

Permanence in book papers: investigation of deterioration in modern papers suggests a practical basis for remedy.

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# Permanence in Book Papers

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## Abstract

Deterioration of paper in the book stock—especially among books of recent decades—has become a serious problem for libraries, but exact measures of the extent or rate of this deterioration have not been available. By the same token, no good indications have been available of the expected useful life of paper in books currently coming off the press. Furthermore, although attention has been given to means of counteracting one of the recognized causes of deterioration—pollutants absorbed from the atmosphere—similar attention has not been given to the problems of identifying and counteracting the other recognized source of deterioration—agents left in or introduced into the paper at the time of manufacture. Our investigation was undertaken in an attempt to fill some of these gaps in our knowledge.

It has been found that modern books—even those written with a serious or

scholarly purpose ("nonfiction") and published ("to last!") in hard bindings—are deteriorating rapidly, and many of those issued 25 to 50 years ago are now almost unusable. The paper of an average American publication of the first decade of this century retains only 4 percent of the folding endurance of a typical new book paper of today; even the paper in the average publication of the 1940's has already declined in folding endurance to 36 percent of today's new book paper.

Meanwhile this typical new book paper itself shows low initial strength (for example, folding endurance on the order of only 20 percent of that of book papers already 200 to 500 years old) as well as indications that it is subject to rapid deterioration.

Acidity appears to be the principal cause of deterioration, both in the older papers and the new. A stabilizing process for neutralizing this acidity was developed and was brought during the investigation to an initial stage of economic feasibility. This process appears to inactivate the most injurious properties found in new book papers and precipitates compounds into the fibers which should, in addition, counteract the effect of pollutants absorbed from the air.

A principal technique used for predicting the durability of paper is the accelerated aging procedure developed by the National Bureau of Standards; by extending the use of this technique, interesting decay curves have been obtained which facilitate comparison of modern papers with papers which have already demonstrated their stability for several centuries. These curves offer other values as well for the study of permanence in paper and suggest that a principle exists relating extended accelerated aging to even longer periods of natural aging than those with which it has hitherto been equated.

During the past 300 years the papermaker has done an excellent job in meeting the demand for more and cheaper paper. A by-product of this accomplishment has been the production of many weak and unstable papers. This does not give rise to any problem where strength or stability are not critical, but where permanence is important, as in libraries of record, the problem becomes serious. While the present study describes a procedure for stabilizing initially unstable paper, much more remains to be done if relatively stable papers are to be made for books of lasting value. There is evidence

that this is possible—that such papers can be made from certain types of chemical wood fibers at but little additional cost. But more research is needed, and the cooperation of the scientist, papermaker, printer, publisher, and librarian will be required to assure permanent books for the future.



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