

CHARLES BABBAGE INSTITUTE NEWSLETTER

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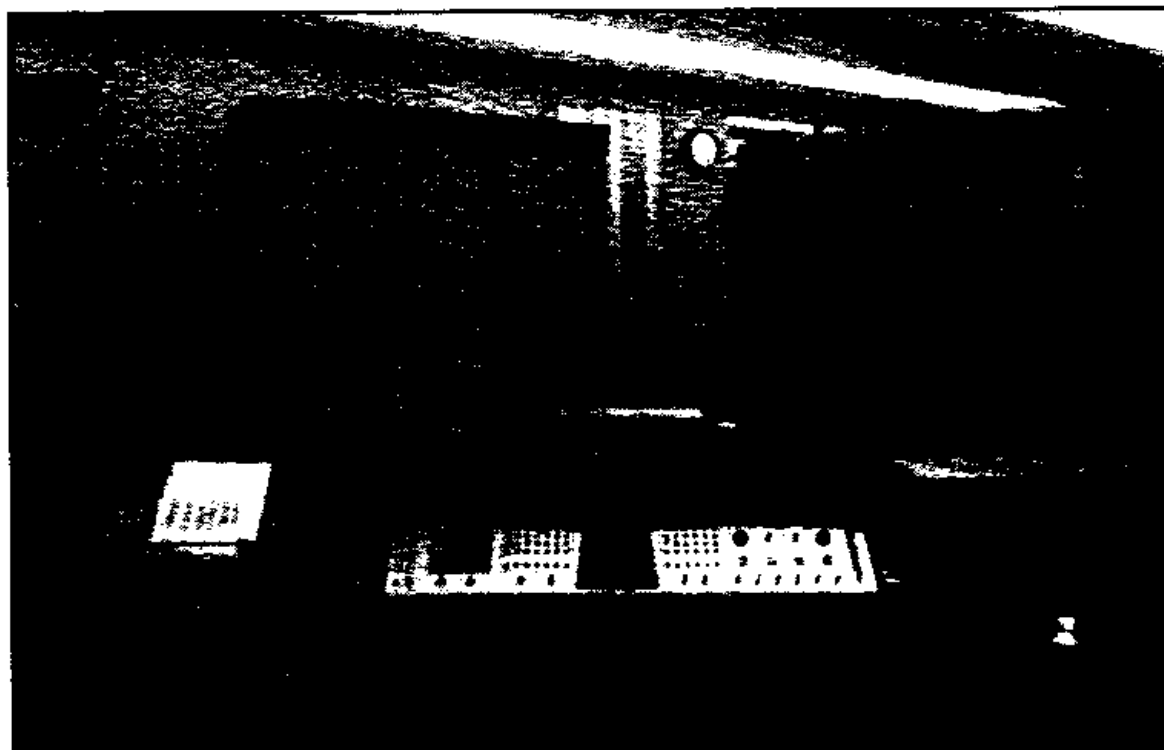
CENTER FOR THE HISTORY OF INFORMATION PROCESSING

ERMA Celebration

by Peter Nurkse
Sun Microsystems

The development of "ERMA," the Electronic Recording Machine -- Accounting, was the subject of two recent programs in the series of *Bay Area Computer History Perspectives* organized by Peter Nurkse and Jeanie Treichel, both of Sun Microsystems. The ERMA system was developed at Stanford Research Institute (SRI, now SRI International) to process checks for the Bank of America beginning in 1950. In 1956 General Electric (GE) began to manufacture production ERMA systems. At the first program in September 1993, Jack Goldberg discussed the development of the ERMA prototype and Fred Kamphoefner talked about the history of Magnetic Ink Character Recognition (MICR) that was developed at SRI for the ERMA system. At the second program Jack Goldberg covered the transition of the system from SRI to GE, Herman Moss represented the GE development team, and Tony Russo related his experience as a Bank of America applications programmer. Both programs were held at SRI International in Menlo Park, California.

ERMA marked the first time that commercial data processing was completed on a daily basis. Although the Bank of America had used computers for processing some types of loans and for savings accounts with punched card savings books prior to ERMA, the strict time limits imposed by check processing required a new type of system. Banking regulations required a bank to either accept or reject a check within 24 hours. One day's accumulation of checks had to be processed the following night, within about six hours. To implement ERMA



GE-ERMA console from CBI Collection.

involved not only new and leading-edge hardware, software, peripherals, and applications, but also required training people, writing manuals, building facilities, and especially changing well established banking procedures and traditions. Fundamental changes were required at the clearing houses which channeled checks to the banks for

processing, as well as at Bank of America itself.

The ERMA prototype developed by SRI beginning in 1950 was based on 1500 diode-tube logic modules and 500 relay modules, with a total of 8200 vacuum tubes. It weighed 25 tons and occupied 400 square feet. Two drums

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Stepka Joins CBI as Project Archivist

Susan A. Stepka began work at CBI in September as the Burroughs Project Archivist, a temporary position made possible by a grant from the Unisys Corporation. Ms. Stepka is a recent graduate of the University of Wisconsin--Milwaukee, where she received her masters degree in library science with a concentration in archives administration. She was employed by the Milwaukee Urban Archives and developed an oral history guide to the collection of the West Central Minnesota Historical Center at the Morris campus of the University of

Minnesota, where she received her undergraduate degree in history. Most recently she worked with the Ramsey County (Minnesota) Historical Society and Oshkosh B'Gosh, Inc. (Oshkosh, Wisconsin), where she produced a finding aid to the company's records for its anniversary.

Ms. Stepka's work at CBI will focus exclusively on the 500 cubic feet of Burroughs Corporation Records, which was donated by the Unisys Corporation in 1990. The collection includes

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Recent Oral Histories by CBI Staff

CBI staff recently conducted three new interviews that we expect to release by the end of the year. In addition, the interview conducted last year of Isaac L. Auerbach (see Fall 1992 newsletter) and the interviews with Robert M. Fano, J.C.R. Licklider, Jack P. Ruina, and Charles A. Zracket are now open and available to researchers.

Calvin N. and Charlotte Mooers. *Oral history interview conducted by Kevin D. Corbitt, 22 June 1993, Minneapolis, MN*

Calvin N. and Charlotte Mooers discuss his research and promotion of information retrieval systems, computer systems, and programming languages from the late 1940s through the early 1990s. The Mooers discussed the development of Zatorcoding, the formation of the Zator Company to market Zatorcoding equipment and techniques, and Calvin's return to computer research in the early fifties. The interview continues with the formation of Rockford Research Institute, Inc., the development of the TRAC language, and Calvin's role

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in the development of ASCII code in the sixties. The interview concludes with a brief synopsis of Calvin's current projects.

Chester Irwin Lappen. *Oral history interview conducted by Arthur L. Norberg, 10 June 1993, Los Angeles, CA*

After briefly describing his educational background and activities prior to the 1950s, Lappen discusses his association with Telemeter, Telemeter Magnetics, and DataProducts companies. He discusses Telemeter's research and development work on pay TV and describes the separation of Telemeter Magnetics (which manufactured core memories for computer companies) from the pay TV operation. He describes the growth of Telemeter Magnetics, its product line, and the decision by Erwin Tomash, Willis K. Drake, and Lappen to found DataProducts in 1962 after Telemeter Magnetics had been sold to Ampex. This is followed by a discussion of DataProducts' operations and products. He concludes by assessing the innovations made by DataProducts and by

21st Century Report

The Computer Professionals for Social Responsibility (CPSR) recently published a report by Gary Chapman and Joel Yudkin entitled *The 21st Century Project: Setting a New Course for Science and Technology Policy*.

The 21st Century Project is an attempt to lay out a framework for United States science and technology policy for the remaining years of this century and the early years of the next one. The report offers a perspective on recent trends in science and technology policy in the United States. It describes and critiques an emerging post-Cold War paradigm for science and technology policy, and offers an alternative.

CPSR is a national alliance of people in the computing field concerned about the social impact of developments in information technologies. To obtain a copy of the report (\$15) or for further information contact CPSR at: P.O. Box 717, Palo Alto, Ca 94302-0717
Telephone: 415 322-3778
e-mail: cpsr@csl.stanford.edu □

describing the challenges of forming a high technology company.

George M. Ryan. *Oral history interview conducted by Arthur L. Norberg, 10-11 June 1993, Los Angeles, CA*

Ryan discusses his work with Benson-Lehner, a manufacturer of digital plotters, including the Computyper, a billing machine that was a combination of a Friden calculator and an IBM Selectric typewriter. He recalls selling the Computyper to Friden, and then joining Friden, where he was involved in the purchase of the Flexowriter from Commercial Controls. He discusses his return to Benson-Lehner and his departure to form Intercontinental Systems, Inc. with Pete Taylor. The company was formed to distribute the Dura typewriter and other data processing products. He describes his initial ideas for what became Cado Systems and describes the small business computers that Cado built. He recalls the expansion of Cado into international markets and the eventual sale of Cado to Contel. □

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correspondence, reports, press releases, technical manuals, product literature, oral histories, artifacts, serials, rare books, and over 100,000 photographs covering the early history of the company (as American Arithmometer) to its merger with the Sperry Corporation. Ms. Stepka will be responsible for the arranging, preserving, and describing the collection, as well as handling reference requests. □



Susan A. Stepka

Become a Friend of the Charles Babbage Institute

We would like you to become a Friend of the Charles Babbage Institute (CBI). The institute is dedicated to promoting the study of the history of information processing. By becoming a Friend of CBI, you can help support the activities of the Institute and learn more about the remarkable development and impact of information processing in society.

CBI's Major Programs

Historical Research CBI specializes in researching historical areas of the information processing field. Topics have included development of the computer industry, scientific computation, the role of government in computing, and technical developments. The results of this research can be found in a series of popular and scholarly books and articles published by the CBI staff.

Historical Collection CBI documents the history of computing with a large collection of historical materials. Chief among them are records donated to the institute by computer scientists, industrialists, businesses, and professional organizations. Our audio/visual collec-

tion contains more than 300,000 items, largely photographs. CBI has recorded oral interviews with over three hundred pioneering individuals in the information processing field. Arrangements can be made in person or by telephone for reproduction of many of the items in the collection. A reading room is available with professional staff to help users.

Archival Advocacy CBI maintains ties to other repositories and encourages the documentation of information processing. Also, it conducts archival research projects.

Graduate Fellowships CBI awards the Adelle and Erwin Tomash Fellowship in the History of Information Processing to graduate students whose dissertations address an aspect of the field's history.

Reprint Series Much of the historical work in the rapidly changing information processing field depends on the use of difficult-to-obtain monographs, conference proceedings, manuals, government reports, and books, issued in very small circulation numbers. The *Reprint Series*, available through CBI, brings these works into wider circulation.

Publications CBI produces this *Newsletter* four times a year. It contains information about current activities at CBI and elsewhere relating to the history of information processing. The Institute also produces occasional papers such as bibliographies and finding aids.

Symposia CBI hosts and co-sponsors conference and lectures in which we provide an historical perspective to contemporary issues surrounding the information processing field. Symposia are directed towards producers, users, public policy makers, archivists, academicians, and many others.

Become a Friend

As an individual, you can join with others to make an important contribution to the activities at CBI. There is a wide range of supporting categories. Details of the Friends Program offerings are listed below on the membership application form. Contributions to the Charles Babbage Institute are tax-exempt. We greatly appreciate matching contributions from companies that match employees gifts. Thank you for considering becoming a **Friend of CBI**.

I would like to join in membership as a "FRIEND OF CBI". Enclosed is my check for the category indicated, made payable to the *Charles Babbage Foundation*.

- _____ Associate Member \$30 donation
(receives 20% discount on *CBI Reprint Series for the History of Computing*)
- _____ Participating Associate \$100 donation
(receives 20% discount on *Reprint Series* and a subscription to the *Annals of the History of Computing*.)
- _____ Colleague \$250 Donation
(receives one free book from *Reprint Series* and a subscription to the *Annals of the History of Computing*.)
- _____ Sustaining Colleague \$500 donation
(receives two free books from *Reprint Series* and a subscription to the *Annals of the History of Computing*.)
- _____ Patron \$1,000 donation
(receives four free books from *Reprint Series* and a subscription to the *Annals of the History of Computing*.)

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Address _____
City _____ State _____ ZIP _____

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Recent Publications

Gary Chapman and Joel Yudkin, *The 21st Century Project: Setting a New Course for Science and Technology Policy*. Palo Alto, CA: Computer Professionals for Social Responsibility, 1993.

Charles H. Ferguson and Charles R. Morris, *Computer Wars: How the West can Win in a Post-IBM World*. New York: Times Books, 1993.

Benjamin Gomes-Casseres, "Computers: Alliances and Industry Evolution," in *Beyond Free Trade: Firms, Governments, and Global Competition*. David B. Yoffie, ed. Boston, MA: Harvard Business School Press, 1993.

Anthony Ralston and Edwin D. Reilly, eds., *Encyclopedia of Computer Science*. New York: Van Nostrand Reinhold, 1993.

Rebecca Elizabeth Skinner, "Developmental Characteristics and Spatial Formations in the Commercialization of Knowledge Base System Shells, 1975-1991." Ph.D. Dissertation. University of California at Berkeley, 1993.

Articles of Interest

Colin Burke, "An Introduction to an Historic Computer Document: The 1946 Pendergrass Report Cryptanalysis and the Digital Computer," *Cryptologia*, 17:2(1993):113-123.

Mark Clark, "Suppressing Innovation: Bell Laboratories and Magnetic Recording," *Technology and Culture*, 34:3(1993):516-538.

Mary Croarken, "The Beginnings of the Manchester Computer Phenomenon: People and Influences," *Annals of the History of Computing*, 15:3(1993): 9-16.

Richard Giordano, "Institutional Change and Regeneration: A Biography of the Computer Science Department at the University of Manchester," *Annals of the History of Computing*, 15:3(1993): 55-62.

Richard N. Langlois, "External Economies and Economic Progress: The

Recent Publications continued on page 6...

When You Move...

Please let us know your new mailing address. This will ensure your receiving the *CBI Newsletter* on a timely basis and also save us postage costs. Thank you.

Current Projects and Research

A wide range of activities are under way in the history of computing. We invite researchers to share their interests and current projects and research with our readers in future newsletters. Please contact Judy O'Neill at CBI for further information.

Proof Requirements in the Orange Book: Origins, Implementation, and Implications

Garrel Pottinger, Visiting Fellow, Mathematical Sciences Institute, Cornell University, is working on a project dealing with the history of formal methods and is the principal investigator for the section of the project that is investigating the origins, implementation, and implications of the proof requirements in the Department of Defense's Orange Book. The Orange Book (officially, Department of Defense Trusted Computer System Evaluation Criteria, DOD 5200.28-STD) defines a hierarchy of security classes for computer systems. The hierarchy has seven levels — D, C1, C2, B1, B2, B3, A1, listed in order of increasing security. Beginning with class B2, some of the requirements used in defining assurance for the hierarchy of security classes mandate that the system and/or its design be proved to have certain specified properties, and these proof requirements become increasingly stringent in passing from level B2 through level B3 to level A1.

The project report (in preparation) focuses on three main issues related to proof requirements. The first issue is why and how the Orange Book was written. The second issue is the ambiguities and vagueness that came to light when producers of computer systems tried to build systems that met Orange Book requirements. How the producers and DOD resolved these problems is also explored. The third issue is the implications for future attempts to specify assurance for computer systems.

The project report is based on a combination of documentary evidence and interviews with persons involved in the processes mentioned above. Although the report is focused on issues that

arise from imposing highly technical and esoteric requirements on computer system development, it discusses the actions and interactions of a great variety of people and institutions. Questions that require answers based on a correspondingly diverse range of knowledge and expertise are considered.

The research aims to produce a document that is informative and accurate in itself and is a sound basis for further research devoted to the topics discussed. The conclusions are tentative, because data available from the current research effort fall far short of what would be needed to support definitive claims. A number of ways in which the research could, and should, be extended are mentioned in the report.

The project is a joint research effort carried out by the University of Edinburgh and Smithers Scientific Services, Inc. as part of a larger research effort, *The Generation of Advanced Computing: Formal Methods of Software Development*, being conducted by the Research Centre for Social Sciences, University of Edinburgh. Responsibility for the project in Edinburgh lies with Professor Donald MacKenzie, Sociology Department, University of Edinburgh. Dr. Pottinger, acting as a subcontractor for Smithers Scientific Services, is responsible for conducting the research and preparing the project report. Support was provided by the UK Economic and Social Research Council's Programme on Information and Communication Technologies (PICT), the University of Edinburgh, the United States Army Research Office through the Army Center of Excellence for Symbolic Methods in Algorithmic Mathematics (ACSyAM), Mathematical Sciences Institute of Cornell University, and the United States Naval Research Laboratory.

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Video Tapes

Further evidence of the poor longevity of videotape was uncovered at the Charles Babbage Institute when a researcher requested a viewing of the "Mockingbird Demonstration." Mockingbird was program developed by Severo Ornstein, John Maxwell, and others at Xerox PARC to score and play music using traditional notation. The demonstration was recorded in April 1981 on Sony U-Matic tape cassettes, a popular video recording medium prior to the release of VHS and Beta cassettes. The tape itself was donated to CBI by Mrs. Alan Perlis along with other records kept by her husband. The tape was playable when it was donated in 1990, but during recent playback the picture deteriorated markedly within a few seconds.

U-Matic tapes have a reputation for finicky playback, and often different controls on U-Matic players must be adjusted to coax a reasonable video picture from the tape. But in the case of the Mockingbird Demonstration, the picture was viewable as it began but quickly deteriorated within a matter of seconds. After unsuccessful attempts at adjusting the tracking of the tape, the video playback heads were cleaned. This time the same passage produced a good picture, but again deteriorated quickly. Similar results were obtain using a different playback unit.

After consultation with the University of Minnesota Media Resources Center, the problem was suspected to be the "sticky shed syndrome." This is a problem that was identified with audio recordings made during the late 1970s which employed a certain formulation in the binder that holds the magnetic oxide coating to the polyester tape base. After a period of years the tape becomes sensitive to humidity and deposits a sticky layer over the magnetic oxide coating, rendering the tape unplayable. Two techniques have been uncovered to temporarily fix the problem. One is a proprietary treatment by Agfa that costs over \$250 per tape and the other is to warm 1/4" tape to 130° F. for four hours (see Philip De Lancie, "Sticky Shed Syndrome" *Mix*

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ERMA continued from page 1...

were available for system memory and twelve 2400 foot tape drives were used to store information.

One part of the original SRI development project has endured: the magnetic ink characters printed at the bottom of every check. Magnetic ink was required for machine readable text because banks and their customers were accustomed to writing and stamping checks in every other kind of ink. When Bank of America asked for bids for printing the initial batches of machine readable checks, the traditional check printers declined. A particular problem was the requirement to constantly stir the ink, to keep the iron particles in the ink in a homogenous solution. So the Bank took on the task of printing its checks, including designing special purpose equipment and providing training and support for printers, until the check printing industry was able to supply the demand.

GE began the development of the ERMA production systems in 1956. Although the initial contract between Bank of America and GE specified a goal of processing 55,000 checks daily on one machine, in production use ERMA could process 175,000 checks daily, in additions to travelers' cheques and savings transactions.

GE ERMA systems were in daily use

at the Bank of America for eleven years, from 1959 until 1970. Twenty years later, one ERMA machine was rescued from a basement store room in San Francisco and a team of dedicated volunteers restored it. It is now on display at an ERMA exhibit at the Bank of America Technology Center in Concord, California, just east of San Francisco. [See *CBI Newsletter* Volume 15 number 4] This exhibit includes the original system console, line printer, tape drives, and paper tape reader, as well as a check sorter. Video testimonies of some of the original developers of ERMA are part of the exhibit, as well as the 1959 press conference announcing the first use of ERMA in routine check processing. Interested visitors should contact Ed Hawthorne at the Bank of America Technology Center at 510 675-1303 to make arrangements to see this exhibit. Further information on the history of ERMA is available in two recent articles in the *Annals of the History of Computing* by Amy Weaver Fisher and James L. McKenney of the Harvard Business School MIS History Project ("The Development of the ERMA Banking System: Lessons from History," 15:1 (1993): 44-57 and "Manufacturing the ERMA Banking System: Lessons from History," 15:4 (1993): 7-26). □

A MESSAGE TO ALL MY CO-WORKERS FROM ERMA

IN MY ELEVEN YEARS OF SERVICE TO THE BANK OF AMERICA, I HAVE BEEN PRIVILEGED TO WORK WITH SOME OF THE BANK'S FINEST EMPLOYEES. FROM PEOPLE LIKE EMMETT JENKINS, DICK DAVIS, JOHN COOMBS, AND MANY MORE WHO WERE WITH ME FROM THE BEGINNING, TO BOB LEE AND ALL OF MY CURRENT CO-WORKERS WHO ARE ASSISTING ME IN THE PROCESSING OF TRAVELLERS CHEQUES—MY FINAL APPLICATION—I CAN ONLY SAY THANK YOU. TOGETHER WE HAVE MADE GREAT STRIDES IN BANKING. AND I CANNOT HELP BUT FEEL, AS THE FIRST COMPUTER SYSTEM TO BE USED FOR BANKING APPLICATIONS, THAT MY RETIREMENT BRINGS TO CLOSE AN HISTORIC ERA. TO BE THE FIRST IN SOMETHING IS A GREAT ACHIEVEMENT, AND I AM VERY PROUD. BUT MY SUCCESS COULD NOT HAVE BEEN POSSIBLE WITHOUT THE HELP OF SO MANY FINE PEOPLE.

ALTHOUGH THE END OF AN ERA IS NEAR, AND WE WILL SOON PART, I WILL NEVER FORGET MY FRIENDS, AND I WISH YOU ALL THE GREATEST SUCCESS IN THE FUTURE.

TO MY CURRENT—AND FINAL—ASSISTANTS, I BID FAREWELL—
MY BEST TO ALL,

ERMA

Retirement message from the last ERMA system in 1970.

Video Tapes continued from page 5...
(May 1990) 148-152).

While no discussion about sticky shed syndrome in videotape could be found in the literature, the symptoms of the Mockingbird Demonstration tape matched those described for audio tape. CBI's archivist constructed a low-heat oven and exposed the video tape to 4.5 hours of warming. Unfortunately there was no appreciable improvement in the picture once the tape cooled and was played. Rather than spend more time warming the video, the archivist opted instead to track down other copies of the tape. CBI had conducted an oral history interview with Severo Ornstein, and the archivist wrote him with hope that he had a copy of the tape. In this case the story had a happy ending because Ornstein donated two other copies of the Mockingbird Demonstration which were then dubbed onto VHS tape by CBI.

The episode with the Mockingbird Demonstration is particularly disturbing because it indicates that video tape barely twelve years old can become unplayable. Other videotapes in CBI's collection, such as the tape of the first History of Programming Languages Conference, have developed problems

that have made the tapes difficult to play or completely unplayable. This problem looms over the Burroughs Corporation collection, which contain over 500 videotapes, most of which are U-Matic. Unfortunately, the poor archival characteristics of videotape is an issue shared by archivist throughout the world. The only available solution to the problem is to transfer videotape to a more permanent medium (like film) or a medium that will not degrade with every subsequent copy (like digital tape). Unfortunately, both of these solutions are expensive. □

Correction

The photograph from HOPL-II in the Summer 1993 Newsletter should have been attributed to Michael Williams. We regret the oversight and wish to thank Professor Williams for allowing us to use his photograph. □

Tomash Fellowship

Applications for the Adelle and Erwin Tomash Fellowship in the History of Information Processing are due 15 January 1994. Further details can be obtained from the Summer 1993 CBI Newsletter or by contacting CBI. □

Recent Publications continued from page 4...
Case of the Microcomputer Industry," *Business History Review*, 66 (Spring 1992):1-50.

Simon H. Lavington, "Manchester Computer Architectures 1948-1975," *Annals of the History of Computing*, 15:3(1993):44-54.

James L. McKenney and Amy Weaver Fisher, "Manufacturing the ERMA Banking System: Lessons from History," *Annals of the History of Computing*, 15:4(1993):7-26.

J.T. Pendergrass, "Cryptanalytic Use of High-Speed Digital Computing Machines," *Cryptologia*, 17:2(1993):124-147. (Reprint of 1946 report.)

Larry Press, "Before the Altair: The History of Personal Computing," *Communications of the ACM*, 36:9(1993):27-33.

P.T. Saunders, "Alan Turing and Biology," *Annals of the History of Computing*, 15:3(1993):33-36.

Special Issue: "Computing at the University of Manchester," *Annals of the History of Computing*, 15:3 (1993).

Geoffrey Tweedale, "A Manchester Computer Pioneer: Ferranti in Retrospect," *Annals of the History of Computing*, 15:3(1993):37-43. □

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