The Making of the Micro: A History of the Computer. CHRISTOPHER EVANS. 2nd ed. Toronto: Oxford University Press, 1983. vii, 114 p. ISBN 0-19-286035-6 $4.75 pa.

Christopher Evans, noted computer expert and psychologist, died in 1979 before completing this short monograph. The forward and final chapter were written by Tom Stonier. The book has a light, friendly, professorial style. Its incisive summaries of concepts reflect its genesis in Evans' television series, *The Mighty Micro*. Evans performs the herculean task of condensing several hundred years of technological change and accompanying advancements in mathematical theory into about one hundred pages. He wisks easily from rudimentary number theory through the age of the abacus to the slide rule, mechanical calculators, and, finally, micro computers. This history is about the incremental advances in calculating and computing equipment over the centuries. It focuses on the people who were central to these developments, their inventions, and the strengths and weaknesses of their theoretical knowledge.

Those alienated by "computerese" will come away from this book feeling less threatened by binary arithmetic, Boolean operands, integrated circuits, microprocessors, core, mainframe, and mini. The book's other merits include an extensive index and a bibliography which includes a list of twenty hour-length interviews with giants of the modern computer era. *The Making of the Micro* provides an excellent way to penetrate the maze of "high tech," acquire esoteric trivia, and, at $4.75, stay within the financial constraints of the office gift exchange.

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The Archival Storage Potential of Microfilm, Magnetic Media and Optical Data Discs. TONY HENDLEY. Hertford: National Reprographic Centre for Documentation. 1983. 77 p. ISBN 0-85267-211-X. £10.00.

The rapid pace of technological change leaves archivists as bemused as most people. Computers appear, grow in size, and then, paradoxically, shrink as they become more powerful. The 64K chip succeeds the 16K chip which will be displaced by the 256K chip, whose obsolescence is already presaged by chips in the research stage. Video tapes, video discs, and disk cameras evolve with amazing rapidity, only to be replaced by better-adapted or new species. In the technological sense, the life of an archival medium resembles life in the Hobbesian state of nature: nasty, brutish, and short.

Into this rich chaos comes Tony Hendley to guide archivists past many a hazard. His report on the archival storage potential of three comparatively new storage media: microfilm, magnetic media, and optical data discs was commissioned by the British National Bibliographic Research Fund and published by the Reprographic Centre for Documentation — an institution which advises librarians, archivists, and information managers on developments in documentation systems. The report begins by showing how limited storage space and deterioration of paper make alternatives to retention of originals increasingly attractive. Unfortunately Hendley looks at these two problems in this part of his report from the librarians' perspective

only and ignores important differences between libraries and archives. For example, libraries may find conversion of information to microform is cost-effective, but the obvious solution to space pressures in archives is satellite storage and not miniaturization.

According to Hendley, librarians think the problem of paper deterioration is impossible to solve. Cooperative efforts and plans have failed, and limited resources allow only the most rare or unique items to be restored. Had he consulted recent literature on research into mass deacidification systems, he would have realized that institutions may have other options. If the more promising systems prove to be technically successful and cost-effective — and we should know in a year or so — libraries and archives will be able to deacidify material which is either new or in good condition. The usable life of these items would then range from several generations to several centuries. If deacidification costs the same or less than microfilm, it would be the most attractive solution to the deterioration problem in many cases.

When he turns to microfilm, Hendley is on more familiar ground and his treatment is excellent. He reviews the factors which ensure the permanence of silver film and reminds the reader that "you not only need a film that meets archival permanence requirements, you need to record, process, and store the film correctly too." Here the reader may well wish that he had elaborated upon the concept of archival permanence. In other words, what is actually meant when one says that an image will last for centuries? Archivists have long wondered whether, centuries from now, the image will be totally lost or will have only begun to deteriorate. The question is extremely important, especially when dealing with microfilm which is not very legible to begin with.

His consideration of diazo and vesicular film is balanced and discerning. Libraries are choosing this type of film more frequently for reference copies because of its durability and cheapness. On the other hand, Hendley and others have misgivings about widespread use of less permanent copies. Hendley sensibly leaves the choice to users since they know their requirements best. Short sections on dry process, updatable, and colour microfilm are followed by one on microfilm programmes. The latter, and the articles cited in his notes, will be very useful to archivists who are considering microfilm as a solution to their difficulties. The chapter closes with a description and assessment of computer-assisted retrieval systems.

The chapter on magnetic media is a good summary for the archivist who is struggling to keep up to date. Hendley explains how data is stored and used in a computer and then deals with discs, tapes, and mass storage systems. Magnetic discs are designed to be easily updated, erased, and accessed, and therefore must be seen "as a form of intermediate storage between the very high speed, high cost, volatile internal storage and the high capacity, low cost magnetic tape store." Magnetic tape is a more stable medium than discs, but still inadequate for storage of material of permanent value. Problems of tape quality, storage, and handling are such that users must resort to the costly procedure of annual copying to ensure integrity of the data. Magnetic tapes should be used as a short- to medium-range storage medium until the data can be transferred to paper or microfilm. This conclusion may surprise some who work with machine-readable records. After all, the U.S. National Bureau of Standards Special Publication 500-101 entitled "Care and Handling of Computer Magnetic Storage Media" (June 1983) anticipates a lifetime of twenty years for

current tapes, or about twice as long as that for tapes made in the 1960s. Regular recopying should protect the data much longer. What must be understood is Hendley's perspective. By permanent he means an indefinite period of time. Not enough is known about the total protective process for tapes to say with certainty that data storage in this form is archival.

Hendley's chapter on optical data discs offers a good, readable treatment of a complex topic. He explains what they are and how they arose from a merger of research on optical data storage systems for computers and the development of video discs for entertainment and educational purposes. The great attractiveness of this medium is its ability to provide high storage capacity (many thousands of pages per side), rapid access with the aid of a computer, great durability, and long life. Hendley gives a brief description of the types of video discs, and then turns his attention to those used for data storage and retrieval and to the problems encountered in their application. Because the technology is still in development, reliable information is difficult to sift from the bewildering array of claims, promises, and counterclaims. Hendley does an admirable job of ordering this chaos and focusing on essentials. His conclusion is that, while the prospects are exciting, it is simply too early to say anything with certainty. The problems of stability of the data (a ten-year storage lifespan appears to be the most common aim), error rates, storage capacity (far below theoretical capacity), speed of data recording, reasonable cost, and compatibility of data must still be solved by the dozen or so manufacturers in the race. Hendley's judgement seems fair:

> The first generation of optical data discs to reach the market is likely to have a storage life of between five to ten years and hence cannot be regarded as archival. Indications are that it will be the end of this decade and possibly even the early 1990s before optical data discs are sufficiently well established for archival tests to be carried out, standards laid down and for really meaningful predictions to be made about their storage potential. All the systems described above are incompatible.... It is too early to say which, if any of them, will be successful and any user who commits his archives to a particular company's disc will be ... in a very vulnerable position should the manufacturers of that disc decide to pull out of the market at a later stage.

The prudent archivist should monitor the technology closely. Those who are sufficiently motivated and wealthy might want to try limited tests to gain familiarity with the type of system which is likely to emerge. To go beyond this now is to risk walking into a swamp of conversion costs later.

Those who disagree with Hendley, or merely want to know more about the topics he discusses, can very profitably consult his extensive notes and bibliography. This little report should be the foundation of many archival policies in this field.

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