Croarken, "The Emergence of Computing Science Research and Teaching at Cambridge, 1936-1949," *Annals of the History of Computing*, 14:4(1992): 10-15.

David Crawford and Philip Fox (ed.), "The Autoscritcher and the Superscritcher," *Annals of the History of Computing*, 14:3(1992):9-22.

Jan van den Ende, "Tidal Calculations in the Netherlands," *Annals of the History of Computing*, 14:3(1992):23-33.

Amy Weaver Fisher and James L. McKenney, "The Development of the ERMA Banking System: Lessons from History," *Annals of the History of Computing*, 15:1(1993): 44-57.

M.D. Godfrey and D.F. Hendry, "The Computer as von Neumann Planned It," *Annals of the History of Computing*, 15:1(1993):11-21.

I. Grattan-Guinness, "Charles Babbage as an Algorithmic Thinker," *Annals of the History of Computing*, 14:3(1992): 34-48.

Roger M. Needham, "Later Developments at Cambridge: Titan, CAP, and the Cambridge Ring," *Annals of the History of Computing*, 14:4(1992): 57-58.

John M.M. Pinkerton, "The Influence of the Cambridge Mathematical Laboratory on the Leo Project," *Annals of the History of Computing*, 14:4(1992):41-48.

Special Issue: "Computing at the University of Cambridge," *Annals of the History of Computing*, 14:4(1992).

Doron D. Swade, "Redeeming Charles Babbage's Mechanical Computer," *Scientific American*, 268:2(1993): 86-91.

David J. Wheeler, "The EDSAC Programming Systems," *Annals of the History of Computing*, 14:4(1992):34-40.

Joyce M. Wheeler, "Applications of the EDSAC," *Annals of the History of Computing*, 14:4(1992): 27-33.

Maurice V. Wilkes, "EDSAC 2," *Annals of the History of Computing*, 14:4(1992): 49-56.

Michael R. Williams, "The Origins, Uses, and Fate of the EDVAC," *Annals of the History of Computing*, 15:1(1993): 22-38. □

CHARLES BABBAGE INSTITUTE

NEWSLETTER

The Charles Babbage Institute, Center for the History of Information Processing, is sponsored by the University of Minnesota and the information processing community. Arthur L. Norberg, Director.

Charles Babbage Institute Newsletter is a publication of the Charles Babbage Institute, University of Minnesota, 103 Walter Library, 117 Pleasant Street S.E., Minneapolis, MN 55455 USA, telephone (612) 624-5050. The Newsletter reports on Institute activities and other developments in the history of information processing. Permission to copy without fee 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 the Institute.
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Production of this newsletter is supported by the Charles Babbage Foundation.

Upcoming Conferences

Collecting and Creating Computers

The U.K. National Museum of Science and Industry is planning a workshop and conference on collecting and conserving computers. This one-day conference/ workshop will cover practical, philosophical and ethical issues associated with the conservation and restoration of electronic computing machines. The program includes a case study based on the successful restoration to working order of a large vacuum tube computer (Ferranti *Pegasus*, c. 1958) at the Science Museum. The program also considers the implications of new techniques pioneered by the team to capture the operational persona of obsolete machines through simulation on modern computers.

The workshop/conference is scheduled for Thursday June 24, 1993 at the Science Museum, London. The conference is intended for conservationists, industrial archaeologists, curators, restorers, and other interested parties. For further information contact Ms A. Jack, Science Museum, South Kensington, London SW7 2DD, United Kingdom. Telephone 071 938 8239.

Busines History Conference

The 39th annual meeting of the Business History Conference will be held at the Harvard Business School, March 19-21, 1993. Of particular interest is a session entitled "Organizational Capabilities and the Emergence of the International Computer Industry." The three speakers for this session are Steven Usselman (University of North Carolina) "IBM and its Imitators," Arthur Norberg (Charles Babbage Institute/University of Minnesota) "New Engineering Companies and the Evolution of the United States Computer Industry," and Martin Campbell-Kelly (University of Warwick) "ICL and the British Computer Industry." The session commentator is Peter Temin (MIT). For further information contact William J. Hauseman, Secretary-Treasurer, Department of Economics, College of William and Mary, Williamsburg, VA, USA 21387-8795
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differential analysis is carried out exclusively in software realizations, executed on digital computers, with little or no limitations in equation complexity or limit values.

Prof. Holst has for some time been interested in the history of technology and particularly of differential analyzers. During the Summer of 1992 he carried out a number of preliminary investigations in Norway, notably of the early mechanical differential analyzer which was built at the Astrophysics Institute at the University of Oslo during the late 1930s. As part of an extended stay at universities and institutions in the U.S., he spent several months at the Charles Babbage Institute. The central subject of his research during his stay in Minneapolis was the period leading up to the construction and applications of mechanical differential analyzers worldwide, especially the enabling technologies that permitted the MIT team to build their machine. The resources of the Institute were instrumental in locating and documenting the early activities in American differential analyzers and provided information about the connections between the differential analyzers, their application areas, and the development of digital computing technologies.

This research project is funded by the Rogaland University Center, Stavanger, Norway.

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Computing Terminology

Richard Lynch is currently teaching information systems at Baruch College/ CUNY. He defended his dissertation, *On Analytical "Engines," Data "Architectures" and Software "Engineers": Metaphoric Aspects of the Development of Computer Terminology*, at Columbia University Teachers College in October 1992.

The study argues that in the evolution of concepts of computing, the computer domain selectively borrowed terms from more tangible, better known domains such as biology, mechanics, etc. In doing so, the new uses for old terms grounded the more abstract computing concepts, highlighting aspects of similarity with the old domains while hiding those aspects of the domains which were in fact dissimilar. Ultimately the meaning of the original terms were changed or extended to include the new computing uses.

The disseration suggests that the computing uses of the terms "machine," "digital," "reading," "writing," "memory," and "language" all exhibited this pattern which is typical of non-literary metaphor. Later computer terms such as "life cycle," "maintenance," and the computer uses of "architecture" and "engineering" (in software engineering) all show that pattern.

The dissertation makes extensive use of early glossaries of terms to show the evolution of the terms in the field. In doing so, it extends the approach of social construction of technology by focusing on the role of language in technological change. The work will be of interest to historians of computing and those interested more generally in the history of technology.

In summary, the work argues that the terms we use to describe computing have an important effect on the way we conceptualize both computers and the development of systems.

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Software Development Standards

As a historian among sociologists, Stuart Shapiro finds working at the Centre for Research into Innovation, Culture and Technology (CRICT) at Brunel University in England an interesting change from a traditional history department. CRICT is one of a network of research centers established by the UK's Economic and Social Research Council (ESRC) through its Programme on Information and Communication Technologies (PICT). PICT has helped support a wide variety of policy relevant research on these technologies. The bulk of PICT research is sociological or economic in nature and Shapiro, a historian and former CBI fellowship recipient, has endeavored to bring an explicitly historical perspective to its work.

CBI Receives Book Contract

Johns Hopkins Universtiy Press has tendered a contract to CBI to convert the DARPA/IPTO Report into a book. CBI agreed to reorganize the material into an integrated and more coherent history. The task of rewriting has been assumed by Norberg, and work has already begun.

Shapiro completed his dissertation at Carnegie Mellon University where his work on the history of software engineering produced a synthesis of historical and sociological analysis. For the last year and a half he has been continuing this line of research employing British sources. Combined, this work forms the basis for a book currently in progress on the historical and social construction of software technology.

One of the key insights Shapiro has derived from this work has been an appreciation of the importance of the institutional and cognitive processes of categorization which find their expression in formal and informal standards for terminology, procedure, and artifacts. Because software is so malleable and so versatile in terms of its application domains, processes of standardization formulation and implementation have been both unusually critical and unusually problematic compared to other technologies. This has led him to his next project, which will be an ESRC-funded study of software development standards in commercial settings. This study will employ historical and ethnographic approaches to examine the way procedural standards have emerged and are applied in three different businesses engaged in software development. By the end of the study, Shapiro hopes to have a clearer understanding of the factors that affect such standards.

Shapiro also maintains an interest in

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the history of engineering education and relations between academia and industry. He is particularly interested in how engineering knowledge structures evolved in both industry and academia, how they relate to one another, and the implications of those changing relations for the teaching and practice of software engineering.

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Computers in Canada

With the aid of the Social Sciences and Humanities Research Council of Canada (SSHRC), Michael R. Williams has spent the last two years actively researching the background to the early development and use of computers in Canada.

Recognition of the important role that computation would play in the development of Canadian science and industry largely stemmed from the experiences that various Canadian scientists had during the period of the Second World War. In particular, several people from the University of Toronto spent the War years on secondment to the military investigating such topics as the behavior of shells in flight and the statistical calculations relating to weather conditions, all of which required extensive calculation. After the War these people formed a nucleus of interest in the subject, generally centered around the Departments of Mathematics and Physics at the University of Toronto. The Canadian government had participated with Britain and the United States in post-war research into atomic energy, leading to the development of various computational needs. These two groups joined forces in the late 1940s to found a computer construction project at the University of Toronto — at a time when there was no operational stored-program computer anywhere in the world.

The result of these efforts was the UTEC (University of Toronto Electronic Computer), a small pilot model for what was hoped later to be a full-scale development. Although too small to be really useful (256 words of 12 bits stored in a CRT, Williams' tube, memory), the UTEC was operational before many of its more famous followers.

Before the larger scale machine was completed, a series of political changes in the British government resulted in the second Ferranti Mark I (the first was used by the University of Manchester), becoming available. The Canadian Atomic Energy people persuaded the University of Toronto to use their funding to purchase this machine rather than build their own. Thus, in April of 1952, the U of T became the second (or third, depending on how you count) recipient of a commercially constructed computer in the world, just shortly after the UNIVAC I was delivered to the U. S. Bureau of Census. This machine, the FERUT (FERranti-U of T), was the springboard from which Canada's expertise in computing took off. It provided service to such projects as the design of the joint Canadian-U.S. St. Lawrence Seaway as well as providing a research platform for very early programming language experiments and remote service to other parts of Canada over a 2,000 mile telex line.

Subsequent developments by Ferranti's Canadian subsidiary, Ferranti-Packard, eventually resulted in a machine, the FP-6000, which was one of the world's earliest multi-programming machines and was adopted as the design basis for the ICT 1900 series of computers manufactured in Britain. Another spin off of this effort was the development by Trans Canada Airlines (now Air Canada) of the first airline reservation system that used fully programmable machines to control a continent-wide seat reservation system — a year ahead of the SABRE system installed by American Airlines.

The first publications from this project are to appear in 1994.

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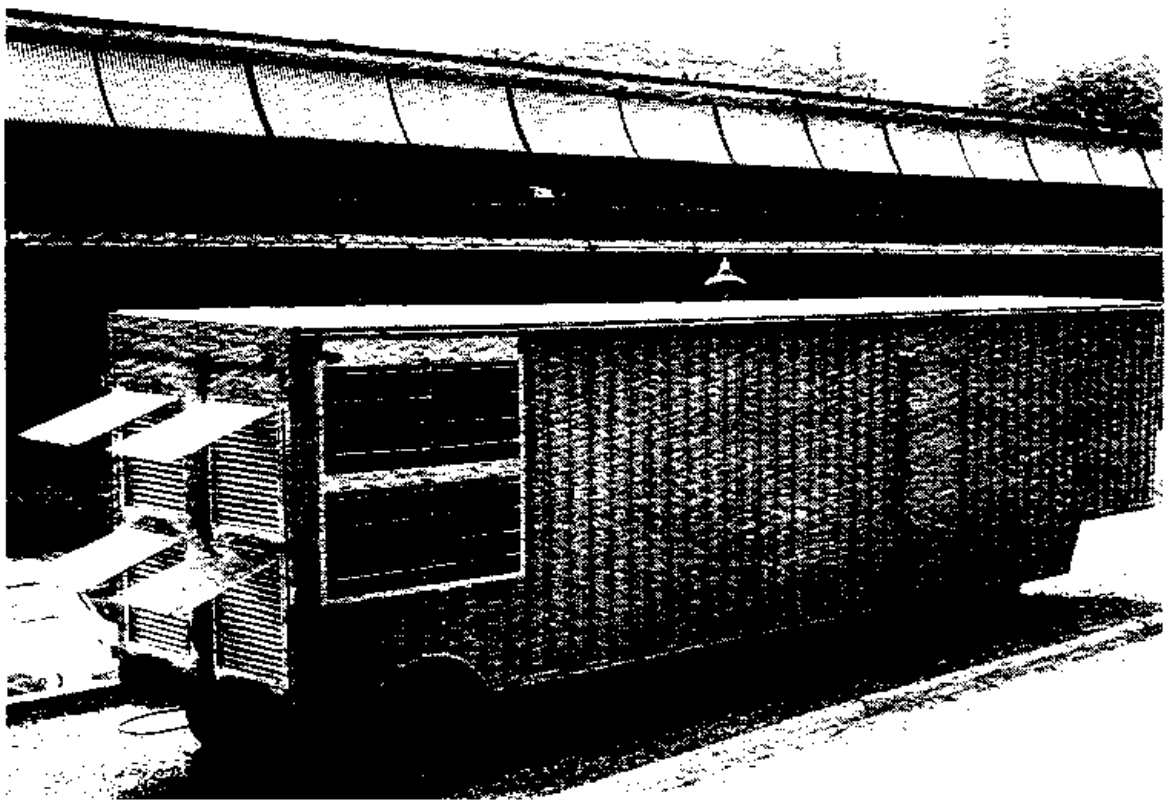
supplied the management of the company with information that was used in policy making.

In addition to the archives, the group toured the Exploratorium in San Francisco, the Tech Museum of Innovation in San Jose, and the Intel Museum at the corporate headquarters in Santa Clara. All three provided different perspectives on inventive uses of high-technology artifact collections. The last site tour was hosted by Jodelle French, curator of the Intel Museum, who described the development of the company's museum and its role in communicating the culture of Intel to employees and their families, as well as the educational value of the museum for customers and the public.

After the Intel tour the meeting participants enjoyed an afternoon of discussion over methods of making historical programs relevant to companies, the participation of cultural institutions (such as CBI and the Smithsonian) in fostering better documentation of the computer industry, and problems and opportunities facing the group. The discussion focused on a common interest in high-technology, rather than the individual perspectives offered by the records management, archival, and museum communities. The group felt that similar meetings should be held in the future, and tentatively agreed to meet in 1994.

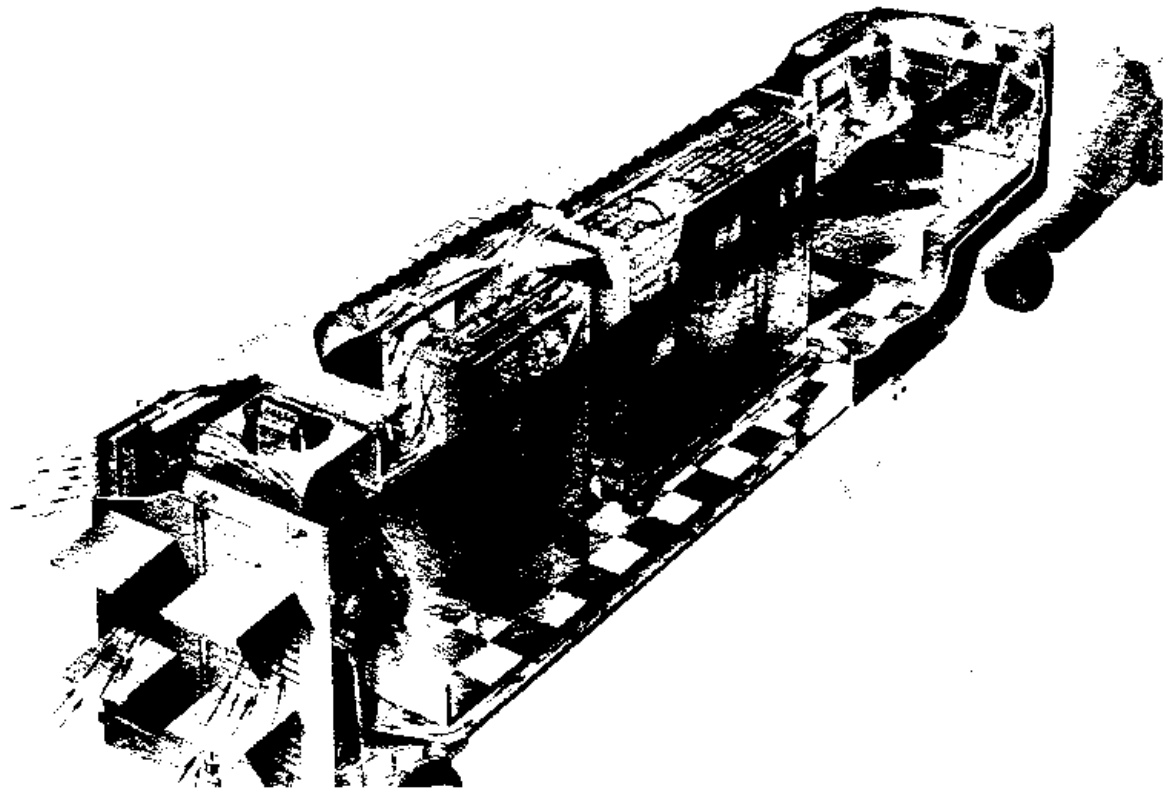
Preceding the workshop, representatives from Apple Computer, CBI, Microsoft, and the Smithsonian met to discuss a National Software Library. This discussion grew out of an initial meeting led by David Allison of the Smithsonian National Museum of American History. A number of microcomputer companies hold large collections of non-current microcomputer software which they feel have historical value and may be worth preserving. In addition, the Library Congress has acquired a major collection of microcomputer software through material submitted for copyright registration. The short meeting solicited the interest of the participants and outlined preliminary steps to identify other collections and interested parties. Another meeting is scheduled for the fall of 1993. □



Fortieth Anniversary of the DYSEAC

In July of 1953, the Research and Development Board of the National Bureau of Standards completed the DYSEAC computer and delivered it to the U.S. Army Signal Corps. A team of twenty-five people built the DYSEAC in eighteen months. The DYSEAC was designed as a non-numeric machine. Its design allowed for the external environment to automatically control the pace of the internal work program and incorporated an interruption property which enabled the machine to handle unscheduled job assignments. These features enabled the DYSEAC to work in connection with other machines such as its precursor, the SEAC, which used the same language and added to its overall flexibility.

The DYSEAC was unique in its installation. It was housed in two trailer vans which allowed it to be moved to its actual operating site. A modular system was used throughout, with groups of approximately fifty components being mounted into aluminum boxes that plugged into standardized racks. Because of its mobility, all components were cushioned against shock with fragile parts (such as the mercury delay lines) removed and specially packaged. The accompanying photographs show one of the trailers which housed the DYSEAC and a cut away view exposing the internal layout of one of the vans. □



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History of Programming Languages Conference and a Forum on the History of Computing

The Second History of Programming Languages Conference and a Forum on the History of Computing are scheduled for April 20-23, 1993 in Cambridge, Ma. For further information see the *CBI Newsletters* 14:2 and 14:3 or contact Dan Halbert, Telephone: 617 621-6616 e-mail hopl@crl.dec.com.

History and Development of Informatics Conference

The History and Development of Informatics Conference is scheduled for October 13-15, 1993 in Sophia-Antipolis, France. For further information see the *CBI Newsletter* 14:4 or contact Colloque Histoire de L' Informatique, INRIA; Telephone: 33-93 657864 e-mail: simoneti@sophia.inria.fr. □

Silicon Valley Information Center Closes

The Silicon Valley Information Center (SVIC) was closed July 3, 1992, due to reduced resources. The most heavily used SVIC directories and books have been transferred to the San Jose Public Library Reference Unit, and a Business Information area has been established so that these and other business materials can more easily be used by patrons. Computerized access to these materials is available through the San Jose Public Library online catalog, but dial-up access is no longer available. The document delivery service has been discontinued, and the SVIC collection of corporate documents and the clipping file are in storage and unavailable. □

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CBI acknowledges the individuals and groups listed below for their support of the programs of the Institute through their membership in the 1993 CBI Friends Program.

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