CONSERVATION LEAFLET

June 2004

CLEANING AND PRESERVING BOOKS

All organic materials are subject to deterioration. For books, the composition of the paper, the processes used in their manufacture, the composition of the binding materials, and the adhesives used all affect the rate of deterioration. The widespread problems with the deterioration of books began in the late 1880s when wood pulp, which is less expensive and more plentiful than cotton or linen rags, became the primary raw material for papermaking. As papermaking became more sophisticated, the products became more acidic. Properties inherent in wood pulp and chemicals added during manufacturing create an acidic condition that causes paper to turn yellow, become brittle, and eventually crumble. It has been estimated that books published today have a life span of less than 50 years.

Other factors that affect the longevity of paper and bookbindings are temperature, relative humidity, exposure to light, pollution, housekeeping practices (keeping books free of dust), and physical wear and tear. Over time, exposure to sunlight and fluorescent light causes a photochemical change in paper and bindings which can result in fading or darkening and also initiates oxidation which leads to further deterioration.

Acids migrate to materials with which they come in contact. Books stored on wooden shelving units absorb additional acids from the wood. This increases the rate of deterioration. Proper storage conditions are essential for the preservation of book paper and bindings.

We cannot change the quality of paper in our book collections, but we can address the environmental problems in book storage and display areas. Control of the environment is the most important factor in the preservation of paper. The purpose of this leaflet is to suggest methods for slowing the deterioration of book collections.

TEMPERATURE

The temperature of book storage and display areas should be maintained as consistently as possible on a year round basis. Fluctuations in temperature cause fluctuations in relative humidity. The relationship is inverse. As the temperature decreases, moisture in the air causes paper to expand. Conversely, as the temperature increases, less moisture in the air causes paper to contract. This expansion and contraction causes the chemical bonds in paper to weaken and breakdown. Rapid or severe fluctuations in temperature can be more harmful than a consistent but moderately high temperature. Maintain temperature at 70 degrees Fahrenheit (F) + or -5 degrees F. An even cooler temperature is better since every 10 degrees of temperature doubles the rate of the chemical deterioration of paper.

RELATIVE HUMIDITY

Relative humidity in book storage areas should be maintained at 50% with a variation of no more than 10%. Fluctuations of humidity should be prevented. As the moisture in the air increases, paper and bindings absorb moisture. Moisture moving through the paper fibers causes paper to weaken. A high relative humidity combined with a high temperature accelerates the chemical reaction within the paper fibers and causes further deterioration. A combination of high temperature and low humidity causes material to dry and become brittle

From spring into fall, the most effective method for maintaining a constant environment is through air conditioning. If manufactured to do so, the unit can serve four purposes--ventilation, air filtration, and temperature and humidity control. If air conditioning is not possible, some practical and relatively inexpensive measures, such as fans, dehumidifiers, and/or humidifiers, can be used to improve the situation.

If books have to be stored in areas where there is no humidity control, use portable dehumidifiers to maintain the relative humidity below 60%. Dehumidifiers are only effective at temperatures above 65 degrees F. They will ice up below that temperature. Electrical refrigeration type dehumidifiers are preferable. If possible, connect a hose to the dehumidifier and run it to a drain. If this is not possible, empty the dehumidifier daily as often as necessary. If no other measures are available for improving humidity, an effort should be made to keep air circulating by using electric fans.

In the winter, if the humidity falls below 25%, it is desirable to utilize humidifiers to increase the relative humidity to 40%. Keep humidifiers clean by vacuuming the louvers and filters and replacing filters as needed.

A result of a failure to control temperature and humidity may be the growth of mold and mildew in the storage area and/or on the books. Mold and mildew stain, soften, and eventually cause paper to crumble. Mold begins to grow at a temperature of 70 degrees F combined with a relative humidity of 70%. Improper air circulation also contributes to the growth of mold. Molds and mildews also grow better in dark, dusty areas.

CLEANING BOOKS

In addition to mold, insects are attracted to dusty books, particularly if they are stored in areas with poor air circulation such as bookcases or shelves. Over thirty types of insects are attracted to the cellulose in paper products and the adhesives in bookbindings. Keeping books clean helps prevent damage from either source.

If the tops of books are significantly dusty, a vacuum cleaner with a round dusting brush can be used to clean them while they are still on the shelves. Fragile books should not be vacuumed since pieces of the pages may be pulled loose.

Hand dust books periodically to keep them clean. Grasp the book firmly and tip it forward so the spine is facing up and the top edge is down. Hold the book tightly closed to prevent dust particles from being pushed down into the paper. Use a soft bristled brush to remove dust. If books are still dusty, use a treated dust cloth (One-Wipe, available at grocery and discount stores) to wipe the top edges of the book in the same manner as described above. Continue to clean all edges of the paper and the cover with the One-Wipe. These cloths may be washed and reused up to 20 times before losing their effectiveness.

OILING LEATHER BINDINGS

Leather, an organic material, is subject to deterioration most often caused by breakage of fibers, either through manipulation during processing or as a result of an acid chemical reaction. Further deterioration is dependent on how volumes have been used and the environment in which they have been stored. High temperatures cause leather bound volumes to dry and lose their natural oils and fats. Low humidity, below 40%, can cause further deterioration of leather bookbindings. High humidity and poor ventilation may also cause mold/mildew to grow on leather bookbindings and exacerbate deterioration. For information on mold/mildew removal and to reduce odors, see: "Responding to a Mold/Mildew Outbreak" on the ADAH website. The final stages of deterioration are characterized by "red rot" – a rust colored powdering of the leather.

Saddle soap may be used to clean leather. Use a clean, soft, lint free cloth dampened with water to apply a small amount of saddle soap to remove dirt from leather. Some light colored leathers may darken from an application of saddle soap and lubricants.

Leather items also may be oiled every two to five years to replace natural lubricants and to keep the leather more supple. Use Neat's Foot Oil or a leather preservative/restorer to re-condition the leather. In preparation for this treatment, wrap the pages of the book in their entirety to prevent oil from soiling them. Cut a piece of waxed paper large enough to cover the entire textblock - the pages. Overlap the waxed paper and seal it with adhesive tape - much like wrapping a package.

Pour a small amount of oil in a small container. Spread the covers of the book and firmly hold it by the waxed paper covered pages. Using a lint-free cloth, apply a light coating of oil using a gentle dabbing, not rubbing, motion. Moisten the cloth frequently and apply the oil to all leather areas evenly. Replace the cloth with a clean one as necessary. Use a cotton swab to apply the oil to the leather edge of the volume.

Do not apply oil to the leather on the inside edges of the book or to areas where the leather is missing as it will be absorbed into the end boards and will stain. Avoid getting the oil on stitching or on gold leaf text often found on older books. If leather areas are worn, they may require another coat of oil after the first one has dried. Do not apply excessive amounts of oil at one time. Several light applications are preferable. Excessive amounts of oil may cause streaking or become sticky and act as a dust collector. Dispose of unused dirty oil.

After books have been oiled, lay them on their side with sheets of manila paper between each volume. Do not stack them so high that they may topple. Allow at least twenty-four hours for the oil to penetrate. If all of the oil has been absorbed and the leather appears too dry, apply another coat. Again, do not use excessive amounts of oil. When a book has been treated satisfactorily and is dry, buff the surface lightly with a soft lint free cloth to remove excess oil.

Sources of assistance: For lists of archival product suppliers, or for more information on this and other records conservation issues, contact: Linda Overman, ADAH Preservation Officer, at:

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