

Prevention and Conservation Methods of Museum Textiles

Manjali Sharma and Aparna Sharma

Textile is a basic necessity of everyone's life which is heavily used during their active lifetimes. Textiles are particularly susceptible to damage due to micro-organism growth, a problem familiar to collection managers. A large number of fungi, bacteria, yeast, and algae have been identified as surviving on fabrics. Associated with a characteristic musty odour, micro-organism growth appears as an irregular stain which generally ranges in color from gray to black although yellow, orange, and red stains are also possible. The result is a permanent discoloration of the fabric.

Health risks must be considered whenever a micro-organism infestation exists. Certain species of micro-organisms are pathogenic in high concentrations. They attack the mucus membrane of the lungs and can cause chronic irritation. If a very badly infested textile is discovered, caution should be exercised in its handling. Rarely are the resources available to identify the microorganism for its pathogenic nature.

Textiles and clothing are also the most numerous items found in small museum and historical society collections. Museums collect and exhibit textiles because of their intimate connection to people's lives.

If you have a textile hanging in direct light, or stored in a basement or attic, you should immediately take an action before it is too late, in order to conserve your textile.

Textile conservation is the practice of using scientific, technical, and historical analysis for the preservation and study of fibre art, textile and artifacts. This means it refers to the processes by which textiles are cared for and maintained to be preserved from future damage.

In the present study, an attempt is made to revitalize, promote and protect the art, craft and cultural heritage of museums by identifying the causes of damage and providing preventive measures to conserve the textile heritage of our country as well as of the whole world. This is done by curative conservation, correct storage and maintenance of heritage objects.

The textiles that you collect and preserve will generally fall into two categories: those that you display and those you use in a limited way, but still try to preserve for the future. The latter category includes such items as wedding gowns, quilts, and household linens. In using these textiles there must be the tacit understanding that while you are doing your best to pass these items onto the next generation, they will eventually become too fragile to use, or may be damaged beyond repair. A tear can be mended, a stain possibly removed, but damage cannot be reversed/recovered even by the hands of a conservator.

Causes for the deterioration of textiles in the museum:-

Textiles that are displayed in both homes and public buildings are subject to deterioration by many environmental factors - such as light, temperature and relative humidity, dust and dirt, insects, and improper storage or display. Thus the critical factors in maintaining your textile collection are control of environmental conditions, proper display techniques, and proper storage. It is true that the standards for which the museums strive for are not feasible in the home, but modifications can be made in order to provide the best conditions possible. These guidelines serve as an introduction and checklist for the care of textiles in the home.

Factors Affecting Biological Deterioration :-

- **Fibre Content** - All fibres support micro-organism growth. However, natural fibres (cellulosic and proteinaceous) are more susceptible to damage than synthetic fibres. The cellulose fibres, such as cotton, linen, ramie, jute, and rayon, are most vulnerable and are attacked by cellulolytic fungi and bacteria. These micro-organisms produce enzymes that convert the cellulose to soluble sugar, which is metabolized as food. While protein fibres, such as wool and silk, are less susceptible to attack, keratinophilic fungi will feed on and damage these fibres as well.
- **Damp Conditions** - Micro-organism growth on textiles is generally associated with damp conditions. Requirements for spore germination vary with species. Growth is noticeable when the RH is above 50% and quite fast above 80% RH.
- **Temperature** is another critical factor for germination. Temperature can be controlled with central heating and air-conditioning systems. These can be supplemented with window air units, or space heaters for individual rooms. Generally, spore activity begins above 24°C (75°F), increasing with higher temperatures. Some microorganisms can grow in significantly lower temperatures and at lower RH levels. Poor air circulation or stagnant air exacerbates problems.
- **Humidity** can be modified with humidifiers or dehumidifiers. A constant flow of air from fans can also be helpful to prevent mold and mildew. Textiles that are found wet due to a leakage or high humidity should be immediately dried with a fan.
- **Acidity/alkalinity** - The acid and alkaline content, or pH, of a textile is measured on a scale from 0 (very acidic) to 14 (very alkaline) with 7 as neutral. The pH of a textile will affect the growth of bacteria and fungi on it. The micro-organisms can survive in both acidic and alkaline conditions within the pH range of 4.0 to 9.0.
- **Light** and, in particular ultraviolet radiation, can damage delicate textiles. One of the greatest threats to textiles is light. The worst damage is caused by ultraviolet (UV) radiation from natural daylight and from fluorescent light

bulbs. However, while the damage caused by UV rays is quite rapid, the entire light spectrum causes textile dyes to fade and the fibres to become brittle gradually.

- **Air pollution** is also an enemy of textiles. Sulfur-di-oxide fumes from automobiles and industries affect some dyes. However, dirt and dust will probably be the greatest problem with your collection. Dust particles act like small knives, cutting the fibres as the textiles expand and contract in response to changes in relative humidity. A regular schedule of inspection and vacuuming is necessary to maintain your collection.
- Apparel is definitely **three-dimensional**, so it makes sense to exhibit them on three-dimensional bodies. This gives the visitors of the museum, a more realistic view of how the garments were actually worn, but it also puts additional strain on the items.
- **Handle with care** - It's no surprise that the oils from your hands can damage textiles, but even carefully-gloved hands can pose a threat to delicate materials. A certain mordant used in the 19th century causes fibres to become brittle when exposed to ultraviolet light. If the fabric is moved or creased, it can "shatter" or turn to powder.
- **Cleanliness of the textile surface** - Micro-organisms often start growing on soil and textile auxiliaries, such as starch, sizing, and brighteners. Textiles relatively free of dust and food stains are less susceptible to becoming a host.
- **Starch finishes** attract dust, dirt, and bugs. **Cellulose nitrate** is commonly used to coat sequins and buttons.
- **Hydrolysis** of the compound produces nitric acid, which, in turn, degrades silk fabrics.
- **Iron-based mordants** for certain dyes cause rust which reacts with textile fibres, causing them to swell and break apart.

The methods for conservation are:-

- **Cleanliness** - When working with your collection, be sure to wash your hands to remove oils, acids, salts, and soils that can stain your textile. Remove jewellery such as rings that might catch on loose threads. Work on a clean surface and do not eat, drink, or smoke around your textile collection.
- The **lack of oxygen** could protect the textiles from insects, pests, mold, mildew, humidity and other environmental factors that would otherwise deteriorate the textiles.
- **Vacuum or fumigation** could be used on the textiles to get rid of insects and pests and then store it in a zip-lock or air tight bag. A low-power, hand-held vacuum is the best tool for the job. Lightweight or fragile textiles should be vacuumed through a fibreglass screen (available at hardware stores). Vacuum slowly and carefully, working in the direction of the nap with

velvets or other pile fabrics. Avoid scrubbing back and forth. If you have a rug in constant use on the floor, make sure to vacuum the back as well as the front on a regular basis. Vacuuming the textile will remove most of the active growth. The Division of Conservation recommends using a vacuum with an HEPA filter. Such filters trap the extremely fine particles. Suction of the vacuum should be gentle and regulated so that it is appropriate for the condition of the textile.

- *Freezing*, which has recently become a widely used method of pest eradication in the United States and Canada, has not been thoroughly researched for its effects on bacteria and fungi. Growth and metabolic activities are reduced at 0°C (32°F) but not enough information is available regarding lethal temperatures. Chemical biocides capable of destroying organisms are the treatment of last resort. It is recommended that the species of fungi be determined before selecting a biocide. Then its use may be considered only in consultation with the regional Integrated Pest Management (IPM) Coordinator and the Regional Curator.
- *Gentle air circulation* in the form of a dry, cool air flow is effective to accomplish this. Dry cleaning is another treatment option that will kill microorganism growth. However, the use of dry cleaning solvents requires special procedures and temperature levels that must be adhered to when cleaning historic textiles. Therefore this option should be considered only in consultation with a textile conservator.
- The technology known as the *Anoxic (oxygen free) storage system* is also used to preserve the textiles. This technique involves storing a textile in a transparent film case which is sealed after all the oxygen is sucked out. Nitrogen gas is filled into the case to purge remaining oxygen and for volume. Additional oxygen absorbent, called age-less, is also put into the case so that the oxygen level in the case is not more than 0.05 percent.

Storage

- *Attics and basements should be avoided* as storage locations for your textile collection because climate is usually very difficult to control in those spaces. The best location in your home for textile storage is a cool, dry room. If using a closet, make sure there is sufficient air circulation to prevent mold growth.
- *Archival materials should be used* to package textiles for storage wherever possible (a list of suppliers can be found at the end of this publication). Archival products such as acid-free tissue, rolling tubes, and boxes are relatively expensive, but a worthwhile investment for your collection. Once packaged, textiles can be stored on rust-free metal shelving, or in drawers. If using wooden shelving or drawers, seal the wood with a water-borne polyurethane varnish, and place a barrier of archival tissue between the wood and your packaged textile. This is important to prevent the transfer of acids from the wood to your textile.

- *Whenever possible, store textiles flat.* This works well for small pieces such as lace or fragments. These can be layered between sheets of acid-free tissue and placed in archival storage boxes.
- *Rolling a textile for storage* is also an option, particularly for larger pieces, such as quilts and rugs. An archival tube is the best support for a rolled textile. A plain cardboard tube can be substituted providing it is buffered by heavy layers of acid-free tissue. Beaded textiles, those with metallic threads or heavy embroidery, and fragile textiles should be stored with tissue in between the layers as they are rolled to protect the surface. Pile textiles, such as carpets, should be rolled in the direction of the pile to prevent distortion and crushing. If a textile has been lined, roll with the lining face up. Some wrinkling will occur when the two fabrics are rolled together, but it is preferable for the wrinkling to occur on the lining than on the textile itself.
- *Garments can be hung* for storage if they are in good condition. To remove stain from the shoulders of a garment, choose a sturdy wooden hanger with the correct shoulder slant for the garment. Wrap the hanger in several layers of polyester quilt batting to give a fuller shoulder support. Cover the batting with a piece of washed muslin for a smooth finish. Finally, a hanging garment should be protected with a muslin dust cover made in the shape of a cleaner's bag. Avoid using plastic cleaner's bags and vinyl garment bags that deteriorate and could potentially harm your textile.
- *Avoid hanging heavily beaded costumes or dresses cut on the bias.* There are large archival boxes available for the storage of garments (approximately 18" x 60"). If it is necessary to fold a textile or garment for storage, crumple sheets of acid-free tissue and place the crumpled tissue in the folds to prevent creasing.

Proper Display Techniques - There are a number of ways to mount a textile safely for display. Ultimately, your choice is dependent on the condition of the textile. The following will assist you in discussing an appropriate mounting technique for your textile with a conservator.

- A textile in sturdy condition can be hung from a VELCRO® fastener strip. Textiles that can be hung this way are quilts, carpets, tapestries and blankets.
- Larger textiles that are not strong enough to hang from one end, such as a paisley shawl or batik, can be mounted on a fixed, square or rectangular, wooden frame, called a strainer, over which mounting fabric has been stretched. The textile is carefully sewn to the stretched fabric in such a way that will provide overall support to the textile. Sewing tension and position of stitches have to be carefully selected and executed. The textile itself should never be stretched over the edges of the strainer.
- It is also helpful to place a panel of archival cardboard in the center of a strainer behind the mounting fabric. This provides a solid support behind the mounted textile and helps prevent the stretched mounting fabric from

sagging. Depending on its size, a strainer with or without a solid support can be framed or glazed.

- As an alternative to the strainer with a solid support, smaller textiles can be mounted to a fabric-covered archival matboard. This type of mount is generally appropriate only for textiles that will be framed, as the matboard easily absorbs moisture and can warp if not restrained within a frame.
- The materials chosen for a mount are as important as the evaluation of the best kind of mount to support the textile. Use as few wooden materials as possible. If wooden supports need to be used (as for example in a strainer mount) the wood should be coated with a water-borne polyurethane varnish to seal in wood acids. Even if sealed, however, the wood must never come in contact with the textile.
- Archival corrugated cardboards or matboards should be used for solid supports and inserts in strainers. Mounting fabrics must be pre-washed to remove excess dyes, finishes, and sizings. The best choices for mounting fabrics are 100% cotton or cotton/polyester blends. Linen is not an appropriate fabric mount because it easily absorbs moisture from the environment causing sagging and distortion. Wool also sags easily and along with silk and silk velvet is susceptible to insect attack.
- A respirator with a high-efficiency particulate air (HEPA) filter and disposable gloves should be worn. The textile Numerous methods can be employed to eliminate dampness and maintain optimum conditions. Dehumidifiers will pull moisture out of the air. Desiccant bags can be placed in storage cabinets or exhibition cases for climatic stability. However, the bags must be monitored and maintained. They will absorb moisture and become fully humidified losing all effectiveness. They may need to be conditioned to a lower humidity level periodically. Stagnant air should be replaced with a gentle air circulation.
- Once a microorganism population is established, it alters the pH of the cloth. This alteration may result in a change of colors in the dyes. There can also be a decrease in the strength of the cloth. For these reasons, it is critical that an infestation be dealt with immediately. Conditions recommended for textile storage include a temperature of 18°C to 20°C (64°F to 68°F). Temperatures may be lower than these levels but the upper limit should be 24°C (75°F). The relative humidity should be kept below 65% and a level of 50% to 55% is recommended if possible. These conditions should be maintained consistently as fluctuations may allow dormant spores to begin growth. Fluctuations are also deleterious to textile collections as fibres dry out and then absorb moisture, swelling and cracking with each swing in RH.

Works Cited

- Glen, R.C., et. al. "Protection of Works of Art from Damage Due to Atmospheric Ozone." *Environment* 25A.2 (1991):441-450. Print.
- India. CPCB. *National Ambient Air Quality Standards*, 1994. Print.
- James, P.L. *Methods of Air Sampling and Analysis*. 3rd ed. USA : Intersociety Committee, Lewis Publishers, 1988. 403-492. Print.
- Jean, T. *Display Materials: The Good, the Bad and the Ugly*. Ottawa : Canadian Conservation Institute, 1994. 79-87. Print.
- Jean, T. *Standards for Levels of Indoor Pollutants in Museums: Indoor Air Quality in Museums and Archives*. Canadian Conservation Institute, 2000.
- Jean, T. *Standards for Levels of Pollutants in Museums: Part-II*. Canadian Conservation Institute, 1999. Print.
- Katz, M. *Methods of Air Sampling and Analysis*. 2nd ed. Washington : APHA, 1977. Print.
- Moraueska, L., et. al. *Indoor Air an Integrated Approach*. USA : EPA Report, 1995. Print.
- Raychaudhuri, M. "Formaldehyde Collection and Detection." East Anglia:IAP, 1999. Presentation.
- Scottish Museums Council. *Fact sheet-The Effect of Storage and Display Materials on Museum Objects*. 1994. Print.
- US.WHO. "Selected Methods for Measuring Air Pollutants." Washington : 1976. 1-31. Print.