

William J. Barrow: A Remembrance and Appreciation

John A. Church

Abstract

William J. Barrow was a unique and significant individual in the history of archives preservation, the development of permanent/durable book paper, and the application of investigative techniques in these fields. The author, who worked with Barrow in his restoration shop and research laboratory during the 1950s when much of his major work was in progress, offers in this article an appreciation of his contributions. The article corrects some recent misapprehensions concerning Barrow and provides an account of his effective personal and problem-solving attributes.

Motivated by a desire to preserve his family's old books and records, William J. Barrow (1904–1967) began his career as a self-employed document restorer in the early 1930s.¹ Initially working with professionals in the field, he later developed his own techniques and equipment for deacidifying manuscripts and documents and strengthening them by lamination with cellulose acetate film and reinforcing tissue.² Deacidification effectively halted the harmful effects of acids in old writing inks, as well as other acids introduced when traditional paper production methods were modified during the Industrial Revolution.³ Barrow customarily finished his restoration treatment by binding the laminated materials into collated volumes for easy reference use.

Barrow's procedures were widely adopted and used for many decades in archives preservation, for libraries, and also for private clients. While

¹ Frazer G. Poole, in *Encyclopedia of Library and Information Science*, ed. Allen Kent and Harold Lancour (New York: Marcel Dekker, 1969), s.v. "Barrow, William James."

² William J. Barrow, "Restoration Methods," *American Archivist* 6 (July 1943): 151–54.

³ For the effect of acid in ink, see William J. Barrow, "Black Writing Ink of the Colonial Period," *American Archivist* 11 (October 1948): 291–307.

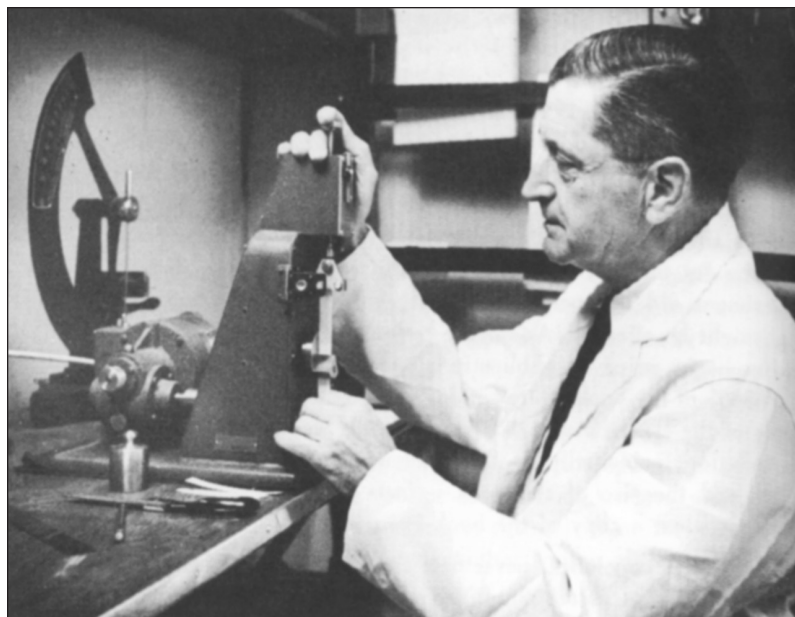
conducting his restoration business, he intensively studied the literature on paper deterioration, supplementing these studies with his own laboratory investigations to address points that he felt had not been adequately researched. Barrow's skills, curiosity, perseverance, inventiveness, publication record, and effective personality won him many friends and sponsors. In his later work, sponsored by the Council on Library Resources (now the Council on Library and Information Resources) from 1957 onward, Barrow applied his knowledge of paper deterioration to the development of permanent/durable book papers as well as other aspects of book-related science and technology. It can fairly be said that Barrow's research and publications in the permanent/durable paper area initiated the eventual widespread commercialization of acid-free papers for both book and archives use. Although he never completed his undergraduate education, he was awarded an honorary doctorate by his alma mater, Randolph-Macon College, a year before his death.

My task here is to remember and appreciate Bill Barrow from the viewpoint of one who was trained and mentored by him. I was associated with him for five summers as a laboratory assistant in the middle and late 1950s, afterward taking graduate degrees in the fields of cellulose and paper science and technology. Barrow's place in the history of preservation research and modern paper technology is certainly secure, but I take the present opportunity to clarify his work further and to give some personal insights into his character and methods. Barrow was an unusual individual, and the course of his career illustrates how a strong sense of dedication, coupled with other essential attributes, can lead to success in a particular field even without the benefit of advanced formal training.

Barrow and his work were extensively commented upon in Nicholson Baker's *Double Fold: Libraries and the Assault on Paper*. This book naturally aroused much interest within the library and archives fields as well as among the general public. Although *Double Fold* had value in that it prompted another look at some long-accepted dogmas and practices, it was marred by serious omissions and inaccuracies regarding a number of paper researchers and library figures, including Barrow. *Double Fold* was generally reviewed favorably in the popular press, but it had a different reception among those with professional experience in the relevant disciplines. Of many examples, the full-length work by Richard J. Cox and the review essay by James M. O'Toole should be consulted by those interested in pursuing these topics in more depth.⁴

Three of Barrow's and his collaborators' most significant and influential works were unreferenced in *Double Fold*. The first of these—a valuable and scholarly volume with 141 ancient and modern references—reviewed the history of ink and paper, followed by detailed descriptions of the various approaches that

⁴ Richard J. Cox, *Vandals in the Stacks? A Response to Nicholson Baker's Assault on Libraries* (Westport, Conn.: Greenwood Press, 2002) and James M. O'Toole, "Do Not Fold, Spindle, or Mutilate: *Double Fold* and the Assault on Libraries," *American Archivist* 64 (Fall/Winter 2001): 385–93.



William J. Barrow in his laboratory conducting tests on the folding endurance of paper. (Council on Library Resources, *Fourth Annual Report for the Period Ending June 30, 1960.*)

had been used up to that time to restore and preserve deteriorated paper records.⁵ The second of these publications, with Reavis Sproull as coauthor, was a thorough account in America's premier science journal of many of Barrow's test results regarding book paper permanence, including the well-known "500 books" project, as well as some suggested methods for treating deteriorated book paper.⁶ In this article, the authors described Barrow's test methods and data interpretation in full detail and gave an outline of research in progress, foreshadowing the important semicommercial trials of acid-free book paper production to come later that same year.

I probably knew the 500 books better than anyone; I performed the physical tests on them during the summer of 1957 in a controlled-atmosphere cubicle in the Rare Book Room of the Virginia State Library. As to the conclusions of this study, I would add that the initial strengths of the papers that were tested were unknown and unknowable, as were the conditions under which the books had been stored, some of them for up to about fifty-five years. In projecting the future life spans of these books, assumptions had to be made that the

⁵ William J. Barrow, *Manuscripts and Documents: Their Deterioration and Restoration*, 2nd ed. (Charlottesville: University Press of Virginia, 1972). This work was originally published in 1955.

⁶ William J. Barrow and Reavis C. Sproull, "Permanence in Book Papers," *Science* 129 (24 April 1959): 1075–84. The data on which this study was based is further discussed and amplified upon in Randolph W. Church, ed., *Deterioration of Book Stock: Causes and Remedies; Two Studies on the Permanence of Book Paper Conducted by W. J. Barrow* (Richmond: Virginia State Library, 1959).

manufacturing standards for book paper had not changed much over this time period (which was probably accurate to a first approximation) and that storage conditions were and would continue to be reasonable. As with any study of the natural aging of materials over long periods, however, there are frequently problems encountered in the study of paper aging. Issues of incomplete initial characterization and variable storage conditions arise and often must be dealt with by making assumptions of this nature. The most important conclusion of this study—that most commercial book papers of that era were deteriorating rapidly—remains a valid one. The question of how long they would continue to be usable has no set answer and, naturally, would depend upon the conditions of use. Perhaps Barrow was prescient enough to foresee the suboptimal handling to which many older library volumes are now routinely subjected in the process of photocopying, perhaps not; but his cautions as to the limited future life of these books now seem to be more than ever justified in light of this particular factor.

The third, and ultimately most significant of the three publications, described, for the first time in the public record, the manufacture of book papers deliberately designed to be both initially strong and free of acidic additives, therefore both durable and enduring.⁷ Today's ubiquitous acid-free papers, including the type that *Double Fold* is printed on, can reasonably trace their history to these pioneering trials conducted at the Herty Foundation in Georgia in 1959 and their subsequent documentation.

In this connection, Nicholson Baker's suggestion that Barrow "possibly adapts [an acid-free recipe] without attribution from a formula developed by the S. D. Warren Company" is misleading and requires correction.⁸ Warren had occasionally used waste "lime mud"—largely calcium carbonate, a by-product of its wood pulping operations—as a paper filler and eventually learned that it conferred increased permanence, an unintended result at the time. These findings remained in the company's confidential files and had not been published before Barrow's. This specific information finally came to light in an article by Joseph J. Thomas (one of Warren's chemists) *well after* Barrow's findings had been published in 1960.⁹ In addition, Warren's papers (e.g. "Old Style") were based largely on short-fibered hardwood pulp and therefore had only moderate initial strength, which Barrow considered an undesirable property for long-lasting durability. Barrow used as his sizing (ink holdout) system a combination of

⁷ Randolph W. Church, ed., *The Manufacture and Testing of Durable Book Papers: Based on the Investigations of W. J. Barrow* (Richmond: Virginia State Library, 1960).

⁸ Nicholson Baker, *Double Fold: Libraries and the Assault on Paper* (New York: Random House, 2001), 146.

⁹ Joseph J. Thomas, "Alkaline Printing Papers: Promise and Performance," *Library Quarterly* 40 (January 1970): 99–107. The discussion by Greer Allen, which follows Thomas's paper (108–112) further illustrates some of the difficulties manufacturers and users of alkaline printing papers initially faced, e.g., that such papers did not print especially well and did not have the "feel" to which printers and customers were accustomed. These problems have since been satisfactorily solved.

Aquapel® and Kymene®—novel at the time for book paper, so far as he was aware—whereas Warren had never publicly disclosed its own sizing system. Additionally, it was already known through Barrow's earlier published researches and those of others cited therein that a number of old papers still in excellent condition had an alkaline reaction and contained calcium carbonate.¹⁰ Hanson's 1939 work showed that some old papers in good condition contained relatively high levels of calcium carbonate; this work was cited in the article by Barrow and Sproull published in *Science*. In his own article, Barrow reported tests on two new (unidentified) papers that also contained calcium carbonate.¹¹

The beneficial effect of calcium carbonate on paper permanence was thus already well known, and Barrow never claimed to have discovered this factor himself. But publicizing the effect, and backing it up with detailed new data, made all the difference. A well-known dictum of Lord Camden in England regarding the invention of the achromatic (color-corrected) telescope in the eighteenth century is perhaps applicable to this situation: "It was not the person who locked up his invention in his scrutoire that ought to profit, but rather he who brought it forth for the benefit of the public."¹² No patent was at stake here, and certainly no real profit for Barrow, except the satisfaction—largely unrealized in his lifetime—of having initiated the future widespread adoption of acid-free papers for books and other permanent paper records.

Thomas did bring one important point about book papers to attention that inhibited the widespread adoption of the newer papers for some time. Publishers and readers frequently appreciate a feeling of softness and mellowness in their volumes, characteristics typically found in papers having a high content of short-fibered hardwood pulp. These features (ironically enough) impart an aura of antiquity and maturity to books printed on such papers, while also allowing good "printability" and "runnability" through the press and bindery. Barrow's early papers were somewhat harsh, as they used a high percentage of long-fibered softwood pulp to ensure excellent initial strength and therefore

¹⁰ In *Manuscripts and Documents*, Barrow writes: "The investigation of W. V. Torrey and E. Sutermeister, of the S. D. Warren Company on three early Chinese and two European papers of the fifteenth and sixteenth centuries indicated that calcium compounds were in the two latter papers. They reported these two papers were alkaline and in good condition. Harry F. Lewis, of the Institute of Paper Chemistry, also found calcium compounds in certain leaves of a book printed in 1576. These leaves were likewise alkaline and in good condition, while others in the same book were acid, discolored, and physically weak" (pp. 38–39). See also Barrow, "Restoration Methods," 151. While discussing the already well-known injurious effects of acidity in paper, Barrow refers to the study by Torrey and Sutermeister ["A Brief Study of Some Old Papers," *Paper Trade Journal* 96 (25 May 1933): 45–6]. It was Barrow's speculation, not specifically mentioned by Torrey and Sutermeister, that these stable old calcium-containing papers had probably been manufactured in a limestone region.

¹¹ Fred E. Hanson, "Resistance of Paper to Natural Aging," *Paper Industry and Paper World* 20 (1939): 1157–63. This article presented additional evidence that calcium carbonate is beneficial to paper permanence.

¹² Louis Bell, *The Telescope* (New York: Dover Publications, 1981), 30.

a good measure of remaining strength after aging. Such papers did not convey a user-friendly feel; instead, they somewhat resembled bond paper in general texture.

Although books produced with the more traditional papers may have had high immediate sales appeal, they were inevitably destined to become weaker much sooner than those printed on paper meeting the newer specifications. I have copies of most of Barrow's publications from the 1959 era onwards that were printed on his type of paper. All have maintained an exceptional degree of whiteness, strength, and "rattle" despite having been stored for a large part of the time in attics and basements under less than optimum conditions.

One tangible measure of Barrow's achievement was realized when the monumental *National Union Catalog: Pre-1956 Imprints* was issued using a paper stock that he had specifically tested and specified and for which he is given credit in a colophon in every one of its massive 754 volumes. So far as I am aware, this is still the largest single publication ever printed; it will be both usable and useful for a long time to come. Regrettably, Bill did not live to see these volumes in print.

Barrow's document lamination process comes in for criticism by Baker, who devotes his brief chapter 16 ("It's Not Working Out") to this subject. It is indeed true that some of Barrow's earlier laminations did not do well in storage, because a type of cellulose acetate film was used that did not have a stable plasticizing system; also, the earlier versions of his reinforcing tissue were not of the best quality. As Barrow became aware of these deficiencies, he changed to more stable grades and also began to deacidify the documents before lamination, resulting in major improvements to his process.

A significant and sometimes unappreciated advantage of lamination was that several related documents of different sizes could be arranged into one larger laminated sheet, with a binding margin of either tissue or stable and durable bond paper incorporated into the lamination. This margin then enabled the sheets to be assembled into bound and organized form, which greatly facilitated their use by researchers. Anyone who has tried to collate loose documents of varying sizes will attest to this advantage. The binding margin took essentially all of the stresses involved in turning the pages of the finished book, and the documents themselves did not need to be handled further. (The same effect can be achieved today, of course, by encapsulating documents in polyester film.)

For his remarks on Barrow, Baker placed much reliance on otherwise unpublished comments by Thomas Conroy incorporated in Sally Roggia's dissertation on Barrow and quoted by Baker (p. 146).¹³ I met with Roggia at the Virginia Historical Society in Richmond in early September 2001. We discussed

¹³ Sally Roggia, "William James Barrow: A Biographical Study of His Formative Years and His Role in the History of Library and Archives Conservation from 1931 to 1941" (PhD diss., Columbia University, 1999).

these matters while researching Barrow's papers, which are preserved in the society's archives. Although Roggia has compiled much valuable background material on Barrow, I do not agree with her conclusion that his most important contributions came early in his career (i.e., in the period from 1931 to 1941), nor with the idea that he somehow tacitly took or was given credit for the already well-known fact that acid was one of the main causes of paper deterioration. Roggia also states that Barrow's sponsor, Verner Clapp, in his classic series of essays on the history of permanent/durable book paper, largely ignored previous work on acidity of paper as a prime cause of its deterioration, ostensibly to give Barrow credit for pointing this out.¹⁴ But Clapp in fact covered this topic in great detail while also discussing how the paper industry tended to downplay this knowledge because of the feeling (largely justified at that time) that book paper could not be economically made and sized without the use of acidic alum and rosin.¹⁵ Many of Barrow's own publications discussed this earlier work on acid in paper, as mentioned above. Roggia's suggestion that a "myth" was to grow up about him after his death is something that would have both amused and discomfited Barrow in his lifetime.

Barrow's accelerated aging tests to predict the natural life of paper, though criticized by Baker, were the best available at that time; they are still extensively used in paper research, with various modifications. By the time of Barrow's principal work, their general applicability and correlation with natural aging had already been shown by Wilson and others.¹⁶ Van Royen reported similar correlations, as referenced in other publications by Barrow and his coworkers.¹⁷ Robert B. Hobbs, chief of the Paper Section at the National Bureau of Standards, independently examined the evidence for the use of Barrow's tests in 1960.¹⁸ As Hobbs saw it, such tests were necessarily an approximation but were still quite good enough for the purposes at hand. They consistently showed the

¹⁴ Roggia, "William James Barrow," 170; Verner W. Clapp, "The Story of Permanent/Durable Book-paper, 1115–1970," *Scholarly Publishing* 2 (January 1971): 107–24; (April 1971): 229–45; (July 1971): 353–67. Reprinted in a slightly revised form in *Restaurator*, Supplement 3 (1972).

¹⁵ Clapp, "The Story of Permanent/Durable Book-paper 1115–1970," 231ff., especially 236–39.

¹⁶ William K. Wilson, et al., "Accelerated Aging of Record Papers Compared with Normal Aging," *Tappi* 38, no. 9 (1955): 543–48.

¹⁷ A. H. H. van Royen, "Vergelijking van de versnelde veroudering van celstoffen met de normale veroudering bij kamertemperatuur (Comparison of the accelerated aging of celluloses with normal aging at room temperature)," *De Papierwereld* 12 (1958): 219–22, 225. In Dutch; an English translation is in the possession of the present writer. Van Royen's work was referenced in Church, ed., *The Manufacture and Testing of Durable Book Papers*, 63 and in William J. Barrow, *Permanence/Durability of the Book*, (Richmond, Va.: W. J. Barrow Research Laboratory, 1963), 44.

¹⁸ *Permanent/Durable Book Paper: Summary of a Conference Held in Washington, D.C., September 16, 1960* (Richmond: Virginia State Library, 1960), 47–53. Hobbs states on p. 50: "For the kinds of papers and conditions covered by the recent study at the Virginia State Library, we are as certain of the suitability of this accelerated aging test as we are ever likely to be about any other such test for any organic material."

existence of large stability variations among different types of papers that were expected to show such differences on other grounds (e.g. acidity and the presence of groundwood pulp). Whether the new book papers would last 275 years or 600 years was not really the point as far as Hobbs was concerned; the point was that they would last far longer than conventional types of book papers.

Lest one conclude that I was merely an unquestioning acolyte of Barrow's, I think I can provide a balanced account of both his strengths and his weaknesses. Lacking extensive formal training, he overcame this deficit and became an able and serious researcher through assiduous home study, discussions with recognized experts, and daily hands-on work in the laboratory. He trained his employees carefully and treated them with the greatest respect. So far as I am aware, he never intentionally misled anyone or took credit for another's work. If the archivists and librarians with whom Barrow dealt were still available for comment, I believe that they would concur with me in the latter opinion.

Barrow was an entrepreneur who developed his own document restoration business from essentially nothing, doing the necessary self-financed research along the way. He sought out and cultivated clients, using his well-developed human relations skills in addition to his technical know-how. A few people did not admire his specific traits and talents. Most, however, were more than glad to be able to deal with an individual who combined a thorough knowledge of both library and archival practices, a long record of published research as well as a valuable full-length book, good though not perfect command of his technical specialty, an ability to move effectively in many circles, and the gift of being able to easily meet and get along with almost everyone. Such combinations are unusual in many fields and are the mark of a leader.

His weaknesses were altogether honest ones. He was not a trained writer and often needed editorial assistance. The fact that he did not have a great deal of background in the more academic aspects of chemistry meant that he had some blind spots in these areas, which he often recognized but occasionally did not. He therefore relied on others to fill these gaps, not always adequately as it turned out, but never deficiently enough to really matter in the overall picture. I remember wishing during my final two summers with him that he knew more chemistry and technology outside of his immediate field, as that would have given him a broader perspective and enabled him to deal more knowledgeably with his consultants and clients. On the other hand, it might also have diverted his thinking and kept him from focusing on the greater tasks at hand—tasks that he managed as very few others would have been able to do.

In August of 1966, two years after I had finished my graduate work, I saw Barrow for the last time. We talked about our old association, and he was clearly pleased that his influence and mentoring had persuaded me to start a career in the cellulose and paper chemistry field. He died a year later, at the relatively early age of sixty-two. He had taught me much, and not only about paper.

Tempora mutantur, et nos mutamur in illis. Working his way through a technical jungle full of byways, folklore, and blind alleys, Barrow largely avoided these traps while constantly improving his skills and processes.¹⁹ His methods were state of the art for their period and evolved as new knowledge became available. Indeed, as Clapp so well observed, Barrow was “gifted with a sure instinct for the essential.”²⁰ Some may dismiss this as a tendency to oversimplify, but it is often a necessary tool for researchers so that they not follow wandering fires, lost in the quagmire, as in Tennyson’s description of King Arthur’s knights searching hopelessly for the Grail.

Among many other independent and complimentary evaluations of Barrow’s contributions is that of Jeffrey Abt:

The breadth and character of Barrow’s Council-sponsored researches were remarkable and the resulting publications continue to remain key references. However, the significance of Barrow’s accomplishments lie[s] not with the particular innovations and discoveries which arose from his more than thirty years of experimentation but with the nature and rigor of his inquiries. Barrow transcended the symptoms of the problem to reverse their source. Furthermore, most of his research was conducted in the context of facilities designed specifically to investigate the materials with which he was concerned. Under his careful direction, the study and repair of library materials passed from reading room tables and bookbinders’ benches to the counters of modern science laboratories with their attendant panoply of specialized methodologies and instrumentation.²¹

Abt goes on to list the many worldwide laboratories and journals devoted to paper preservation research that were established after Barrow began his work, and which can in large part trace their origins to his pioneering efforts. This is indeed no myth, but a solid legacy.

The victory belongs to the person actually in the arena, as Theodore Roosevelt observed. If anyone was in the arena, it was Bill Barrow. The many researchers who have successfully used laminated documents over the years, and far more importantly the millions of present and future purchasers and users of books made with acid-free paper, will long be in his debt.

¹⁹ See, for example, W. J. Barrow, “Deacidification and Lamination of Deteriorated Documents, 1938–63,” *American Archivist* 28 (April 1965): 285–90. In this symposium on lamination, Barrow discusses how he continually updated his processes and materials, correcting issues as they became apparent. This presentation was followed by generally favorable discussions of his process on the part of Leon deValinger, Jr., state archivist of Delaware (290–93) and James L. Gear, chief chemist, Document Restoration Branch, National Archives (293–97).

²⁰ Clapp, “The Story of Permanent/Durable Book-paper, 1115–1970,” 362.

²¹ Jeffrey Abt, “Objectifying the Book: The Impact of Science on Books and Manuscripts,” *Library Trends* 36 (Summer 1987): 31. See also Abt’s comment on page 28 that significant advances for the betterment of paper restoration and manufacture began only when Barrow inaugurated his research program in 1935.