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VANISHING ACCOUNTING JOURNALS DUE TO PAPER DETERIORATION: A LABORATORY STUDY

Abstract: Many accounting documents and journals disintegrate every year due to the acidic quality of paper used in them. Using the laboratory of the Office of Preservation of the Library of Congress, certain accounting journals were analyzed for their acidic or alkaline paper. Journals printed on acidic paper, such as the *Accounting Historians Journal* and the *Accounting Review* can be expected to disintegrate quickly. Journals printed on alkaline paper, such as the *Journal of Accounting, Auditing & Finance* and *Taxation for Accountants* should last for centuries. Historians wishing to preserve material appearing in acidic journals should photocopy on alkaline paper or use microfilm.

Accounting historians are accustomed to seeing records and documents which are many centuries old. Unfortunately, this will be rare for new generations of historians. Each year, accounting historians lose an unknown number of irreplaceable documents. Some journals and documents yellow, crack at the edges, and eventually disintegrate. The reason for this is the acidic quality of paper being used today.^a The purpose of this article is to examine the problem of document deterioration using current selected accounting journals.

The major portion of the paper being manufactured today has a useful life of fifty years or less, due to processing methods which leave the paper acid.

Acknowledgement is made to Mrs. Ann Alexanian of the Price Waterhouse & Co. library for providing samples to be tested.

The mention of trade names in this article is for discussion only and in no way constitutes an endorsement or recommendation by the authors or their institutions.

^aInks from over 20 years ago may photocopy better due to the use of carbon black, rather than nigrosine, as a toner. A discussion of the physics of photocopying is beyond this paper's scope.

There have been many changes in paper technology in the last two hundred years. Ancient paper was produced from cellulose fibers obtained from cotton and flax rags. Modern paper is made from cellulose fibers extracted from wood. Newsprint uses unrefined wood fibers which still contain lignin from the tree, and as a result, turns a brown color when exposed to sunlight.

Higher grade paper is made from refined fibers which have been treated to remove the lignin. Recycling the acid paper results in poor quality paper from a preservation standpoint.

Paper is ordinarily produced "sized" or water repellent (droplets of water roll off without soaking in). Sized paper can be written on without the ink line "feathering." Ancient papers were made by hand, sheet by sheet and sized individually by dipping in a gelatin solution.

Modern paper is made continuously, in any length, and by machine. As the machinery was developed, in the early part of the 19th century, a new method of sizing was applied. Rosin soap was dispersed with the fiber in the beater and precipitated by the addition of alum.^b The paper then came from the machine in the sized condition. Unfortunately, as mentioned, the alum left the paper acid and shortened its life. Papermakers are aware of this fact. Newer sizing methods have now been developed which allow sized alkaline paper to be taken from the paper machine. If the paper also contains a filler such as fine calcium carbonate, the paper will remain alkaline even in polluted atmospheres. Unfortunately, most papermakers have not taken advantage of these newer techniques.

Alkaline papers are in existence today which were made over 1,000 years ago, while acid papers made in 1900 have disintegrated. While there is an advantage in strength and durability in making paper with rag fiber, it has been shown that refined fiber from wood can give long-lasting alkaline paper.^c The useful life of paper can be estimated by accelerating aging. A reasonably precise relation exists that 72 hours at 100°C in the dry oven is equivalent to 25 years at room temperature.

Paper becomes brittle on aging. The folding endurance of paper indicates the extent to which this has occurred. Folding endurance of paper is measured by placing a strip under tension and bending it continuously until it breaks. The paper is given accelerated aging

^b*Rosin* should not be confused with *resin*. Rosin is made of resin acids together with neutral materials.

^cOne common misconception is that high rag content will preserve paper; it will not, if the paper is acidic.

and the folding endurance is again measured. The rate of decline in folding endurance (the increase in embrittlement) can thus be assessed.

Using the laboratory of the Office of Preservation of the Library of Congress, the paper of major accounting journals was tested, for acidity and folding endurance (the issue treated is in parentheses).

Acidic journals:

Accounting Review (January, 1980)

Accounting Historians Journal (Spring, 1979)

CPA Journal (May, 1980)

Government Accountants Journal (Summer, 1979)

Journal of Accounting Research (Autumn, 1979)

Tax Advisor (June, 1980)

Alkaline journals:

Journal of Accounting, Auditing & Finance (Summer, 1979)

Taxation for Accountants (January, 1980)

The *Journal of Accountancy* (October, 1979) was neutral.

It was determined, that the more acidic the journal was originally, the faster the journal deteriorates. In particular, the *Accounting Review* and the *Accounting Historians Journal* are very acidic. In 50-75 years, both of these journals are likely to have disintegrated, while alkaline and neutral journals like the *Journal of Accounting, Auditing & Finance* and the *Journal of Accountancy*, respectively, are likely to last for many centuries (see appendix for more detail).

Readers and researchers of accounting history, and accounting firms with libraries, should realize that some journals will deteriorate very quickly. Historians may wish to photocopy key articles on an alkaline paper, or microfilm important papers. Publishers of scholarly journals may consider switching to printing on alkaline paper in the future. Those interested in obtaining information on alkaline paper should contact their local paper supply representative.

Appendix

The folding endurance of selected accounting journals was tested as the journals came from the publisher. The journals were aged 72 hours at 100°C., to simulate 25 years of aging. The following results are arranged by change in folding endurance.

	Average Number of Folds Before Breaking		Change in Folding Endurance (%)
	At Start	After 72 Hours	
<i>Accounting Review</i>	341	157	- 54.0%
<i>CPA Journal</i>	562	318	- 43.0%
<i>Accounting Historians Journal</i>	229	143	- 37.0%
<i>Tax Advisor</i>	327	206	- 37.0%
<i>Government Accountants Journal</i>	387	214	- 45.0%
<i>Taxation for Accountants</i>	582	527	- 9.5%
<i>Journal of Accountancy</i>	670	645	- 3.7%
<i>Journal of Accounting Research</i>	525	519	- 1.1% *
<i>Journal of Accounting, Auditing & Finance</i>	451	541	+ 20.0%

The most acid journals will have disintegrated long before the alkaline or neutral journals are in danger.

*While the *Journal of Accounting Research* exhibited a low drop in endurance, the authors believe that the high acidic content (pH = 5.0 at 72 hours) of the *Journal* will ultimately cause rapid deterioration.