

The Care and Preservation of

Archival Materials

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Virtually everyone has a collection of Archival Materials that require preservation, whether they are sentimental, financial, or educational materials. Archival collections can be preserved for years of use provided that some basic care is given to their preservation. The conservation staff at the Henry Ford Museum and Greenfield Village have compiled the information in this fact sheet to assist in promoting the responsible care of archival collections. The first step in the care of collections is to understand and eliminate or minimize conditions that can cause damage. The second step is to follow basic guidelines for care, handling and cleaning.

THE NATURE OF ARCHIVAL MATERIALS

Archival collections can be divided into three basic types: individual documents, books and photographic materials.

This information sheet addresses issues associated with the preservation of documents and books. For information concerning photographic collections see the listing of available conservation information sheets.

ARCHIVAL DOCUMENTS

Documents generally consist of three basic components: the paper or parchment support upon which information is recorded, a sizing material or ground layer that covers the surface of the paper or parchment, and the media that is applied to the support to create the document.

PAPER AND PARCHMENT SUPPORTS

Most paper consists of cellulosic materials. There are a variety of plants that can serve as sources of cellulose for paper making; which, in addition to hard and soft wood, include: linen, hemp, cotton, and mulberry.

Prior to the 19th century paper was made by hand. Most paper consisted of cotton, hemp, linen or mulberry fibers. Paper that is made from these fibers is commonly referred to as rag paper. Rag papers are generally very durable and can be preserved for hundreds of years.



With the dawn of the modern paper industry in the early 19th century, wood-based papers became an abundant and inexpensive alternative to costly rag-based papers. As with many inexpensive materials, cost efficiency did not coincide with durability.

Wood-based papers are prone to degradation due to the presence of lignin, which if not removed during the process of paper manufacture, degrades to form acidic compounds. The presence of these acids causes the paper to degrade rapidly becoming yellow and brittle, eventually leading to total disintegration. Modern newsprint paper is an example of wood-based paper.

Parchment and vellum are made from the skins of small animals. Traditionally, the skins are treated with slaked lime which acts as a preservative. The skin is then rubbed smooth with an abrasive such as chalk or pumice. Generally, parchment refers to the skin of sheep and goats, while vellum refers to fine quality skins that are obtained from calves, kid or lambs.

SIZING AND GROUND MATERIALS

Sizing refers to the application of adhesives, such as gelatin, plant gums or starches, to the surface of a sheet of paper. Unsized paper is highly porous and absorbent making it unsuitable for use with media such as ink and watercolor paints. Sizing is added to make the paper surface less absorbent in order to prevent the bleeding and blurring of media and to provide additional strength.

In the early 16th century, alum (potassium aluminum sulfate) was introduced as an additive to gelatin sizing, which served as an effective hardening agent. Unfortunately, alum degrades to form sulfuric acid, which leads to the eventual degradation of the paper support.

Processes such as printmaking require the use of paper having an extremely smooth surface. A ground layer consisting of clay, chalk or pigmented materials which are held together by an adhesive can be applied to the paper to give the required smoothness for these processes.

MEDIA

Media refers to the materials that have been used to create the document. Some commonly used media include watercolor paints, pencil, chalk, and ink which has been applied through a variety of printing or writing techniques.

Iron gall ink, which has been in use since the medieval age, degrades at an exceptionally rapid rate due to its chemical composition. This ink is manufactured from a mixture of

oak galls and ferrous sulfate. As it ages, the ink emits sulfuric acid which eventually destroys the underlying paper support.

BOOKS

Books can be viewed as having three basic components: (1) pages or leaves consisting of parchment or paper; (2) a protective covering made from leather, parchment or fabric; (3) the media that has been used to create the document.

Paper and parchment leaves can be bound together by a variety of different methods including sewing, stapling or attachment with adhesives.

BOOK COVERS

Both flexible and rigid book covers comprised of leather, parchment and fabric have been used over the years. In general, for rigid covers, cardboard, pasteboard and wood have been used as the underlying support. Pasteboard is a rigid material that is made by lamination of leather and parchment scraps.

Leather has been used for the manufacture of book covers since medieval times. Leather is made from a variety of animal including: cattle, pigs, deer and sheep. For the majority of book coverings, tanned leather was utilized. Tanning refers to a process by which leather is chemically treated in order to impart strength and stability. A variety of tanning processes have been developed over the years; each of these processes varies in its effect upon the longevity of the leather.

Leather that was produced prior to the 17th century using a vegetable-tanning process has proven to be highly stable. However, much of the vegetable-tanned leather that was produced during the 19th century is particularly unstable and prone to the development of Red rot. Red rot appears as powdery red degradation that is caused by the presence of sulfuric acid in the leather. During the mid-1800's, an increased demand for leather goods led to the development of a variety of new processes which vary in stability.

PARCHMENT AND VELLUM

Parchment and vellum were widely used for written materials up until the 19th century. Like leather, parchment and vellum are manufactured from animal skins. Both materials are extremely strong and durable; however, they are highly sensitive to moisture changes. Parchment and vellum undergo dramatic expansion and contraction corresponding to absorption and evaporation of water which leads to the formation of wrinkles and puckers. When utilized as coverings over wood or cardboard, this instability can lead to warping and distortion of book covers.

FABRIC

In recent times, the use of fabric and paper has increasingly replaced leather as book covers. Sized linen or cotton fabric is frequently used. Bookcloths, which were first manufactured in England in the early 1820's, were sized with starch which imparted rigidity and resistance to water damage. In 1910, pyroxylin-treated fabric came into use; however, these cloths were found to be unstable. Acrylic materials are becoming a common replacement for the traditional starch-based sizing. Other fabrics that have been used as cloth covers include silk and velvet.

FACTORS THAT CAUSE DAMAGE

There are a variety of factors that contribute to the degradation of archival materials. These include careless handling, poor environment, inappropriate storage, exhibition or framing, and improper cleaning and/or conservation.

CARELESS HANDLING

Careless handling is by far the most prevalent cause of damage to archival materials. It can lead to tears, wear, loss of the image, creases and staining. The following guidelines are included to assist in the prevention of damage that can occur during handling.

- Clean white cotton gloves should always be worn when handling a book or document. Salts and oils from human hands can cause damage in the form of staining and can also transfer dirt to the paper surface. Cotton gloves can be purchased from conservation suppliers (see supply list). If gloves are not available, care should be taken to ensure that hands are washed and dried frequently when handling the art.
- All work spaces and table tops should be neat and free of dirt.
- When moving a paper or parchment document always support it from below. The safest method for moving the object is to slide a piece of stiff paper or matboard underneath the art so that the matboard (not the document) is handled. This is particularly necessary when handling brittle paper or parchment items that cannot support their own weight. Never lift a piece of paper by its edges, particularly if there are any tears present.
- Stacked paper objects should never be dragged or slid across each other. This can cause abrasion or smudging of their surfaces. It is preferable to lift them up one at a time.
- Books should be grasped by both sides, not by the upper edge of the book (endcap). This can lead to damage and tearing of the binding. If the sides of the book are not readily accessible (as is often the situation with books that are

stored on book shelves), the book should be gently nudged forward on the shelf from the back so that it can be fully grasped with one hand.

- Never eat, smoke or drink in the vicinity of archival collections. Accidents can lead to irreparable staining or burns.
- It is a good rule to use only pencils when working on, or around, archival materials as pens and markers can cause staining. Never write on documents with a marker or pen. It can bleed through to the other side or can complicate future conservation work.
- Paper clips, binder clips and post-it notes should not be used on archival materials. Metallic clips can corrode and leave rust stains on paper, parchment and fabric. Post-it notes can damage the media or paper surfaces.
- Extensive xeroxing of books and documents should be avoided as it can lead to damage in the form of fading. The compression of books during xeroxing can also break the binding and spine of the book.

ENVIRONMENT

The overall environmental conditions under which archival materials are stored and displayed can have a great effect upon their longevity. Factors that can lead to damage include: pollution; pests; and inappropriate temperature, relative humidity and light levels.

Pollution - The fading of dyes and pigments and the overall degradation of archival materials can be caused by a variety of pollutants, including sulfuric acid, nitric acid, ozone and formaldehyde. These chemicals can originate either from the outside air or from materials in the environment. Wood and leather, as well as some rubber and plastic materials, can produce acid vapors as they age.

Air filtration is the most effective way to minimize damage due to pollution. Proper storage can help to prolong the life of works of archival materials, if air filtration is not feasible.

Measures should also be taken to eliminate storage or display in the vicinity of materials that emit hazardous gases. Unfortunately, for composite objects such as books, incompatible materials such as leather and paper cannot be separated. (see proper storage and display).

Pests - There are a variety of insects that can damage paper and leather artifacts; primarily, silverfish, firebrats, carpet beetles and the book louse.

Silverfish

Silverfish feed on mold and starchy materials that are found on paper. They are small gray insects (approximately 12mm in length) and have a scaly appearance. Silverfish are generally found in dark, cool and moist environments such as basements. Evidence of silverfish damage is visible as an abraded rough surface on paper materials.

Firebrat

The firebrat is similar in appearance to the silverfish; however, it is somewhat darker in color. Like silverfish, firebrats also feed on mold and starchy materials; the major difference being that firebrats prefer environments which are warm, moist and dark.

Book Louse

The book louse is generally found in heated buildings. They feed on mold spores that are found on paper and cardboard. Direct feeding by book lice doesn't cause visible damage to paper; however, their squashed bodies can cause staining. Book louse prefer high humidity levels (above 60%), and they reproduce at warm temperatures above 25 degrees C.

Carpet Beetles

Carpet beetles generally subsist on protein-based materials that are often present in archival objects; i.e., adhesives, leather or parchment. The presence of tiny black beetles (2mm in size), small worms or furry carcasses are an indication of infestation.

Pest Prevention

In general good housekeeping is the best method of deterrence. Regular inspections of stored collections provides the cheapest and safest method of safeguarding against infestation. Screening on windows and doors will aid in keeping out larger pests. In addition, fresh flowers and plants should be inspected before being brought into the home. When infestations are suspected, sticky insect traps can be placed under cabinets and cupboards. These traps do not poison insects, but they do aid in assessing the numbers and types of insects that are present.

In general, insecticides should not be used on or in the vicinity of archival materials. Insecticides can cause the fading and discoloration of paper, leather or parchment.

If you do find an infested item, place in sealed plastic bag and contact a professional immediately.

Temperature and Relative Humidity - Fluctuations and extremes in temperature and humidity levels can have a detrimental effect upon the preservation of archival materials. By far, the greatest damage to collections is caused by rapid fluctuations in relative humidity.

Temperature and humidity are interrelated. In general, heated buildings have very low relative humidity levels in winter. Conversely, humidity levels are high in the summer months.

Low humidity levels can cause:

- the drying out and embrittlement of materials.
- the shrinkage of vellum and parchment covers, resulting in warpage.

High humidity levels can cause:

the swelling of paper and parchment materials, resulting in planar distortions.
coated papers to stick together
the transfer of inks from one surface to another.
mold growth in levels above 60%.

Ideally cool storage is desirable for archival materials; however, in the home, it is generally not practical. Therefore, damage should be minimized by avoiding extremes in temperature and humidity. This can be done by insuring that objects are kept away from heat sources such as furnace vents, fire places, warm lights and direct sunlight.

Excessive humidity, as can be found in most basements, should also be avoided since it can cause mold growth that can stain the surface of the object.

Recommended temperature and humidity levels for the storage and display of collections are as follows:

Temperature: 67 degrees F, plus or minus 2 degrees F

Humidity: 47%, plus or minus 2%

Inexpensive temperature and humidity sensors can be purchased from University Products Inc. (See Suppliers).

Light - Another major cause of damage to archival materials is exposure to high light levels, which leads to fading of media, discoloration and embrittlement due to heating.

The most damaging portion of natural and artificial light is Ultra Violet (UV). UV is the invisible high energy portion of light. This is the same energy that has been proven to damage eyes and skin. UV filtering for windows and frames is commercially available and can significantly reduce the damaging effects of UV light.

In addition to damage resulting from exposure to UV, visible light can also damage documents. The recommended light levels for display of paper materials in museums is very low. 50 LUX is the level that is recommended for short periods of time (6 months). Colored inks are among the most susceptible to light damage and should be displayed in dim areas, free from bright light sources. Media such as black ink can tolerate somewhat higher exposure levels.

A camera light meter can be used to read visible light levels within your home; however, this method cannot be used to record UV levels. See CCI IIC Notes 2/5.

STORAGE, EXHIBITION AND FRAMING

The proper storage and display of archival materials can help to minimize many of the factors that can lead to degradation.

Paper Documents

The encapsulation of documents within a clear plastic (mylar) envelope provides a simple method of protecting documents from dirt, dust and tearing. Encapsulation also allows for viewing of both sides of the document. Mylar envelopes and acid free boxes can be purchased from conservation suppliers. For large or odd size documents, sheets of mylar can be sewn together or adhered along the edges using double sided tape. The recommended tape is 3M #415 adhesive tape. Care should be taken to insure that the tape does not come in contact with the document. Encapsulated documents can then be placed into acid free boxes or folders for long term storage.

Items that are not handled often can simply be placed in folders and boxes. All storage boxes, paper folders and tissue paper should be acid-free, lignin free and have a neutral pH. Acid that is generated by poor quality wood-based cardboard boxes and folders can cause the degradation of artworks stored within them.

Severely degraded paper should be stored in buffered boxes that contain an alkaline reserve. Alkaline reserve buffers are chemicals that absorb acids that are generated by the degraded paper.

In general, good housekeeping is essential to the preservation of artworks on paper. Routine inspection and cleaning of boxes and folders will aid in extending the life of collections.

Parchment Documents

Parchment documents should be stored in unbuffered acid free folders or boxes. The use of mylar folders is not recommended for parchment.

Books

Bookshelves are the most common method of storing books. To minimize damage that can be caused by overcrowding, books should be packed loosely on shelves. The use of book ends can help to provide even support. Large books should be stored flat on shelving units. Rare and fragile books should be placed into individual protective enclosures (see CCI IIC notes 11/1).

Exhibition and Framing

The display of documents and books in the vicinity of fireplaces or air ducts should be avoided since dirt and soot can be deposited onto the paper surface. The display of framed documents on exterior walls should be avoided as it can lead to damage resulting from moisture condensation on the back of the document.

Matting and Framing

Archival documents can be framed for display. The use of high quality, acid-free, lignin-free matboard is recommended. In general, paper objects should be framed using a window mat. Window mats provide space between the surface of the artwork and the glass of the frame to prevent the work of art from becoming stuck to the glass surface (see CCI IIC Notes on Framing 11/5).

The document should be attached to the matboard using only acid-free paper hinges and high-quality adhesives. Staining can be caused by contact with acidic or other poor quality materials, such as scotch tape or rubber cement. The recommended adhesives for hinging paper are wheat starch paste, methyl cellulose, and the ready-made paper framing/hinging tape that is available from University Products Inc.

The use of ultra violet filtering glass and Plexiglas in frames can help to reduce damage from UV light.

REPAIR AND CLEANING

Aside from obscuring text, dirt can attract moisture, mold spores and pollution. Dirt also has an abrasive quality that weakens the structure of leather and paper.

In general, the cleaning and repair of paper materials should be carried out by a professional conservator. If you wish to carry out some surface cleaning, the following procedures should be followed:

Surface Cleaning

Paper and parchment documents can be lightly dusted with a soft brush to remove surface dirt. Prior to dusting, the art should be inspected carefully to insure that there is no loose or powdery media or surface that could be brushed away during cleaning. Any additional cleaning of parchment should be carried out by a professional conservator.

If brushing does not remove sufficient surface dirt, dry eraser pads such as Opaline and Skum-X can be used on paper. Again, this method of cleaning should only be used for stable images.

To clean with Opaline or Skum-X, simply shake the powder onto the surface of the document and very gently rub it over the surface of the paper. The powder should then be brushed off using a soft brush. Care should be taken to clean only the areas around the media, not the media itself.

Always proceed with caution when cleaning. Over-cleaning can cause more damage than the dirt itself. Extensive wet or solvent cleaning should only be carried out by a conservator.

Books

The covers and edges of books can be brushed to remove surface dirt. An alternate method of cleaning is the use of a low-suction portable vacuum. A soft brush attachment and nylon screen should be attached over the end of the nozzle to catch loose fragments that could be vacuumed up during cleaning. All fragments should be saved since they can be reattached during future conservation work.

Mold Removal

Archival materials that have been stored in damp environments are highly susceptible to damage by mold growth. In situations where mold growth has occurred the mold must be removed before it can cause permanent staining or contamination of other objects.

The safest method of mold removal for paper items is the use of a brush and a small low-suction vacuum cleaner. Mold spores can spread through the air and must be contained. The Canadian Conservation Institute has devised an inexpensive method of making a vacuum that traps mold in a glass vial containing water (see CCI IIC Sheet 18/2).

If a vacuum cannot be constructed, an alternative method is to brush the mold off the surface of the paper. This must be carried out in an area where other paper and objects will not become contaminated. During the summer, this work could be done outdoors. Frequent cleaning of brushes is essential.

Place artwork in stable environment with moderately low humidity level and monitor its condition.

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Storage and Display

ICC CCI Notes

Canadian Conservation Institute Notes

1030 Innes Rd.

Ottawa Ontario Canada K1A 0M8

613-998-3721

11/2 Storing works of art on paper

11/5 Matting works of art on paper

11/1 Protective enclosures for books and paper artifacts

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Washington, DC 1980

SUPPLIERS

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800-828-9859

www.LightImpressionsDirect.com

Conservation Resources International LLC

8000-H Forbes Place

Springfield, VA 22151

800-634-6932



703-321-0629 (fax)

REFERENCES

For a listing of conservators in your area, please contact:

The American Institute of The Conservation of Historic and Artistic Works

717 K Street NW

uite 301

Washington, DC 20006

202-452-9545

<http://aic.stanford.edu/guide/form.html>

Note: The in-house conservation staff at The Henry Ford has developed these Preservation Fact Sheets to assist in caring for your historical materials. These fact sheets provide basic information on the care, cleaning, and handling of a particular type of artifact, referral information to other conservation organizations, and a bibliography of authoritative works. Individuals may also arrange for a private consultation with a conservator. For more information, please contact the Benson Ford Research Center at research.center@thehenryford.com.

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