

A Brief History of Preservation and Conservation at the Library of Congress

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One of the early Librarians of Congress, in transforming the Library from a good facility serving the needs of U.S. legislators into one that would become the largest and most complex universal library in the world, realized that the acquisition path did not have to be hampered by limited funds. Several new approaches were utilized whereby large quantities of free materials were and still are being channeled into the Library. With collections growth thus proceeding in astonishing steps, questions arose regarding proper maintenance of the holdings. Not only did space become a problem, but also collections care.

Although the Library has a tradition of concern regarding minimizing the deterioration of printed matter and improving handling and care procedures, its preservation² activities have been organizationally centralized only since 1967. In 1965, a national preservation planning conference jointly sponsored by the Library and the Association of Research Libraries led the Library to re-examine its preservation activities and the need for application of scientific and sound management principles to its program. Following these developments and awareness of preservation needs resulting from international response to the disastrous flood in Florence in 1966, the Library consolidated its preservation activities into an organizational unit that would be responsible for protecting the collections and extending their useful life. A concerted program is now carried out by components of the Preservation Directorate -- the Office of the Director for Preservation (which includes the Mass Deacidification Program) plus four divisions: the Binding and Collections Care Division, the Conservation Division, the Preservation Research and Testing Division, and the Preservation Reformatting Division.

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² In the United States, "preservation" is a term that describes all of the activities that minimize chemical and physical deterioration and damage and that prevent loss of informational content. The primary goal of preservation is to prolong the existence of library and archival material for use, either in their original physical form or in other ways. It has broader implications than "conservation" (which it includes), encompassing binding, reformatting, rehousing, physical support, cleaning, environmental stabilization and related technical and facility issues that work together to provide for longevity of an institution's collections. "Conservation" describes examination, documentation, and treatment of important artifacts such as manuscripts, rare books, works of art, or museum objects. It includes stabilization, strengthening, restoration, or housing of materials in specialized ways aimed at sustaining survival of the objects as long as possible in their original form. In some other cultures and languages, the connotations of the terms "preservation" and "conservation" are reversed, with derivatives of the word "preservation" being used to describe activities that we characterize in this country as professional "conservation," and vice versa.

Institutional Growing Pains

Congress established the Library in 1800 when it was moving to the new capital city of Washington from Philadelphia. An act of April 24 creating the Library appropriated five thousand dollars "for the purchase of such books as may be necessary for the use of Congress." The books were to be housed in "a suitable apartment" in the Capitol, and a joint congressional committee was to oversee the purchase of books, furnish a catalog, and "devise and establish" the Library's regulations.³ Thomas Jefferson, in particular, took a keen interest in the new institution. Originally the Library of Congress (LC) was a library that could be used only by the members of Congress and the Justices of the Supreme Court. During the first dozen years of the Library's existence, the first Librarian of Congress acquired some 3,000 volumes covering a broad range of topics for use by this small constituency.

Following the British burning of the Capitol Building during the War of 1812 and the subsequent loss of original library collections housed there, the Congressional reference library was replaced by a single transaction when Congress in 1814 authorized the purchase of Thomas Jefferson's entire multilingual library of 6,487 volumes for \$23,940. It contained volumes on everything from architecture to geography and the sciences. Anticipating the argument that his collection might seem too wide-ranging for Congress, Jefferson said that there was "no subject to which a Member of Congress might not have occasion to refer."⁴ The collections grew slowly, as did the number of people who had access to the facility, although use of the Library was still basically reserved for legislators, the diplomatic corps, and senior members of the three branches of the U.S. government. Then, on Christmas Eve 1851, a major fire devastated the holdings of the Library.

Librarian Meehan wrote to Senator Pearce of Maryland, Chairman of the Joint Committee on the Library: "It is my melancholy duty to inform you that a fire originated in the principal room of the Library of Congress this morning, about half past seven o'clock, and that nearly everything in the room was destroyed before the flames were subdued."⁵ The fire destroyed about 35,000 of the Library's 55,000 volumes, including nearly two-thirds of Jefferson's library. Two days later the House of Representatives approved a joint resolution authorizing an investigation into the origin of the fire.⁶ Three days after the incident Architect of the Capitol Thomas U. Walter reported that the fire was caused by faulty chimney flues.⁷ Funds were appropriated shortly to replace the lost books and to construct a new facility exclusively for the Library.

The arrival in 1864 of Ainsworth Rand Spofford as the Librarian of Congress heralded a new era in having the Library meet its mandate of being a resource center for legislators. Limited funds were not to deter him from bringing in "oceans of books and rivers of information." Spofford seized upon copyright registration as a great opportunity for expanding the Library's collections at no added cost to the Library. In 1870, his lobbying efforts paid off. The law was changed to

³ 2 U.S. Statutes at Large, 55.

⁴ James H. Billington, "Statement of James H. Billington, The Librarian of Congress, before the Committee on Rules and Administration, United States Senate, March 20, 1997." Annual Report of the Librarian of Congress, 1997. Appendix B: p. 105. Washington, D.C.: Library of Congress, 1998.

⁵ Library of Congress Archives, Librarians' Letterbooks, John S. Meehan to James A. Pearce, December 24, 1851.

⁶ Congressional Globe, December 26, 1851, 32/1:153-54. Coincidentally, the same day, the House changed its wording from "the National Library" to "the Library of Congress."

⁷ Washington Republic, December 27, 1851.

require that anyone claiming a copyright on any book, map, chart, dramatic or musical composition, engraving, cut, print, or photograph or negative must submit two copies to the Library. In the first 25 years after this revision was passed, the Library gained 371,636 books, 257,153 magazines, 289,617 pieces of music, 73,817 photographs, 95,249 prints, and 48,048 maps. And this flow of free material has continued unabated over the years.

Spofford also inspired a law that gave the Library many free copies of the Congressional Record and the Statutes at Large of the United States. He parlayed these into an exchange program with foreign governments that had diplomatic relations with the nation at that time. As a result, the Library has the largest and most complete collection of government documentation in the world. In addition to these creative approaches to expanding the Library's holdings and access, Spofford paid heed to traditional methods of acquiring material through donations from collectors and purchases.



As might be expected, all available space was soon utilized. By the mid-1870s, the situation had reached crisis proportions. Shelving was no longer done in an orderly manner. The construction of a separate building (now known as the Jefferson Building) for the Library, begun in 1886 and finished in 1897, solved for about 35 years the physical problem of housing the collections and provided reading rooms and research and exhibition areas for the first time for the general public. "The Annex" (now the Adams Building) constructed during the 1930s afforded additional storage space and work rooms when the volume of material once again outgrew the available space.

At Left: Photograph of crowded library in the Capitol, 1890

A Congressional directive during the 1960s that the Library acquire "all library materials currently published throughout the world which are of value to scholarship" resulted in ever increasing augmentation of the Library of Congress' yearly receipts, to the point that now over 2.5 million items are processed each year. Again, the physical problems imposed by the increasing quantity of material and the greater number of staff members needed to process and serve the incoming receipts were dealt with by the construction of another building.

The third structure -- the Madison Building -- was occupied in 1980. It houses the Law Library and many of the Library's management and staff operations, including the Librarian's Office, the Congressional Research Service, and the Copyright Office. In addition to the Preservation Directorate, components of the Office of the Associate Librarian for Library Services that are housed here are the Acquisitions Directorate, the Cataloging Directorate, and some of the custodial divisions of the Public Service Collections Directorate, including the Manuscript Division; the Prints and Photographs Division; the Motion Picture, Broadcasting and Recorded Sound Division; and the Music Division.

Concurrent with the matter of adequately housing an ever increasing volume of library materials, the problem of preserving these resources obviously came into focus. The Library's 119 million items (including 18 million books, 2 million recordings, 12 million photographs, 4 million maps, and 53 million manuscripts) "cover more than 530 miles of shelf space and include research

materials in more than 450 languages and almost all media through which knowledge and creativity are preserved and communicated."⁸ The vast quantity of the holdings, along with the tremendous variety of formats and materials and the uniqueness of many of its items, makes tackling the Library of Congress' preservation needs a particularly stimulating and highly challenging proposition.

Paper and Environmental Challenges

Since the late 1800s, preservation has been a documented subject of attention at the Library of Congress. However, only in more recent times have policies and programs become formalized. Utilizing appropriate treatments and technologies, the Preservation Directorate today aims to preserve for the current and future use of the Congress and the Nation a comprehensive record of American history and creativity and a universal collection of human knowledge.

In the final year of the 20th century, the directorate had a staff of 172, an appropriated budget of \$11 million, and either program or budgetary responsibility for preserving all of the Library's holdings, including the approximately 10,000 items on average that are added to the institution's collections each working day. One of the first noted concerns by LC over preservation can be found in the 1898 annual report of the Librarian of Congress when John Russell Young commented on the "questionable quality of the paper upon which so much of the Library material is printed," the papers that were then being mass produced from wood pulp being far less permanent than the papers made prior to the 1840s which utilized rags. Decrying the use of this cheap, nondurable paper by publishers, Young warned that many of the works coming into the Library "threaten in a few years to crumble into a waste heap, with no value as record."⁹

Not only has the quality of paper been of continuing concern to the Library, but also the effect of the Washington, D.C. environment upon the Library's holdings. One of the first steps to minimize deterioration induced by the environment was taken in the early 1900s by Herbert Putnam, Young's successor as Librarian of Congress. Learning of British studies which indicated that sunlight was an agent of deterioration in leather book bindings, Putnam had the Library design a system for controlling sunlight in rooms. He directed the Superintendent of Buildings to devise a "system of blinds which will protect the . . . west windows" of the stack areas which were normally flooded by sunlight.

The final "Report of the Committee of the Society of Arts on Leather for Bookbinding"¹⁰ had confirmed the view that bookbinding leathers being used then were inferior to those used 50 years earlier; degradation was attributed to mechanical causes (changes in methods of

⁸ James H. Billington, "Statement of James H. Billington, The Librarian of Congress, before the Committee on Rules and Administration, United States Senate, March 20, 1997,." *Annual Report of the Librarian of Congress, 1997*. Appendix B: p. 108. Washington, D.C.: Library of Congress, 1998; and Fascinating Facts About the Library of Congress, from The Library Today on LC's web site <<http://www.loc.gov/today>> (7/5/2000).

⁹ John Russell Young, *Report of the Librarian of Congress for the Fiscal Year Ended June 30, 1898*. [55th Congress, 3d Session, Senate Document No. 24.] Delivered December 12, 1898, pp. 45-46. Washington, D.C.: Government Printing Office, 1898.

¹⁰ London: George Bell and Sons, 1905.

manufacture and tanning) but also to the "injurious effect of light and gas fumes which at that time were common in many libraries."

Interestingly, similar findings of one of the earliest investigations into the causes and prevention of the decay of leather were reported some 60 years earlier by Michael Faraday to the Royal Institution.¹¹ This resulted from a request by the Athenaeum Club, which had employed Professor Faraday to determine what was causing the deterioration of their leather chairs and books. Faraday "ascribed the damage to the heat and sulphur fumes emanating from the illuminating gas then used."

Coping with the oppressively hot and humid summer climate of Washington awaited the development several decades later of suitable air conditioning and dehumidification systems and controls. The Library's climate is now regulated to maintain temperature and humidity conditions appropriate to different types of collections. In addition, systems have been installed in all three LC buildings to filter out contaminants.

GPO Branch Office at the Library, 1900-40

The problem of poor paper and the deterioration of thousands of valuable books in the Library of Congress collections had been recognized then since the end of the nineteenth century. Putnam was instrumental in having the Government Printing Office (GPO) establish a branch bindery and print shop within the Library in 1900; the staffs' preservation responsibilities included binding, repair, and other collections maintenance activities. The "binding and repair shop," as it was generally called, remained under the control of GPO from 1900 to 1968.

This branch by 1923 had 60 persons involved with the "rebinding of thousands of library books" for LC. The 1923 report of the Public Printer stated that the "most important work of the branch bindery is the repair and preservation of the treasured books and manuscripts in the Library.... Even the original manuscript of the Declaration of Independence was intrusted to the branch bindery for some preservation touches...."

In the early years, this office did very little that could be called book restoration; but, through the years, it gradually undertook a greater variety of restoration operations: treating manuscripts and other documents by silking or laminating them, cleaning and matting prints and photographs, and performing similar tasks. Armed with knowledge of currently acceptable preservation practices, some of this early work now appears less than desirable, such as silking and cellulose acetate lamination of documents.

Keeper of the Collections, 1940-63

The next major advance in collections care and preservation came in June 1940 when Librarian of Congress Archibald MacLeish created the position of Keeper of the Collections. At first the responsibilities of Alvin W. Kremer, the person appointed to this position, encompassed only "custodial care of the collections of the Reading Rooms."

¹¹ Michael Faraday, *Light and Ventilation*. London: Royal Institution, April 7, 1843.

At right: In 1944, Librarian of Congress Archibald MacLeish, center, with David C. Mearns (Reference Department), left, and Verner W. Clapp (Acquisitions Department), right, examining Thomas Jefferson's rough draft of the Declaration of Independence, which had just been returned to the Library from safekeeping at Fort Knox



Gradually, over the next 17 years of his tenure, the custodial duties for all of the collections were centralized and brought under the administrative control of the Keeper's Office. This office also had administrative responsibility for the binding and repair activities staffed by GPO.¹²

Document restorers were engaged to preserve some of the Library's precious documents, while a new crew of workers was instructed in maintenance procedures such as cleaning books and stack areas. Stack inspections were undertaken to evaluate (and subsequently try to remedy) existing and potential fire hazards. Investigations of commercial binding methods were undertaken in cooperation with the GPO in order to upgrade binding specifications for the LC operation.

In addition, research programs into methods of document lamination were co-sponsored with other government agencies. The first significant effort at independent research into preservation of audiovisual materials was carried out in the 1950s when the Library commissioned a study into the preservation of sound recordings. This resulted in the 1959 publication *Preservation and Storage of Sound Recordings*.¹³

Office of Collection Maintenance and Preservation, 1963-1967

Upon Kremer's retirement in 1963, the Keeper's Office was reorganized and renamed the Office of Collections Maintenance and Preservation, with Paul Edlund appointed as principal officer. One of the first problems he encountered was the need to relocate 1-1/2 million books in the main building so that duct work for a new ventilation system could be installed. Solving this portion of the environmental control problem presented another difficulty -- the loss of about 5 percent of the total stack area in this building.

Other preservation activities of the Library during the early-to-mid-1960s included pH testing of books, artificial aging tests on motion picture films, and studies of environmental control equipment such as humidifiers and of laboratory devices, including pH meters and ultrasonic cleaners. Binding and much of the restoration activities, however, stayed under the supervision of the GPO.

¹² Note, however (see below), that the Library did not gain full control over the methods and materials used in conservation until 1968.

¹³ A.G. Pickett and M.M. Lemcoe. *Preservation and Storage of Sound Recordings*. Washington, D.C.:Library of Congress, 1959.

Centralization and Modernization of Preservation Activities

A joint conference of the Library of Congress and the Association of Research Libraries in 1965, focusing on the need for a national preservation program, led the Library to re-examine its preservation activities in terms of how well it was fulfilling LC's own requirements and how it could play a leadership role for library preservation action throughout the United States and elsewhere. In addition, the Library recognized "the need for greater emphasis on the application of scientific principles and sound administrative methods to an effective preservation program."

Through such events in the 1960s, the Library became increasingly aware that preservation activities were fragmented and poorly coordinated, and that better administrative control, a centralized budget, and a more scientific approach to preservation problems were essential if the vast collections were to be preserved for future generations of scholars. As a result, plans were formulated to centralize most of the preservation activities into one office.

In this way, a more concerted, more efficient approach to preservation problems could be taken, and funds could be better utilized. These plans for an expanded preservation program also provided for the establishment of a research and testing operation and a modern conservation facility under direct Library control.

Preservation Office, 1967-89

As a result, in 1967 the Library undertook a new approach to preservation by centralizing all activities related to preservation, and the necessary funds to support these activities, in one office, under one administrative head. On May 15 that year, the position of the Assistant Director for Preservation was established, and the name of the Office of Collections Maintenance and Preservation was changed to the Preservation Office, located within the Administrative Department. This new unit was given the responsibility of comprehensively dealing with the Library's preservation programs.

The operation, led by Frazer G. Poole, created a preservation microfilming section, a research and testing laboratory, and a restoration group, and brought these together with the Binding Office (which came from Processing Services) and the collections maintenance function (that was transferred from the Stack and Reader Division). An agreement was soon reached in 1968 that the Government Printing Office would relinquish control to the Library on matters fundamental to preservation, such as staffing, development of technical standards and procedures for treatments and specifications for materials used in the preservation of Library collections; the only exception was that the GPO retained oversight on binding contracts.

Mr. Poole was succeeded by Norman Shaffer as Assistant Director for Preservation in 1978. That year the Preservation Office was transferred to Research Services. The preservation administrator's title was changed from Assistant Director to Director for Preservation when Dr. Peter Sparks was appointed to that position in the Preservation Office in 1981.

Administrators of Preservation Offices and Divisions

In 1971, Peter Waters became head (Restoration Officer) of the Restoration Office, later renamed the Conservation Office and even later (1995) the Conservation Division. Waters was succeeded in 1998 by Mark M. Roosa as Chief of the Conservation Division, who was in turn succeeded in 2001 by Dianne van der Reyden.

Dr. John C. Williams served as the first Research Officer of the Preservation Research and Testing Office; he was succeeded in 1982 by Dr. Chandru J. Shahani, who is now Chief of the Preservation Research and Testing Division.

Lawrence S. Robinson initially directed the Preservation Microfilming Office, which was first designated as the Brittle Books Project when this program began in 1963. Robinson, who then served as Assistant Director for Preservation from 1980 until his retirement in 1989, was succeeded as manager of the reformatting program by Bohdan Yasinsky, then by Tamara Swora, and subsequently by Irene Schubert, and then Mark Sweeney, who is now Chief of the recently-renamed Preservation Reformatting Division.

GPO's direction of binding activities from 1900 to 1967 was successively managed by Arthur Kimball, George Morgan, David Wahl, Ruth Kline, and George Smith. Direct Library management of the binding program continued in 1967 with Smith as the Binding Officer. He was succeeded by August Domer, Matt Roberts, William Underdue, and then by Debra McKern, now Chief of the Binding and Collections Care Division (as this office has been retitled).

Dating from the 1930s, the Photoduplication Service was managed, successively, by Donald Holmes; Charles LaHood, Jr.; Norman Shaffer; and Linda Washington; followed by today's Chief, Kevin Flood.

Collections maintenance, i.e., physical care (including inventorying, housing, movement, and cleaning) of the general collections, was initially a separate operation within this new preservation set-up, under the supervision of Emmett Trainor. This general collections maintenance activity was later moved to the Stack and Reader Division and is now managed by Steven Herman, Chief of the Collections Management Division.

Preservation Directorate, 1989-Present

In 1989, the Preservation Office became the Preservation Directorate, under the Associate Librarian for Collections Services. The Directorate consisted of five offices, each having a specific area of preservation responsibility but cooperating closely with each other. In a 1995 Library reorganization, Collections Services was abolished; the Preservation Directorate became one of six directorates in Library Services, a new service unit, which brought together all national library functions. Deanna Marcum is the current Associate Librarian for Library Services.

The Directorate was reorganized the same year, and the preservation offices were redesignated as divisions. The National Preservation Program Office, where preservation informational and reference services as well as coordination of many domestic and international preservation

activities had been handled since 1977, was integrated into the Office of the Director; and the Photoduplication Service became an organizational unit of the Preservation Directorate. For the past two decades, the Director for Preservation position has been held, successively, by Peter G. Sparks, 1981-89; Kenneth E. Harris, 1990-94; Diane Nester Kresh, 1994-2000; Mark S. Roosa, 2000-2004; and Dianne van der Reyden, 2005 to present.

The Preservation Directorate Today

Overview: The Library's preservation program is administered by the Director for Preservation, who is responsible for planning, coordinating, and directing all activities of the Preservation Directorate. The Director reports to the Associate Librarian for Library Services, who, in turn, reports to the Librarian of Congress. The Directorate coordinates and oversees all activities throughout the Library relating to the preservation and physical protection of Library materials.

The directorate works actively with other national and international research institutions and organizations in developing and implementing immediate and long-range library preservation initiatives; plans and coordinates preservation education and information programs for Library staff and patrons that will raise preservation awareness; provides reference and information services as well as emergency response and recovery assistance to other libraries, outside agencies, institutions, and individuals on matters involving preservation, conservation, and physical custody and care of library materials, including materials affected by vandalism and theft or damaged by fire, flood, or other catastrophes; and provides technical liaison between the Library and other government agencies and scientific and professional organizations.

Mission: The Library's Preservation Directorate is the largest library preservation and conservation facility in the world. It is the most extensive and oldest operation of its kind in the United States, has the largest conservation laboratory, and was the first program to include a materials science research and testing component. The mission of the Preservation Directorate is to assure long-term access to the intellectual content of the Library's collections, either in original or reformatted form. This mission is accomplished directly through the provision of conservation, binding and repair, housing, reformatting, materials science and preservation research and development, and staff and user education; and indirectly through coordinating and overseeing all Library-wide activities relating to the preservation and physical protection of Library materials.

Range of Activities and Collections: The Library of Congress uses the full range of traditional methods of conservation and binding as well as newer technologies such as the deacidification of paper and the digitization of original materials to preserve its collections and make them more accessible to users. These measures include maintaining materials in the proper environment, being prepared for emergencies such as water leaks, ensuring the proper care and handling of the collections by both staff and researchers, and stabilizing fragile and rare materials by placing them in alkaline buffered or pH-neutral containers to significantly retard deterioration and thus prolong their useful life.

At the Library of Congress, preservation program management poses many challenges. The collections of the Library are vast and varied, much of it the iconography of more than two hundred years of our nations' struggles and triumphs. In no other library can one find such

diverse and important documents and artifacts as the contents of President Abraham Lincoln's pockets the night he was assassinated, President Thomas Jefferson's drawing of a macaroni machine, the corporate records of the National Association for the Advancement of Colored People (NAACP), photographs of migrant workers during the Great Depression, television episodes of "I Love Lucy," Pierre L'Enfant's plan for Washington, D.C., the Washington Haggadah, and the Gutenberg Bible. The collections are also in diverse formats, including leather, vellum, palm leaves, papyrus, paper, nitrate film, CD-ROM, wax cylinders, vinyl discs, and magnetic tape.

Outreach Programs: The Preservation Directorate has a strong national and international outreach program and provides information about preservation to the Congress, government agencies, other libraries, institutions, and the general public. The office has played a key role in organizing and hosting preservation planning meetings for U.S. institutions as well as preservation science symposia that have been both national and global in scope. As indicated below, the Directorate's Conservation Division administers an active professional internship program through which it provides advanced training in specialized conservation skills to interns who come to the Library from around the world.

Following the 1986 creation of the Preservation and Conservation Core Program (PAC) of the International Federation of Library Associations and Institutions (IFLA), the Directorate served as the organizing and coordinating focal point, managing the organization's preservation activities during the initial five years of PAC's existence. Since 1992, the Library has continued to serve as the PAC Regional Center for the United States and Canada, one of five such centers that serves preservation interests in a particular global geographic area. In both capacities, the Directorate has supported cooperation with the other PAC regions through specific preservation activities involving seminars, conferences, education and training, publications such as International Preservation News (the IFLA/PAC newsletter), the creation of various types of preservation standards, and through hosting Robert Vosper IFLA Fellows to produce preservation publications of interest to the library community at large. Along with several other leading U.S. libraries, LC has also sponsored Mellon Fellows, who have received advanced training in preservation administration through assignments in various divisions of the Preservation Directorate.



At left: Senior Book Conservator Lynn Kidder sews the pages of a book in a book sewing frame

The Directorate provides programs for Library staff and patrons that raise preservation awareness and increase the level of knowledge about the Library's preservation policies and practices. For example, a day-long Preservation Awareness Workshop, usually held in the Library each year in conjunction with National Library Week, provides general information services about preservation and conservation to the public.

Publications Program: The staff of the Preservation Directorate at the Library of Congress has made noteworthy contributions to the literature of library, archival, and cultural preservation. In leaflets, annuals, scholarly and scientific articles, proceedings, bulletins, newsletters, books, and slide presentations, authors from A (Albro) to Z (Zimmermann) have

taken a close look at the challenges of the preservation, conservation, and materials science professions and have sought to lend practical advice, share expertise, re-visit, compile, establish, teach, and wonder aloud. Some of these written accomplishments are reflected in a bibliography that can be obtained from the office of the Director for Preservation.¹⁴ Many relevant publications are available at the Preservation Directorate's [Web site](#).

Preservation Security Planning: Preservation Directorate staff has participated actively in the recent development of a Preservation Security Plan that provides a framework for identifying the Library of Congress' minimum standards for preservation controls that are essential for securing the collections for future generations. Incorporating preservation needs into the Library's security plan acknowledges risks posed by a failure to protect collections. Control measures depicted in this framework provide an integrated, comprehensive preservation approach, addressing the needs of Library materials on both the collections and individual item levels.

Program Components: The Preservation Directorate has seven basic organizational components, including five divisions and two special programs that are administered out of the Office of the Director:

The Binding and Collections Care Division manages the Library's program for binding, repair, routine housing, and preparing for the shelf items from the Library's permanent research collections.

The Conservation Division manages the Library's program of providing conservation treatment and preventive conservation, as well as specialized housing, for materials that are high priority and at risk and for rare and intrinsically valuable collection materials in the permanent research collections.

The Preservation Research and Testing Division conducts in-depth research to benefit preservation of the Library's collections and to establish specifications, acceptable practices, and testing protocols for conservation and storage materials, conditions, and treatment processes that may have a direct or indirect impact on the lifetime of Library materials.

The Mass Deacidification Program, administered through contract management in the Office of the Director for Preservation, ensures the longevity and availability for research use of important, at risk, paper-based library materials such as books and manuscripts. This is achieved through safe chemical treatment that neutralizes in paper the acids that would otherwise contribute to its embrittlement and loss. Deacidification of large quantities of valuable collections materials is an example of preservation cost-avoidance, in that relatively inexpensive chemical treatment of endangered items today greatly retards rapid deterioration that would necessitate reformatting of the same materials in the future at many times the cost of deacidification.

¹⁴ Remarks by Diane N. Kresh in the Foreword to Carole Zimmermann (comp.). *Material Published by Members of the Library of Congress Preservation Directorate: A Bibliography*. Washington, D.C.: Preservation Directorate, Library of Congress, 1994.

The Preservation Reformatting Division manages the Library's program to convert at-risk Library materials to a new preservation format and recommends repair, replacement, or storage of deteriorating, damaged, and mutilated materials.

The U.S. Newspaper Program, funded by the National Endowment for the Humanities (NEH) and jointly administered by NEH and the Library through the Office of the Director for Preservation, is an activity aimed at locating, inventorying, cataloging, and selectively preserving through reformatting important newspapers that have been published in the United States and its territories since colonial times.

Binding and Collections Care Division

Established in 1900 as a branch bindery of the Government Printing Office under the Chief Clerk with Arthur Kimball in charge, the binding program was the first unit created by the Library to support preservation activities. Mr. Kimball retired in 1932 and was succeeded by George Morgan as head of the GPO-operated Binding Division.

When the Administration Department was created in the Library in 1940, the Binding Division became the Binding Records Section of the Supply Office. The Reading Room Binding Unit and approximately twenty other binding units of the Reference Department prepared and transmitted material to the Binding Division. In 1941, David Wahl conducted a survey of all binding activities in the Library. As a result, in 1942 the Binding Office was created, absorbing the Reading Room Binding Unit and the Binding Records Section of the Supply Office. Wahl was named Binding Officer, and the office was transferred to the Reference Department under the direction of the Keeper of the Collections.

To coordinate binding activities more closely with other processing units, the Binding Office was transferred to the Processing Department in 1943. Ruth Kline was designated Binding Officer under the Director of Processing. Concurrently, the binding activities that had been operating more-or-less independently in twenty or more units were transferred at this time to the Binding Office. George Smith was Binding Officer, 1944-1967, with Harriet Woodring and Henrietta Mierke serving as Assistant Chiefs.

From 1950 until 1969, there was a transition away from an onsite (GPO) bindery to the use of contract services provided by commercial library binders. The GPO, however, continued its relationship with the Library in the role of contract management. For a brief time, the Binding Office reported to the Subject Cataloging Division in the Library's Processing Department, then it was incorporated into the new Preservation Office in 1967. George Smith was succeeded in 1968 by August Domer, who served as Binding Officer until the following year. As previously mentioned, Matt Roberts served as Binding Officer from 1970-1989, with William H. Underdue as Assistant Binding Officer. Underdue succeeded Roberts in 1990 and served as Binding Officer until he retired in 1993. Debra McKern was Acting Binding Officer until 1995, when she was appointed as Chief of the renamed Binding and Collections Care Division.

The Binding and Collections Care Division is responsible for the care of the Library's permanent research collections that are in bound formats, performing treatment on a large scale in a cost-effective manner. In fiscal year 1999, the division processed (bound on contract, labeled, repaired or boxed) about 30,000 items per month. Responsibilities include binding preparation

and contract management; book repair; in-house binding, such as pamphlet binding; housing; and shelf preparation.

At right: A book undergoing repairs in the Collections Care Section

The Division provides a strong line of defense in ensuring that new holdings are adequately protected from possible damage during handling and use and that those books already in the collections that have been subjected to extensive use and require rebinding or repair receive suitable attention. The Division supports the care of special collections through the construction of custom-fit protective enclosures, using an automated box-making machine. Rare books that require treatment of their bindings, however, are handled by the Conservation Division.



There are two organizational units within the Binding and Collections Care Division (BCCD) -- the Library Binding Section and the Collections Care Section. Binding and Collections Care staff work closely with other Library staff members, in particular the collections maintenance staff in the custodial divisions who identify retrospective collection materials in need of treatment and the cataloging staff who indicate when items require special attention.

Library Binding Section: This section is responsible for binding and labeling. Formed as a branch bindery under GPO in 1900, it provided the foundation for the Library's future preservation program. The Library has always required that general collections materials acquired as paperbacks receive library binding as a way to safeguard them. The only exceptions to this policy are multiple copies, items that receive minimal level cataloging or those which are unsuitable for binding due to their format. This has been particularly important as publishers' use of hot-melt adhesives, cross-grain paper (i.e. paper with grain running at right angles to the spine), and burst binding has increased, causing many text blocks to fail before cataloging is completed. Further, all original signatures are retained either by sewing through the fold or recasing (providing a new buckram cover for an intact text block). This improves openability and enhances the longevity of the book.

The Library has been closely involved in standards setting for library binding, through the efforts of successive Binding Officers working with the Library Binding Institute (LBI) and the American Library Association (ALA). In 1997, the Library sponsored binding research to support the work of the NISO/LBI Standards Committee ZZ to set performance specifications for library binding. This work is included in the ANSI/NISO Z39.78 Standard for Library Binding.

Currently the binding program relies upon three binding contracts to handle the nearly 240,000 volumes commercially library-bound annually at a cost of approximately \$1.4 million. The focus of the program in recent years has been on the installation of automation equipment and software to speed up the work of the section and improve accuracy of data entry. Until 1994, Library staff used typewriters to process materials for binding. Now it is possible to download author, title, and call number information from the Library's catalog directly to BCCD's binding automation system, LARS (Library Automated Retrieval System). BCCD has expanded use of

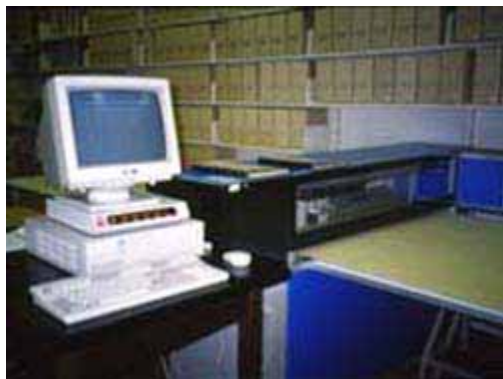
the LARS system to the Serial and Government Publications Division, the European Division, the Law Library, the Hebraic Section of the African/Middle Eastern Division, and the Geography and Map Division for decentralized binding preparation. It is particularly helpful to decentralize in cases where the custodial division has resident expertise in vernacular languages or format. The Serial and Government Publications Division, which began using LARS in 1996, has built up a LARS database of over 30,000 serial binding records to date.

The Library Binding Section also has responsibility for shelf preparation -- the labeling and property stamping of publisher-bound volumes. The labeling program has changed dramatically over the years. First, the Library used labels that were preprinted with classification letters (e.g., AP); then a staff member would write the rest of the call number in ink below. These were affixed to the spine with wheat paste. Then for many years the Library used Se-Lin® heat-activated labels, which required ironing to set the adhesive, making it very labor-intensive.

In 1996, BCCD began using a laser-printed, pressure-sensitive label based on specifications developed by the Preservation Research and Testing Division (PR&TD). At the same time, BCCD implemented a new software program that allows author, title, and call number information to be extracted from the Library's catalog and formatted for a spine label. A portion of the labeling activity is now done in the Cataloging Directorate using these new procedures, thereby reducing the time an item takes to reach the shelf. In fiscal year 1998, over 155,000 volumes were labeled in BCCD.

The spine label specification is just one of many collaborative efforts between BCCD and PR&TD to improve the quality of products used in processing materials for the shelf. Others include testing of security devices, bar codes, labels, book plates, and marking inks.

Collections Care Section: The collections care program provides in-house repair and binding for items in the general and reference collections and produces custom-fitted boxes for general and special collections materials. Repair may include tip-ins, recasing, new covers, page mending, consolidation of text blocks, or spine repair. In-house binding may include pamphlet binding or stiffening.



At left: Automated box-making machine

By having these capabilities in-house, BCCD is able to serve the reading rooms who cannot afford to be without materials for the five weeks required for commercial library binding.

Housing provides custom-fitted protective enclosures for materials that require physical support or cannot be bound, repaired, or otherwise physically treated.

Examples include protective enclosures for Bernstein scrapbooks in the Music Division, unbound serials in the American Folklife Center, and books with accompanying CDs in the Humanities and Social Sciences Division.

The Collections Care Section was created in 1995 to expand the range of treatment options for preservation of the original. Previously there was a Book Repair Unit, created in 1983, but

staffed with only one technician. Thus, for many years, there was only one choice for materials from the general or reference collections -- the Binding Office could rebind the item in ruby buckram.

Today, instead, the collections care program aims to: (1) get materials back in circulation as soon as possible, (2) perform the minimal amount of treatment necessary to stabilize the item, (3) retain components of 19th and 20th century books with potential artifactual value, and (4) provide options such as constructing protective enclosures where binding or reformatting is inappropriate or costly. Staff from the Collections Care Section serve as members of liaison teams to the Library's custodial divisions. They work closely with other preservation staff, especially with the key professional conservators from the Conservation Division, who serve as the primary preservation liaisons with the special collections divisions, to provide the full range of treatment options for the collections.

Conservation Division

The Library of Congress was the first library in the United States to establish a conservation office (originally titled the Restoration Office) staffed by professional book and paper conservators. The Conservation Division is responsible for examination, documentation, treatment, and preventive care of intrinsically valuable manuscripts, prints, drawings, photographs, maps, and rare books that must be retained in their original format. This work requires the skill of book, paper, collection level, and photograph conservators whose special abilities are developed through academic and intern training. In specially-equipped laboratories, conservators treat (stabilize and restore) rare and special collections materials to minimize further deterioration. In addition to treatment, conservators advise custodial divisions on the care of library materials.

Development of a professionally trained conservation staff did not occur overnight. Traditional restoration activities had been performed since the early 1900s by the original GPO restorer staff (called Bindery Workers). In the late 1960s, Frazer Poole convinced Library management that it was important to professionalize the approach to conservation management and practice. After he experienced some difficulty trying to recruit a qualified U.S. citizen to head up the new Restoration Office, he obtained permission to try to hire a laboratory manager and other experienced conservators from other countries.

Poole hired Peter Waters from England on contract in 1969 and worked closely with him for two years to plan the development and staffing of the new Office. Waters moved to Washington to accept the full-time position as the Library's Restoration Officer in 1971. On Waters' advice, Fraser Poole hired two other British conservators who were also critical to the early development of this program -- Donald Etherington, who joined the office in 1970 and served as training specialist for ten years, and Chris Clarkson, who for five years was head of the Rare Book Conservation Section. Poole hired this team of conservation managers due to the reputations they earned in part through their professional involvement and experiences in disaster recovery operations following the Florence Flood of 1966, as well as their book conservation training experience under Roger Powell and Sydney Cockerell, two well-known English book conservators.

Building a professional book and paper conservation staff was a high priority for the new management team. It took about a decade to achieve this goal. Even before Waters was hired, Frazer Poole had decided, due to the dearth of qualified artisans and the lack of conservation training schools in the U.S. at that time, to attempt to recruit someone with an appropriate academic background and seek specialized training for them.

In Margaret Brown, he found a young person with a good formal education and work experience in art restoration who was interested in paper restoration. The Library then arranged for her to receive specialized training for several months in the paper restoration shop of the Museum of Modern Art in New York. Later she learned relevant paper testing techniques at the Barrow Research Laboratory in Richmond and studied fiber microscopy at the Institute of Paper Chemistry. Poole also hired Marilyn Weidner, a highly skilled paper conservator, as a consultant, who came to the Library one or two days a week to offer advanced conservation training to Ms. Brown and to provide advice on difficult treatment problems. In this manner, the Library thus developed its first conservator, largely through apprentice training.¹⁵

During the 1970s and later, the professional staff of paper and rare book conservators, and eventually "phased conservators," was built up, partly by hiring experienced personnel from other institutions and from the new conservation training schools in the U.S., with the result that a full complement of conservators eventually consisted of both apprentice-trained and program-trained (i.e. with graduate degrees) personnel. Many of the early hires and interns who have received advanced training in the Library's conservation labs now hold prominent positions in other major institutions and conservation businesses around the world.

The Conservation Division has provided leadership in the development of the profession of library conservation as we know it today. Many innovative treatments have been developed in its laboratory over the years. The Division is known worldwide for its development of new concepts, products, techniques, and procedures for the conservation and preservation of library and archival materials.

At right: Using solvent to remove adhesive residue from an art work



Working with the Preservation Research and Testing Division, and in coordination with other offices as appropriate, the Conservation Division establishes criteria and standards for supplies and techniques used in the Library's conservation, housing, and storage activities. The Division works to ensure that all collection materials are displayed, housed, and stored under appropriate environmental conditions. It oversees the preservation needs of all Library materials that are exhibited by the Library or by borrowing institutions, domestic or international.

Since the 1980s, the Division has offered internship opportunities to third year conservation students from the conservation graduate programs in the U.S., as well as foreign advanced or mid-career students. These internships, traditionally in book or paper conservation, have now

¹⁵ Frazer B. Poole, "The Research Library and Book Conservation," in *Bollettino dell'Istituto di Patologia del Libro Alfonso Gallo*, Anno XXIX (Gennaio-Dicembre 1970), Fasc. I-IV, pp. 99-122. Roma: Fratelli Palombi Editori, 1970.

been expanded to include advanced training in photograph conservation and preventive conservation.

The Division functions in a manner similar to that of a museum operation where preservation priorities are determined by custodial division managers and subject-matter experts in collaboration with professional staff of the Conservation Division, who prepare treatment proposals and condition reports and, in their capacity as "conservation liaisons," advise the divisions about conservation options that can be properly carried out within manpower constraints. Conservators advise the divisions on a broad range of collection issues, such as the selection of housings during processing, proper handling guidelines, environmental concerns, and staff training. As with most preservation operations within institutions that have sizeable collections that span a long period of time, there is only sufficient time and personnel to carry out work budgeted for in any given year.

In order to better plan the treatment schedule for the various special collections in LC, a time management system called the "point system" was initiated in the Conservation Office in the 1980s by Peter Waters, its first chief. The Library's custodial divisions are assigned a "budget" of a specified number of points in a given year, one point being equivalent to one hour of conservation work. With the custodial divisions receiving roughly equivalent numbers of points for treatment in a given year, these divisions pay close attention to the selection of important collections materials for which either collection level or single item treatment is requested. In 1995, the Conservation Office became the Conservation Division and was reorganized from three sections (Rare Book; Paper; and Phased) into two: the Book and Paper Conservation Section and the Preventive Conservation Section.

Book and Paper Conservation Section: The Book and Paper Conservation Section is responsible for the examination, documentation, and treatment of rare, intrinsically valuable, bound and unbound items in the Library's collections. These include, but are not limited to, incunabula and other rare books, unbound maps, atlases, globes, manuscripts, prints and drawings, posters, photographs, and related materials.

Treatment options are diverse. By performing thorough examinations and carefully documenting the existing condition of items, and taking into account their future use, conservators can make professional decisions about performing appropriate treatments ranging from minor surface cleaning and physical stabilization to interventive, complex restoration activities. The types of treatment are selected to be compatible with the period of the artifact, and optimal quality materials are always used for repair and rehabilitation measures.



At left: Hand sewing a rare book

The necessity for full treatment varies for bound materials; but book leaves may be washed and cleaned, and rare book bindings may be repaired or replaced with new materials sympathetic to the original period and style of binding. Flat or unbound paper-based materials may be chemically stabilized and mended; poor quality adhesives and coatings or previous repairs and treatments may be removed; individual leaves may be washed or cleaned; and media may be consolidated to avoid future loss.

Materials may also be conserved by such means as leafcasting, which repairs documents by filling in voids and missing margins with pulp that is compatible with the original; and they may be physically supported in boxes, folders, mats, or by enclosure (encapsulation) in clear, chemically inert polyester film. Section staff provide advisory and consulting services to the Library's curatorial and custodial divisions. Conservators are also responsible for serving as liaisons to custodial and curatorial divisions in the selection of materials for treatment each fiscal year.

At right: Customized housings prepared in the Preventive Conservation Section for fragile Library materials.



Preventive Conservation Section: The Preventive Conservation Section is responsible for developing and applying conservation strategies, i.e. treatment and housing solutions, for collections or portions of collections in the Library. Section staff carry out individual and batch treatments of rare and special collections materials, as identified in consultation with the curatorial divisions and in collaboration with other units of the Preservation Directorate. Staff are also responsible for coordinating the selection of materials to receive conservation treatment for the coming fiscal year. An important theme in the work of the Section is the prevention of damage and methods that will enhance preservation through the selection of materials for housing that provide appropriate physical support and chemical stability, correct handling in use and storage, optimal environment, early conservation treatment, and preparedness to minimize the impact of disasters.

It has primary responsibility for developing and maintaining the preservation components in the Library's overall disaster plan.¹⁶ This role is a natural outgrowth of the work performed over the years by the Library's conservation staff in support of recovery from fire and water disasters at other cultural institutions throughout the world. These efforts stemmed largely from experiences following the noted Florence flood in the 1960s and the Library's sustained assistance to the Library of the Russian Academy of Sciences in St. Petersburg after the tragic fire that occurred there in 1988.

"Phased conservation" was a concept first introduced by Conservation Officer Peter Waters in the mid-seventies. The idea behind "phased" work was a focused conservation strategy whereby collections or single items were treated in stages, i.e., phases, over a period of time according to a planned and logical sequence of priorities and procedures. The main emphasis was on large treatment and rehousing projects that could achieve economies of scale. In the present program, this concept has evolved into collection level treatment, which includes the mitigation of deterioration and damage to collections materials through the formulation and implementation of policies and procedures for the following: appropriate environmental conditions; handling and maintenance procedures for storage, exhibition, packing, transportation, and use; and emergency preparedness and response.

¹⁶ See: Peter Waters. *Procedures for Salvage of Water-Damaged Library Materials*. 2nd ed. Washington, D.C.: Preservation Office, Library of Congress, 1979.

The Preventive Conservation Section utilizes many creative collection stabilization techniques based on the type of use the collection receives or will receive, its inherent value, and its physical vulnerability.¹⁷ Its activities include providing protective care and preventive activities such as environmental control, improved housekeeping, cleaning, single item deacidification and mending, encapsulation, boxing and construction of custom-designed enclosures. Doris Hamburg, the first head of the recently formed Preventive Conservation Section, has inaugurated the Library's program to monitor and optimize environmental conditions for the full range of collections at various Library sites. Section staff work with curatorial units and with the Library's facilities staff as well as with the office of the Architect of the Capitol to monitor and effect changes as needed.

Specifications based on ASTM and ISO standards are developed and used by staff to facilitate the purchase of materials to house collections. Conservation Division liaisons work with curators and specialists in Library custodial divisions to determine the most appropriate housing solutions. Procurement of these materials is then carried out by the Conservation Division to insure that all housing supplies meet rigid Library of Congress specifications.

In addition, this section responds as needed to emergency incidents in the Library that require conservation intervention, and assists in training of other staff in disaster response techniques. A 24-hour response team of trained conservators and other Preservation Directorate staff, using beepers and cellular phones, is on call to respond to emergencies. The emergency response procedures have been developed in conjunction with Library Policy and the Security Office. Emergency supplies are stocked and strategically located in Library stack areas and in other key locations in all three buildings on Capitol Hill as well as in off-site locations.

Preservation Research and Testing Division

In 1965, Librarian L. Quincy Mumford committed the Library to establishing a preservation program "which would specifically include a research laboratory." The Preservation Research and Testing Office, a unique and distinctive feature of the newly created Preservation Office, was established in 1971 to begin a rigorous in-house research effort designed to develop lasting solutions to problems that had long confronted librarians and archivists.

Its essential mission is to provide scientific and technical support for the Library's preservation program and to seek solutions to complex technical problems for the benefit of the entire library and archival community. As a result, the Library of Congress is the only research library in the country that has an in-house scientific research laboratory dedicated to the support of its preservation activities. Today's Preservation Research and Testing Division (PR&TD) evaluates existing and future preservation strategies. Staffed with a dozen research scientists and other technical experts, the PR&TD facility consists of a spacious main laboratory and three smaller, specialized laboratories equipped with state-of-the-art scientific equipment.

The Division's scientists initiate and conduct fundamental research, testing, and technology assessment to establish preservation practices and specifications for a variety of materials, including paper as well as non-paper-based media such as motion picture film, still photographic materials, magnetic tape, wax cylinders, cellulose acetate discs, and CD-ROMs.

¹⁷ See: Peter Waters, "Phased Conservation" in *The Book and Paper Group Annual*, Vol. 17, pp. 113-122. Washington, D.C.: The American Institute for Conservation of Historic and Artistic Works, 1998.

The PR&TD staff also participates extensively in standards setting bodies to safeguard the long-term preservation interests of the Library of Congress and the library community. The unit's work has a significant impact on the general practice of preservation in libraries and archives throughout the world.



At left: Performing MIT fold endurance test on a paper sample

While the Binding and Collections Care Division helps preserve library materials by what is essentially a preventive maintenance operation and the Preservation Reformatting Division transforms information from a deteriorated material to a more stable medium, the Preservation Research and Testing Division focuses on developing and evaluating new materials and methods that could extend the lifetime of our intellectual

heritage. Thus the Preservation Research and Testing Division undertakes scientific and technical research to advance and support Library preservation. For example, studies in deacidification techniques aim at preserving these materials in their original format. Research also is conducted that is directed toward gaining a better understanding of deterioration mechanisms. This knowledge, in turn, may enable more appropriate treatments for degraded items to be formulated.

Topics for study include paper permanence; longevity of digital, photographic, magnetic, CD-ROM, and other contemporary media; adhesives behavior; storage conditions; binding methods; deacidification; preservation of digital collections over time; and other problems affecting the preservation of the diverse materials in the Library's collections.¹⁸ The Division also tests supplies and materials to ensure that items purchased for use in conservation treatment, binding, housing, and storage of Library materials meet appropriate standards of quality.

The Preservation Research and Testing Division works closely with the Conservation Division in establishing criteria and specifications for supplies and techniques used in the Library's conservation, housing, and storage activities, in coordination with other offices as appropriate. The two divisions collaborated, for example, in extending earlier research on the effects of cellulose acetate lamination (created in the 1930s by scientists at the National Bureau of Standards as a method of reinforcing brittle paper¹⁹) and subsequent development and adoption at the Library of an alternative, now widely-accepted method of providing physical support to fragile paper artifacts -- i.e. polyester encapsulation.²⁰ The scientific Division also works with the Conservation Division, with other offices of the Library, and with the Architect of the Capitol's office to assure that all collection materials are displayed, housed and stored under appropriate environmental conditions.

¹⁸ For general overviews of preservation research undertaken by this and other laboratories, See: (1) Chandru J. Shahani and William K. Wilson, "Preservation of Libraries and Archives," *American Scientist*, Vol. 75 (June 1987) ; and (2) Kenneth E. Harris, "A Review of Recent Research Findings on Preservation and Conservation of Library and Archival Materials," in *Proceedings of the Pan-African Conference on Preservation and Conservation of Library and Archival Materials, Nairobi, Kenya: 21-25 June 1993* (IFLA Professional Reports: 43). The Hague: Headquarters of the International Federation of Library Associations and Institutions, 1995.

¹⁹ See: William K. Wilson and B.W. Forshee, "Preservation of Documents by Lamination" (*NBS Monograph 5*). Washington, D.C.: U.S. Department of Commerce, National Bureau of Standards, October 30, 1959.

²⁰ See: "Polyester Film Encapsulation." Washington, D.C.: Preservation Office, Library of Congress, 1980.

PR&TD communicates the results of its research to other research facilities that conduct similar or related investigations (both in government and private agencies) and to the preservation community of libraries, archives, and museums. Some recent research and development initiatives are described below.

Accelerated Aging Test For Paper: Aging tests are at the heart of future projections and comparisons of relative effectiveness of deacidification treatments, environmental conditions, assessments of paper quality, and other important issues that are an essential part of the decision making process in management of library collections. Accelerated aging tests that are presently available for paper are arduous and require expensive aging chambers to implement; their resemblance to the natural aging process has been questioned repeatedly in published research. Chandru Shahani and his scientific staff have recently developed a new artificial aging test for paper that involves using glass tubes containing pre-conditioned paper samples, which can be aged in dry ovens that are much less expensive and more reliable than humidity-controlled aging chambers. This test can be accomplished more economically and in much less time than can currently available tests; most importantly, the new test has been proven to closely approximate the natural aging process. Since this test has the support of the American Society for Testing and Materials (ASTM), as well as that of several paper manufacturers who supported its development, it is hoped that the new test will gradually gain national and international acceptance as a measure of the long-term stability of papers.

Preservation of Digital Media: Preservation of digital media, including CD-Audio, CD-ROM, CD-R, digital tape, and magneto-optical disks, is an issue of increasing importance in the library community. Because the size of the Library's digital media collections has grown explosively over the past few years (and will probably continue to do so), we urgently need to learn about the preservation problems that these new media may experience in the future.

A testing and monitoring program for CDs was initiated in 1995. Program objectives include developing guidelines for storage conditions that would maximize the useful life of CDs and estimating the lifetime of CDs in LC collections using an accelerated aging procedure. By determining the rate at which optical and physical changes occur, the Library can anticipate when discs in the collections need to be reformatted so no information is lost. Aging of CDs under natural as well as artificially accelerated conditions is under study. In the natural aging study of CDs, the objective is to monitor periodically the condition of samples from LC's CD collection.

At right: Laboratory longevity testing of CDs

This program, which is expected to continue for at least a decade, will establish benchmarks of the current state of the collection first. It will then continue to monitor the condition of the discs in order to determine any optical and physical changes over a period of time. The data gathered will provide information about when discs should be reformatted for preservation. It will also provide important data on the natural aging of CDs. The artificial aging study, which complements the natural aging study, will be initiated in FY 2000. However, its findings will be available much earlier than



the natural aging study and will also extend to other digital media.

Security Marking and Labeling of CDs: The attachment of anti-theft devices to secure library items has become an integral part of contemporary library practice. However, some security devices can potentially have an adverse influence on the longevity of the media they are intended to protect. A prime example is security labels for CDs. Pressure-sensitive adhesives from these labels can over time seep through the thin coating on the title (label) side and compromise the long-term stability of the CD. Also efforts to mark CDs can have a similar effect because inks or solvents from markers can degrade the disks. PR&TD staff identified a laser engraving machine similar to the one used by CD mastering companies for safely imprinting identification information on the hubs of CDs as they are received in the Library by the Copyright Office. Transparent, full-face security labels for CDs that cover the entire CD on the title side were also tested under accelerated aging and found to have an adverse effect on the life of some of the CDs. At present a dialog is in progress with manufacturers who are developing security labels that will fit the hub of CDs, where no data can be compromised.

Other Materials Science Initiatives: Additional recent research developments include completion of risk assessment studies on motion picture film and magnetic tape; development of new chromatographic techniques for quantitative measurement of aging of paper that are much more sensitive than other available techniques; conclusive proof that the rate of aging of acidic paper accelerates with time, which further demonstrates the urgency of preservation actions such as deacidification and reformatting; and refinement of quantitative methods for optimization of the storage environments for preservation of library collections.²¹

Mass Deacidification Program

The Challenge: Acid Paper: An important outgrowth of the Library's materials science activities is its mass deacidification program to save books and other paper-based materials on a large scale and extend their useful life. The primary reason modern books and other paper artifacts often deteriorate significantly within fifty to one hundred years is that they are acidic -- a condition brought about largely by the introduction in the mid-nineteenth century of alum-rosin compounds that were used as sizing agents in the paper.



At left: Loss of valuable information can be avoided by employing mass deacidification to ensure the longevity of paper-based materials

Since the late nineteenth century, paper deterioration was further hastened by the introduction of mechanically-produced ground wood pulp in the papermaking process. These products, frequently not chemically purified, resulted in weaker paper and in additional formation of acids and peroxides that promote the aging process. Other factors contributing to the deterioration of paper include

²¹ Chandru J. Shahani, Frank H. Hengemihle, and Norman Weberg, "The Effect of Fluctuations in Relative Humidity on Library and Archival Materials and Their Aging within Contained Micro-Environments," in *Proceedings of the Pan-African Conference on Preservation and Conservation of Library and Archival Materials, Nairobi, Kenya: 21-25 June 1993* (IFLA Professional Reports: 43). The Hague: Headquarters of the International Federation of Library Associations and Institutions, 1995.

atmospheric pollutants, high temperature and humidity levels, light exposure, insects and rodents that feed on paper and book bindings, and microorganisms such as mold and bacteria. Acidity in paper undermines the use and long-term preservation of library collections and archival materials. Chemists now know that acid deterioration can be minimized by deacidification and simultaneous impregnation with alkaline buffering agents. Millions of deteriorating books and documents in libraries and archives throughout the world attest to this problem. Mass deacidification retards embrittlement of paper and is, therefore, a preservation treatment appropriate for books that are acidic and at risk of irreversible deterioration if no action is taken.

Research and Development Initiatives: The Library of Congress - with strong support from the U. S. Congress - has provided leadership over several decades in research and development efforts that have encouraged the success of mass deacidification technologies that are finally being used in several countries to ensure the long-term useful life of paper-based materials. A Mass Deacidification Action Plan approved by Congress is making it possible for the Library to mass deacidify significant quantities of acidic books each year from the general and special collections.

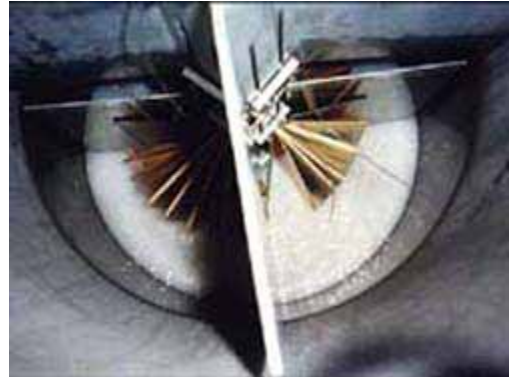
Deacidification has been an important area of research and development. Several approaches involving aqueous and non-aqueous systems were developed for single-sheet deacidification. Vapor phase (gaseous) mass deacidification using the diethyl zinc (DEZ) process received major research and engineering emphasis after the Library's scientists patented this technology in the mid-1970s. By 1978, the first series of tests were carried out on 1,600 disposable volumes, using a vacuum chamber at General Electric's Valley Forge, Pennsylvania, facility. Beginning in 1981, tests of the DEZ process were conducted in a vacuum chamber at NASA's Goddard Space Flight Center in Greenbelt, Maryland, with the assistance of Northrup Services, Inc., a NASA contractor.

A scaled-up testing program in late 1985 and early 1986 that resulted in two DEZ-related fires caused a temporary setback for development of this technology. At a pilot test facility subsequently built near Houston and operated for the Library by Texas Alkyls and its successor Akzo Chemicals, Inc., LC conducted 31 small scale DEZ tests to perfect the process. After completion of 12 more experimental DEZ runs in 1993 and 1994, which resulted in resolving two remaining problems with the DEZ process, Akzo chemicals announced that it was getting out of deacidification for business reasons and subsequently closed down the Texas DEZ plant. Fortunately, a technical evaluation committee reported almost simultaneously to the Library, encouraging the institution to work with Preservation Technologies, Inc., to enhance and hopefully utilize its promising Bookkeeper mass deacidification technology.

LC's Deacidification Treatment Program: The Bookkeeper method deacidifies paper when it is immersed in a dispersion of extremely fine magnesium oxide suspended in a fluid. The process takes two hours from the time books are placed in the treatment cylinders until the volumes are ready to be packed for return to their home library. All steps in the process, from selection to reshelving, are monitored to ensure that the intended results are achieved. The process meets the Library's basic preservation requirements by: (1) raising the pH level of treated paper to the acceptable range of 6.8 to 10.4 pH, (2) achieving a minimum alkaline reserve of 1.5%, and (3) extending the useful life of acidic paper (measured by fold endurance after accelerated aging) by at least 300%.

Early in 1995, Congress approved a two-year action plan in which the Library proposed using this new book deacidification technology. As a result, the Library awarded a limited production contract in 1995 to utilize the Bookkeeper deacidification process to neutralize the acid in books. The primary focus of this initiative was to ensure uniform, effective deacidification treatment of processed books and to enhance work flow, including book handling, storage, packing, and transportation procedures.

At right: Books are mounted in treatment cylinders where magnesium oxide is introduced to neutralize acid in the paper



Through a competitive process, the Library in 1997 negotiated a second contract for mass deacidification. The contract was again awarded to Preservation Technologies, Limited Partnership (PTLP) of Pennsylvania, which is providing book preservation services to the Library with their Bookkeeper mass deacidification process for four more years. By late-1999, the Library had deacidified a quarter of a million books from its general and law collections.

Selection Criteria: Deacidification treatment is reserved for books that are acidic and at risk of loss if no action is taken. Due to its role as the national library and the official library of the U.S. Congress, the Library is focusing primarily on selection of "Americana" for early treatment under the mass deacidification program, emphasizing the selection of endangered volumes from collections that are central to the Library's mission.²²



At left: Quality control lab tests verify the effectiveness of treatment

The Future: LC's Thirty Year Plan: Various deacidification technologies continue to be developed throughout the world. Institutions and companies are actively commercializing, developing, or initiating programs to create mass deacidification and related mass preservation technologies in other countries such as Germany, The Netherlands, Switzerland, France, the United Kingdom, Canada, Japan, South Korea, and China.

In the summer of 2000, Congress approved a Library proposal to establish mass deacidification as a permanent preservation program activity and to commence work on a one generation deacidification program. The plan calls for scaling up deacidification over the next few years in order to save and greatly extend the longevity of a

²² See: Kenneth E. Harris, "A Paper Chase: Saving the Written Word at the Library of Congress," in proceedings of the international conference "Preservation Management: Between Policy and Practice, Koninklijke Bibliotheek, The Hague, 19-21 April 1999." The Hague: Headquarters of the European Commission on Preservation and Access (ECPA), 2000. See also: Carole Zimmermann, *Bibliography on Mass Deacidification*. Washington, D.C.: Preservation Office, Library of Congress, 1991.

large volume of unbound paper-based materials as well as all retrospective (existing) and prospective (to be acquired) books that will benefit from mass deacidification treatment.

Preservation Reformatting Division

The Preservation Reformatting Division (PRD) preserves materials that are on unstable media, such as groundwood paper, so their content will be accessible and usable. In 1967, the Council on Library Resources funded a Brittle Books Project at the Library through the Association of Research Libraries. Although the Library began microfilming materials in the late 1930s, the Preservation Microfilming Office was not established until 1968, as a result of the pilot Brittle Books Project. The unit establishes internal microfilming requirements for the Library.

This unit ensures adherence to national standards and recognized guidelines for reformatting and conversion, such as those promulgated by the Association for Information and Image Management International and the Research Libraries Group. Along with these technical and bibliographic standards, the reformatting program collaborates with other preservation staff in developing a coordinated array of preservation services to assist custodians of the collections in making informed decisions for preserving individual items and discrete collections.

The Preservation Reformatting Division staff assist custodians and curators of paper-based collections in making condition assessments of library materials and in determining the most appropriate reformatting method -- microfilming, preservation photocopying, or digitizing. The staff conduct searches to identify replacement copies in paper or other formats of items which must be replaced because they are on fragile media that will not remain usable. They evaluate the quality of replacements in microform available from other sources. PRD compiles and delivers this information to custodians and then advises them on options to preserve the content of materials through replacement or provision of surrogates.

At right: Library staff and contractors collate materials and prepare them for reformatting

If custodial and preservation staff decide to reformat fragile items, staff or contractors determine the completeness of the originals based on an inventory and a page-by-page collation. The staff orders missing materials through interlibrary loan or arranges to borrow it from other institutions. Once a complete job is assembled for reformatting, the staff or contractors create finding aids and other internal information to facilitate use of the works that are being reproduced.



In microfilm, targets may include guides to contents, dates of issues for periodicals, missing page identifiers, or technical information that facilitates quality review in accordance with international standards. Technicians must program reels if the work exceeds the Library's maximum of 90 feet of frames on a 100 foot roll of 35mm film. Finally, librarians provide catalogers with the information about a title or collection that is ready for the cameras so that the Library will have an accurate bibliographic record of the newly created work.

Library staff inspect newly created microfilm to assure that it is readable, represents as complete and as accurate a version of the original as possible, and meets technical preservation standards. PRD tightened these standards to generate microfilm that can be digitally scanned at high quality in the future to facilitate improved access.

For twenty-five years, the preservation reformatting staff could provide only one option -- microfilming -- to replace fragile material without great intrinsic value as artifacts (such as telephone directories) or to create surrogates for valuable original items that would be damaged by use (such as George Washington's papers). Preservation microfilming matured during this period, not only through the development of stringent preservation microfilming standards, but also with improvements in equipment. Library clients grew more accepting, if reluctantly so, of microfilm as a useful medium that facilitated long-term access and preservation, in part because of improvements in reader-printers and due to interlibrary loan programs.

In 1992, the Library began creating paper-to-paper replacements by contracting for preservation photocopies of items such as reference works that were not suited for microfilming. Illustrations with gray-scale images are captured digitally and printed out on preservation quality paper. All volumes are bound according to Library Binding Institute standards.

In the late 1990s, the Preservation Reformatting Division began to establish a program using digitization as a method of reformatting. The preservation community responded to end-user enthusiasm for digital images due to accessibility of images when distributed on the World Wide Web, rapid improvements in scanning and delivery equipment, and the ability to capture and deliver materials in color. Though the Library has not fully accepted any existing digital format as a preservation medium, it acknowledges the value of providing highly accessible digital surrogates for fragile materials. The initial work selected for digitization in this program was the first full run of a serial to be distributed on the World Wide Web -- Garden & Forest, a horticultural newsletter, which was published weekly from February 29, 1888, through December 29, 1897. The project includes establishment of guidelines for selection, preparation, indexing, search and retrieval, as well as presentation and archiving of digital images for preservation and access purposes.

Photoduplication Service

The Photoduplication Service is a cost recovery operation that provides expanded access to the Library's collections through a wide variety of fee-based reproduction services, using photographic, photocopy, digital, and document delivery technologies. These services are designed to assist scholars, publishers, and members of the public who visit the Library and use the Library's collections in the reading rooms.

Before 1938, photoreproduction facilities at the Library were wholly inadequate for the public, with the result that the collections were available to a comparatively few people who were able to visit Washington, or whose professional connections made them eligible for interlibrary loan. In February of 1938, the Librarian of Congress announced the acceptance of a Rockefeller Foundation grant of \$35,000 to establish the Photoduplication Service. This fee-for-service, self-sustaining operation does not receive any appropriated funds.



At left: Microfilming Library materials.

In 1938, the Photoduplication Service had three employees and generated revenues of \$1,233. Today, the Photoduplication Service has 78 positions and generates revenues in excess of \$5 million per year -- evidence of increasing demand for the services of this unit. The objective of the service is to provide exceptional service to Congress, its constituents, and the larger world of scholars by furnishing the highest

quality photoreproduction, duplicating, and imaging products and services to ensure timely access to the Library's resources and collections.

This Library service organization provides a myriad of products and services to a variety of customers. Some of the products and services are photographic reproductions which include exhibition quality prints, slides and transparencies, microform (both roll film and fiche), and black and white as well as color photocopies. The microphotographic section of the Photoduplication Service is responsible for actually filming many of the Library materials that are collated and prepared by the staff of custodial divisions and the Preservation Reformatting Division (see above); for many of these prepared materials, PRD also contracts out microfilming to commercial vendors. A special services section of the Photoduplication Service maintains in low temperature and humidity storage the Library's master negative microform collection, totaling nearly 400,000 microfilm reels and more than 240,000 microfiche sheets, and reproduces copies of these microforms for a fee.

U.S. Newspaper Program

The United States Newspaper Program (USNP) is managed in the Library's Preservation Directorate by Robert Harriman. This is an effort, funded by the National Endowment for the Humanities (NEH), which is jointly coordinated by LC and NEH to locate, inventory, catalog, and selectively preserve all newspapers published in the United States and its territories since colonial times.

At right: Selection of United States newspapers

Project teams are established in each state to survey collections in libraries, archives, historical societies, and publishers' offices; inventory and catalog those collections; and preserve on microfilm important newspaper collections discovered as a result of project activity. Initiated in 1983, it is expected that this comprehensive newspaper preservation work will be completed by 2007.²³



²³ See: Robert Harriman, "The United States Newspaper Program" in *The ALA Yearbook of Library and Information Services: A Review of Library Events 1989*, Vol. 15, pp. 230-231. Washington, D.C.: American Library Association, 1990.

State-of-the-Art Storage And Special Media Conservation Activities and Facilities

Preservation of Special Media

Many preservation activities concerning special media (largely non-paper-based materials) within the Library's collections are funded through the preservation budget that is managed by the Director for Preservation. Technical support as required is provided by the staff of the Preservation Directorate, although day-to-day program activities concerning these media are managed by other Library organizational units such as the Geography and Map Division; the Motion Picture, Broadcasting and Recorded Sound Division; and the Prints and Photographs Division.

National Audio-Visual Conservation Center at Culpeper, Virginia

The National Audio-Visual Conservation Center (NAVCC), in Culpeper, VA, opens in the spring of 2007. The NAVCC is the result of a unique partnership between the Packard Humanities Institute (PHI), the United States Congress, the Library of Congress, and the Architect of the Capitol. PHI has a long history of support for the work of U.S. film and sound archives, for film exhibition, and for prototyping new digital preservation and access projects.

At right: Artist sketch of National Audio-Visual Conservation Center (NAVCC)



The Library and PHI collaborated to design the facility and its unprecedented new digital systems that will set standards for the world. PHI's gift to the nation is the largest private donation ever made to the Library of Congress.

The archive houses over one million theatrical films, newsreels and television programs, plus educational, industrial and advertising material (including over 150,000 reels of nitrate film). The Center also centralizes the Library's collections of nearly three million commercial sound recordings and radio broadcasts plus early voice recordings of historical figures.

The new facility will utilize diverse modes of preservation - from hands-on "boutique" copying of rare and fragile materials to streamlined "robotic" transfers for increased efficiency. These systems will significantly increase preservation capabilities with a digital preservation and acquisitions system that enables the center to serve as a "production factory" for archiving multiple petabytes of audiovisual content.

This magnificent new facility is equipped to provide preservation services to other libraries, archives and industry constituents, provide a test bed for the development of large-scale mass

digital archiving systems for audiovisual materials, and share innovations, standards and tools developed at NAVCC with the archival community.

High Density Collections Storage Facility at Fort Meade, Maryland

The Preservation Directorate advises the Architect of the Capitol on effective environmental storage areas and is fully involved in the planning for off-site, state-of-the-art library storage facilities.

At right: Collections Storage Facility at Fort Meade



On a 100-acre site on the grounds of Fort George G. Meade, Anne Arundel County, Maryland, located approximately 30 miles north of Capitol Hill construction has been completed on the first 2 of 13 projected book storage modules storage modules for the Library of Congress to be erected on that site. The completed modules provide a cool, safe environment for both paper-based and non-paper-based Library materials.

The Fort Meade facility, which will focus on storing books and special format collections such as maps and manuscripts, will be built in a modular fashion with a new module erected every several years. The first two modules, which have been designed specifically for paper-based collections, will include, in addition to the storage, an office area, loading docks, mechanical rooms, vestibule, and circulation corridors. Subsequent modules will also include an isolation room, processing space, and cold storage rooms for items that require a lower temperature, e.g. photographs and microfilm masters.

This state-of-the-art facility provides an environment that slows deterioration 500% over typical storage conditions, provides filtration from particulate matter and gaseous pollutants, shelving designed to specific preservation specification, and mitigates the risks of damage due to fire. Preservation Directorate staff worked closely with other LC units, contractors, and the Office of the Architect of the Capitol on specifications for the environmental systems, the selection of preservation-compatible materials for use in buildings construction, and the design and components of storage enclosures that will house books and other materials that will be transferred to the new site.

Conclusion

Our intellectual culture is diverse, not only in its breadth of expression, but also in how it is recorded for current and future use. The Library's mission presents us with a dual challenge -- that of preserving the ideas of our culture and that of ensuring that these ideas are both readily and continuously available to an inquisitive public.

In an informed, democratic society, our ability to accomplish this task is the shared responsibility, not only of the staff and management of the Library of Congress, but of also sister cultural institutions, our legislature, and concerned citizens. Due to the sheer size of the collections, their diversity, and the various ways in which they deteriorate, the Library's preservation challenges are both large and complicated.

Like all organic things, library materials, in simplistic terms, begin deteriorating the moment they are made, some much more rapidly than others. In other words, all library materials are inherently unstable. More specifically, their internal chemical structure inevitably leads them to enter into one or more chemical, physical, or biological interactions with moisture, oxygen, ozone, atmospheric pollutants, or micro-organisms.

Therefore, our objective is to postpone the inevitable as long as we can, or to transfer the information to a longer lasting medium. Clearly, it is the mission of the Preservation Directorate to prolong the existence of the collections through activities that minimize chemical and physical deterioration and damage and that prevent loss of informational content.

We are engaged in a race against time. In keeping with what fatalists say about time being "our worst enemy," we can realize that time has a way of insulting both the most useful and the most beautiful things in life. One of the laws of nature seems to be that time does not need to cheat in order to win. Though time is the natural enemy of preservation staffs and the institutions they serve, we must acknowledge that human ingenuity, determination, hard work, and professional commitment are surely our allies. The future always struggles against being mastered, but in the field of preservation the Library of Congress and many other great cultural institutions worldwide are demonstrating that they are up to the challenge.