STORAGE OF EIGHTEENTH-CENTURY WOMEN'S COSTUMES AT THE KENT STATE UNIVERSITY MUSEUM

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STORAGE OF EIGHTEENTH-CENTURY WOMEN'S COSTUMES AT THE KENT STATE UNIVERSITY MUSEUM

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Thesis

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ABSTRACT

The main objective of this thesis was to evaluate and reorganize the storage of the eighteenth-century women’s costumes at the Kent State University Museum (KSUM). Initially all the eighteenth-century women’s costumes – gowns, bodices, petticoats, and stomachers – were hung on hangers and stored within a single wardrobe unit, which caused compression, stress, and abrasion. The primary plan of this project was to spread the costumes into two wardrobes and to develop a hanging mechanism for the gowns whereby they were not just suspended from the shoulders but could also be supported at the waist.

In order to develop an efficient and effective storage solution for these costumes, I visited eight museums to interview their curators and gain first-hand knowledge of various storage techniques currently in use. I evaluated recommendations made by museum curators, conservators, and published experts. I also examined catalogues of archival storage products to determine what was available for the storage of costumes and textiles. Thus I was able to compare and evaluate various storage techniques. Since this project was mostly about the storage of eighteenth-century women’s silk costumes, I also delved into the history of eighteenth-century women’s costumes and silk textiles including weighted silks.

Each eighteenth-century women’s costume, at the KSUM, was carefully examined to assess its condition so as to determine a suitable storage method. Some
costumes had to be stabilized before they were put back in storage. A hanging method was developed distinctive for each costume such that a complete ensemble – gown, stomacher, and petticoat – could be stored together. Dustcovers were made for all costumes and included provisions for the storage of stomachers and various trims.

Labels stitched on each dustcover provided information on each garment and made them easily accessible. The garments were stored in two wardrobe units. The storage technique thus incorporated was simple, easy, and relatively inexpensive for other museums, with limited space and budgets, to follow.
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York, New York), Mr. Glenn Petersen (Assistant Conservator at The Museum at FIT, New York), and Ms. Karen Herbaugh (Curator at American Textile History Museum, Massachusetts). I also wish to thank Ms. Chris Paulocik (Textile Conservator at the Metropolitan Museum of Art, New York) and Ms. Suzanne Smith (Housekeeper of Furniture, Textiles, and Fashion Department at the Victoria and Albert Museum, London, U.K.) for answering my questions on costume storage at their respective museums.

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CHAPTER I

INTRODUCTION

Clothing and textiles are manufactured mostly as functional objects, to be used and discarded when worn out or out of style. Some are preserved, including cases where memories are associated with them or when they are produced as symbolic costumes for ceremonial purposes. Even though they are produced as utilitarian objects, certain meanings are attached to items of clothing and textiles by the manner in which they are worn. Hence one can learn a lot about other societies or past cultures by interpreting the meaning attached to the clothing and textiles produced and worn by the people of that society or culture. Isabel Alvarado, textile preserver and restorer at the Museo Histórico Nacional in Santiago, Chile, rightfully observed that because of our desire to study history and cultures through clothing and textiles, we have turned them into museum pieces. This has opened the door to a whole new chapter in the preservation, storage, and conservation of museum artifacts; that is, preservation, storage, and conservation of clothing and textiles.¹

The Kent State University Museum (KSUM) in Kent, Ohio, is dedicated to collecting, exhibiting, interpreting, and preserving fashion and decorative arts. The museum has a well-established storage system for its historic costumes, textiles, and
accessories like shoes, hats, purses, etc.² Dr. Anne Bissonnette, Curator of the museum, however, wanted to reorganize the storage of eighteenth-century women’s costumes. This presented me with an opportunity to focus my research on the storage of eighteenth-century women’s costumes. Since the storage area of the KSUM is already designated and established, this research mainly focused on the physical placement of eighteenth-century women’s costumes within the existing storage units.

**Challenges in Researching Storage of Costumes and Textiles**

Preservation, storage, and conservation of costumes and textiles is a relatively new field and as yet no concrete, fool-proof method of preservation and storage of these items has been formulated. Through trial and error and through years of experience in dealing with costumes and textiles, many conservators and curators have developed methods and procedures of preservation, storage, and conservation for costumes and textiles. Many of these methods have evolved from preservation, storage, and conservation practices of other museum artifacts. Conservators and curators come from different backgrounds and different regions of the world. Since each relates to his or her own experience, they often have different ideas and recommendations. Hence the literature on costume and textile preservation and storage, though full of recommendations, is incomplete and often contradictory.³ Alvarado pointed out that as yet no overall agreement has been reached on which are the best methods of caring for costumes and textiles.⁴

Clothing and textiles differ from other museum artifacts such as paintings and sculpture in the way that they are composed of not only cloth but of a combination of many different mediums such as fur, feather, leather, ivory, tortoise-shell, and metal.
Hence they require even more careful supervision in preservation and storage because these different materials may react differently to atmospheric changes. Furthermore, some manufacturing techniques employed in the production of some textiles have proved detrimental to those textiles and costumes and have produced nightmarish problems for conservators and curators. One such problem is the preservation, storage, and conservation of weighted silk. These textiles are simply turning to dust and there, at present, seems to be no solution to the problem. Few such problems, which are typical of costumes and textiles, are encountered in other museum artifacts. As preservation, storage, and conservation of costumes and textiles is a relatively new topic, improvements and refinements in techniques and practices are constantly being made. Hence one must read the literature on this topic with a critical eye and always keep the specific needs of the collection in mind.

Planning an Effective Storage System for Costumes

In order to develop a suitable storage system for costumes and textiles, it is important to first examine the collection to determine its storage needs. As budgets and storage spaces in most museums and historical societies are limited, this assessment will aid in the development of a compact and cost-effective storage system focused on the primary needs of each object.

To develop an effective storage unit, Christine Giuntini, Associate Conservator of Textiles at The Metropolitan Museum of Art, New York, recommended conducting an inventory survey, which must include an assessment of how the object must be stored based on its condition. For example, costumes can be stored flat or hung on hangers and textiles can be rolled on rods or stored flat in boxes. Developing a storage unit requires a
record of the overall dimensions of the costume together with its archival support.\textsuperscript{9} For example, to determine the dimensions required to make a wardrobe unit for hanging costumes, one needs to consider the maximum width of the costume while hanging, and the length of the costume including the hanger. A wardrobe unit thus made would ensure that the costume, when hung, does not brush against the walls or the floor of the wardrobe unit. A record of the final weight of the costume together with its archival support is essential to ensure that the storage unit can bear the load of the costumes with their archival supports.\textsuperscript{10} The storage area of the KSUM is furnished with wardrobe units and drawers, which were modeled along the lines of those used by the Costume Institute of the Metropolitan Museum of Art in New York, and designed specifically for storing historic costumes. Therefore this research mainly focused on the physical placement of eighteenth-century women’s costumes within the existing wardrobe units.

The second step in developing a storage system, according to Giuntini, is to conduct a literature review on the subject.\textsuperscript{11} Lastly, she advised a visit to other museums and historical societies to investigate and compare their textile and costume storage systems.\textsuperscript{12} This would allow the researcher to explore the successes or failures of existing storage systems in meeting the storage needs of individual costumes and textiles.

Lucy Commoner, Textile Conservator at the Cooper-Hewitt National Museum of Design, New York, added that planning a storage system also requires analyzing the projected use of the collection while it is in storage and the degree of physical protection it would hence require.\textsuperscript{13} How often would the objects be handled, either for exhibition or educational purposes? Who would be allowed to handle the collection – volunteers or
trained staff? These are some of the important questions to be considered while planning a storage system.

**Method of Research**

For this research, I carefully examined the eighteenth-century women’s costume collection of the KSUM and its existing method of storage to identify problems, if any, in storage and determine specific storage needs for each costume. This examination enabled me to identify the following storage problems that would have to be addressed to arrive at an optimum storage solution:

1. Front-open gowns were hung on padded hangers. As they have no buttons or hooks and the necklines are wide, these gowns tend to fall off the hanger while being removed from the wardrobe unit. So the problem was to identify a better way to hang or store these gowns.

2. Two-bar skirt hangers were used to hang petticoats. A rectangular piece of washed muslin or archival tissue paper was draped over the waist of the petticoat which was then clasped between the bars of the hanger. This method posed a problem for one petticoat which was heavier than the others and so kept slipping from between the bars of the hanger.

3. Some costumes have trimmings and embellishments that when hung close to other costumes tended to rub against them causing the threads to abrade.

4. In one case, lace and fabric trims were removed from the gown and placed in a plastic ziplock bag. The bag was pinned to the hanger. This situation brought two questions to my mind. First, was it correct to place lace in a plastic bag and second, what would be the appropriate method of storing this lace with the gown it belonged to?
5. For exhibition purposes, when part of a costume, such as a petticoat, is missing, the KSUM has had the fabric of the costume digitally reproduced in their CAD department and made into a petticoat. These digitally printed petticoats are stored with the actual gowns, which some conservators believe might pose a problem.

6. Lastly, as most of the eighteenth-century costumes in the museum’s collection are made in silk, it was important to focus on the properties of this fiber. If the costumes were sewn using a silk thread, the thread might dry out and break, causing seams to open. Hanging such costumes could cause unnecessary stress on seams. Even if they appear to be in a good condition, is it still advisable to hang silk costumes sewn with silk thread?

I also studied the history of eighteenth-century costumes so that I had complete background knowledge of the kind of costumes I was dealing with in terms of the shape, silhouette, construction methods, and textiles used. This study provided me with a context on which storage solutions for the eighteenth-century women’s costumes were based. I concentrated mainly on silk textiles as the eighteenth-century costume collection at the KSUM consists predominantly of this material.

I visited museums and historical societies that have eighteenth-century costumes in their collections to study and compare the storage facilities incorporated by these museums and historical societies. These meetings with the curators and conservators of costumes and textiles enabled me to gain a hands-on experience of various storage techniques and understand their successes or failures. These museums were Los Angeles County Museum of Art, California; The Western Reserve Historical Society, Ohio; Colonial Williamsburg Foundation, Virginia; Philadelphia Museum of Art, Pennsylvania;
Cooper-Hewitt Museum, New York; The Museum of the City of New York, New York; The Museum at FIT, New York; and the American Textile History Museum, Massachusetts. I also contacted the curatorial staff of the textile and fashion department at the Victoria and Albert Museum in London, which I knew had a substantial eighteenth-century costume collection but where it was not possible for me to visit.

My foremost question, during these interviews, was whether storage of eighteenth-century costumes was different from storage of costumes belonging to other eras. Each time I received the same answer – the storage of any costume was determined on a case-by-case evaluation of each costume’s storage need and not the period it belonged to. Linda Baumgarten, Curator of Textiles and Costumes at the Colonial Williamsburg Foundation, specified that the storage method for any era’s costume depended on the shape (what part needed support), materials (is the costume made of a fragile textile that should not hang), and the condition of the piece. In most cases, the fragility of a textile or the condition of a garment is impacted by the age of the costume; therefore, age should be one component of care for costumes. Based on this theory one would expect costumes belonging to an earlier era to be more fragile than costumes belonging to a later period. There are, however, many extant costumes to indicate otherwise. For example, the weighted silk costumes of late-nineteenth century and early twentieth century require more care than some costumes belonging to an earlier period.

Though the focus of my research was eighteenth-century costumes, I was exposed to storage of not only clothing and textiles, but also accessories such as fans, parasols, hats, and shoes. This enabled me to experience the diagnostic and problem-
solving approach to storage these museums and historical societies employed within their respective budgets and storage space.

I reviewed published and unpublished literature to study current recommendations made on storage practices by various authors. I also studied catalogs of various suppliers of archival products to discover what kind of archival products were available for storage of costumes and textiles. Through these interviews and literature reviews, I was able to compare and evaluate storage techniques incorporated by various museums and historical societies, such as their storage methods and the use of archival materials, dust covers, and hanging devices. Using what I learned through the interviews and literature review, I tried to implement at the storage of the KSUM.

The Importance of this Research

Interestingly, much has been written about ideal storage conditions for costumes in terms of the physical environment like effects of light, temperature, humidity, dust, and insects on costumes. A lot has also been written about designing effective storage facilities focusing on such topics as the location of the storage room within the building and its floor plan, installation of necessary electronic and mechanical monitoring equipment like fire detectors, and the design of effective storage units and furniture. Not much, however, has been written about the physical placement of costumes within these storage units. Also, to date, any research focusing on storage techniques has not been specific to costumes belonging to any particular period in history.

Up until 1970s, most conservators preferred to hang costumes to prevent creases. Today, most agree that some costumes, even if they are in a good condition, are better stored flat in boxes or drawers than hung on hangers. Only time can judge the
effectiveness of a storage technique for any particular costume. So, as costumes in collections become older, conservators and curators discover the effects of storage techniques on costumes, favorable or otherwise. This enables them to learn from their mistakes and build on their successes, thus developing optimum storage solutions.

Through this research, I have documented, evaluated, and compared storage methods incorporated by various museums and historical societies as well as recommendations made by various experts in the field of preservation and conservation of costumes and textiles. This enabled me to propose an effective storage solution for the eighteenth-century women’s costume collection at the KSUM. Hopefully, this research will also benefit other museums and historical societies.

Notes


2 *The Fairchild Dictionary of Fashion* defines costume as, “dress, coat, or suit with coordinated accessories, an ensemble; fancy dress for masquerade parties, Halloween costume and masked balls; dress from a certain period in history, generally referred to as historic costume; theatrical dress worn on stage; native dress worn for festivals and specific occasions; and term used, in 1860s, for outdoor day dress or afternoon dress with a long train.” See Charlotte M. Calasibetta and Phyllis Tortora, *The Fairchild Dictionary of Fashion*, 3d ed. (New York: Fairchild Publications Inc., 2003), 113. In this thesis, the term costume is used in reference to historic costume.


4 Alvarado, 28.

5 Ibid., 29.

7 Ibid., 69.

8 Ibid.

9 Ibid.

10 Ibid.

11 Ibid., 70.

12 Ibid.


14 Linda Baumgarten, Curator of Textiles and Costumes at the Colonial Williamsburg Foundation, email correspondence with author, 2 March 2004.
Before embarking on the journey of researching storage techniques for eighteenth-century costumes, it was essential to first gain a brief insight into the timeline of eighteenth-century costumes and comprehend the properties of the textiles that were used to make these costumes. Understanding the history of eighteenth-century costume enables one to study the characteristics of these costumes in terms of shape, silhouette, size, construction methods, and textiles used, all of which are of extreme importance when determining appropriate storage techniques.

Shape, silhouette, and length of the costume are important considerations while selecting a box for flat storage or a hanger to hang the costume. The dimensions of the ideal wardrobe unit, whether for flat or hanging storage, largely depend on the area of maximum width and length of the costume. The dimensions of a box, drawer, or tray for flat storage affect how the costume would be folded. The shape and silhouette of the costume, such as the width and slope of the shoulders, the height of a collar, or depth of a neckline, control the shape, size and type of hanger required and the length of its hook.

Fabric and construction techniques of costumes, whether hand sewn or machine-made, the placement of seams, and the type of thread used determine the stress
areas of the costume. This knowledge in turn helps determine the appropriate type of storage, that is, whether the costume should be boxed or hung, and if it is hung what areas of the costume may require additional support and how should that support be provided with the least amount of stress on the costume.

The main purpose of this chapter is to provide a general background of eighteenth-century women’s dress and textiles to provide a better perspective of storage needs for these costumes. The discussion of textiles focuses primarily on silk textiles, as the eighteenth-century costume collection at the Kent State University Museum (KSUM) consists predominantly of this material. To help explain why most eighteenth-century silk costumes are in a better condition than most late-nineteenth and early twentieth-century silk costumes, a study of the silk-weighting process, which was predominant in the late-nineteenth century and early twentieth century, was included. This information helped justify the storage methods finally selected for eighteenth-century costumes. Thus this chapter presents a context on which storage solutions for eighteenth-century women’s costumes were based.

**Timeline of Eighteenth-Century Women’s Costumes**

The eighteenth century can be divided into five distinct periods based on the popular style of costumes: 1700 to 1740, 1740 to 1770, 1770s, 1780 to 1795, and the late 1790s. Women’s dress, during the entire century, was comprised mainly of a gown worn either open or closed.¹ The open gown consisted of a gown open in the front, filled at the bodice with a stomacher, and worn with a petticoat.² The closed or round gown was closed all the way down the front and did not require a stomacher or petticoat to complete the ensemble.³ Women also wore a separate bodice and skirt style of dress, where the
bodice was like a short jacket worn over the petticoat or skirt. This style was more common with working-class women.⁴

All through the eighteenth century, except for the last decade, women wore stays under their gowns. These stays compressed the bust and pushed its fullness high, transforming the bodice into an elongated cone. This enabled women to have an erect posture with a straight back, rounded shoulders, and a prominent chest.⁵ For open gowns, a triangular stomacher further emphasized the cone shape of the bodice.⁶

During the eighteenth century, subtle changes in components such as trimmings, textiles, sleeve and skirt shape heralded the change in fashion. The style of trimmings and accessories changed more rapidly than the basic silhouette and so women were able to update their gowns by replacing old-fashioned trims to create a new look.⁷

As most silk costumes during this period were remodeled to reuse expensive textiles, the interior construction was not exceptionally neat and often displayed rather long stitches.⁸ More care went into the construction of women’s plain cotton or linen shifts, men’s shirts, and baby clothes. These were sewn with small, tight stitches with raw edges turned inside because they were subjected to more stress in wearing and cleaning than silk costumes. Most silk textiles were woven so tightly that close stitching was also not practical.⁹ All garments were hand-sewn with either silk or linen thread.¹⁰

1700 to 1740

Towards the end of the seventeenth century, women wore a gown called the mantua.¹¹ It was a wide overgown, either plain or decorated with gathered panels, with a pointed boned bodice and a train caught in a bustle at the back. The underskirt or petticoat was sometimes trimmed with flounces.¹² According to costume historian Norah
Waugh, the mantua developed from a loose open gown with pleats at each shoulder, which continued to the waist and were held at the waist with a sash. The sleeves of this gown were cut in one piece with the garment. Later the sleeves were cut separately in horizontal grain and the pleats of the bodice were stitched down till below the waist from where they fell in folds in the skirt. The front skirt was draped around the hips and caught at the back in the form of a bustle and the back skirt fell into a long train. The mantua was worn over stays.

With the passing of Louis XIV in 1715, court etiquette in France became fairly relaxed, so French women adopted a looser, more comfortable dress called the *robe battante, robe volante, innocente, or sacque*. In England it was usually called a sack. This was a loose, tent-shaped gown, worn over dome-shaped hoops, with or without stays, and with pleats that fell from the front and back shoulders. The sack was not very popular with English women, who preferred to wear something more fitted. They continued to wear the mantua. This preference led to the French distinguishing between the two styles, later in the century. They called the sack a *robe à la française* and the mantua a *robe à l’anglaise*.

From 1710 to 1740, the mantua’s skirt, which was worn over round hoops, developed into a dome-shaped silhouette. It was worn open to reveal a decorative petticoat. Sleeves ended just below the elbow and were full and often cuffed. Towards 1720, the sack gown was fashioned with a fitted bodice in the front, which was fastened on either side of the stomacher. Pleats, arranged in two layers, fell loosely at the back from the center of the neckline.
Silk, during this period, was heavy but crisp and with a rich drape so that other decorations were seldom required. Figured damasks, brocades, and figured silks with large floral designs and sometimes integrated with broad stripes were popular. Textiles were often in dark, rich colors with lacy, symmetrical designs or tight scrolls.

1740 to 1770

Instead of a dome-shaped silhouette, skirts from 1740 to 1770 became oval with wide sides. This look was achieved with oval hoops or side paniers made of reed, cane, or whalebone. Paniers were used first in England around 1720 and slightly later in France. From 1725 to 1730 they were more in the shape of an oval bell gradually modifying into a shape where the front was flat with wide sides. Paniers remained in widespread use until about 1770 to 1780. The robe à la française, with a fitted front and pleats at the back, remained popular in France. English women still preferred the robe à l’anglaise, which had a close fitted front and back bodice. Both styles, however, were worn in both countries and in America. Bodices retained the cone shape and the use of stomachers. Stomachers were often decorated with a row of bows, called eschelles, decreasing in size towards the waist. Ribbons, laces, and flounces were used to embellish the gowns and often appeared in serpentine patterns down the front of skirts. Sleeves generally ended below the elbow. They began to narrow and by 1750 layers of ruffles, called engageantes, replaced cuffs.

By the 1750s, silk became lighter in texture, though it was still firm and crisp. Floral designs remained popular. Bold, realistic floral patterns of the 1740s developed into lighter scatterings of flowers, often in a serpentine design in the 1750s. Stripes with floral sprays became popular in 1760s.
Six gowns, in the eighteenth-century women’s costume collection at the KSUM, belong to the period between 1740 and 1770 (see table 2.1). The first gown (1983.1.11) is a robe à l’anglaise altered from a robe à la française. It is made in white silk damask. The fabric is said to be from Spitalfield, England, and is dated ca. 1740s. The gown, however, was probably last altered around 1770s or 1780s. The second gown (L1995.17.60ab), which survives with a petticoat apron, is in a blue silk fabric brocaded with silver flowers. This gown is trimmed with silver metallic lace. It is probably French. The fabric of this gown is dated ca. 1750. The gown, however, is severely altered and hence, as a garment, has lost its authenticity as an eighteenth-century gown.

The third gown (2002.35.7ab) is a robe à la française, in a peach, blue, and white striped silk lampas, and survives with a stomacher, which might have been altered or made later. This gown is dated ca. 1750-1760 and is probably German.

One robe à la française gown (1983.1.24abc), possibly English, is dated ca. 1765. It is constructed in moiré brocade and is complete with a matching petticoat and stomacher. The gown, petticoat, and stomacher are embellished with a chenille trim. The petticoat is decorated with ruffles. Two gowns are dated ca. 1760-1770. The first gown (1983.1.8ab) is a yellow silk faille robe à la française, possibly from England or France, which can be draped à la polonaise. This gown and its matching petticoat are embellished with a fly fringe trim. The second gown (L1995.17.59), a robe à la française in a wide iridescent green brocade silk, which is probably of Chinese origin, is lined with silk in a pink color and linen. One of the silk lining panels is a blue silk, which has shattered and is in a fragile condition. This is stabilized with silk crêpeline. This
Table 2.1. Eighteenth-Century Women’s Costumes at the KSUM.

<table>
<thead>
<tr>
<th>Accession No.</th>
<th>Costume Type</th>
<th>Fabric</th>
<th>Date</th>
<th>Provenance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1983.1.3</td>
<td>Petticoat</td>
<td>Silk satin</td>
<td>ca. 1750-1775</td>
<td></td>
</tr>
<tr>
<td>1983.1.4</td>
<td>Petticoat</td>
<td>Silk satin</td>
<td>ca. 1750-1775</td>
<td></td>
</tr>
<tr>
<td>1983.1.5</td>
<td>Ceremonial gown</td>
<td>Silk damask</td>
<td>ca. 1725-1799</td>
<td></td>
</tr>
<tr>
<td>1983.1.6</td>
<td>Bodice</td>
<td>Silk brocade, Back=linen</td>
<td>ca. 1740-1749</td>
<td></td>
</tr>
<tr>
<td>1983.1.8ab</td>
<td>Gown, petticoat (reproduction stomacher)</td>
<td>Silk faille</td>
<td>ca. 1760-1770</td>
<td>England or France</td>
</tr>
<tr>
<td>1983.1.9ab</td>
<td>Gown, partially reproduced petticoat (reproduction stomacher)</td>
<td>Silk brocade</td>
<td>ca. 1770s</td>
<td>England</td>
</tr>
<tr>
<td>1983.1.10ab</td>
<td>Gown, petticoat</td>
<td>Silk brocade</td>
<td>ca. 1770-1790</td>
<td>England</td>
</tr>
<tr>
<td>1983.1.11</td>
<td>Gown (reproduction petticoat)</td>
<td>Silk damask</td>
<td>Textile: ca. 1740. Garment last altered 1770s-1780s</td>
<td>Spitalfields, England</td>
</tr>
<tr>
<td>1983.1.24abc</td>
<td>Gown, petticoat, stomacher</td>
<td>Silk moiré</td>
<td>ca. 1765</td>
<td>England</td>
</tr>
<tr>
<td>1983.1.2158</td>
<td>Petticoat</td>
<td>Silk, Lining=cotton &amp; wool</td>
<td>ca. 1760-1779</td>
<td></td>
</tr>
<tr>
<td>1995.68.1</td>
<td>Gown</td>
<td>Silk</td>
<td>ca. 1780-1785</td>
<td>England</td>
</tr>
<tr>
<td>L1995.17.59</td>
<td>Gown (reproduction petticoat)</td>
<td>Silk</td>
<td>ca.1760-1770</td>
<td>England or France</td>
</tr>
<tr>
<td>L1995.17.60ab</td>
<td>Gown, petticoat-apron</td>
<td>Silk</td>
<td>Textile: ca. 1750. Garment much altered</td>
<td>France</td>
</tr>
<tr>
<td>L1995.17.61ab</td>
<td>Gown, petticoat (reproduction stomacher)</td>
<td>Silk</td>
<td>Textile: ca. 1770s</td>
<td></td>
</tr>
<tr>
<td>L1995.17.65ab</td>
<td>Bodice, petticoat (reproduction stomacher)</td>
<td>Silk brocade</td>
<td>ca. 1762-1763</td>
<td></td>
</tr>
<tr>
<td>L1995.17.66</td>
<td>Bodice (Reproduction petticoat and stomacher)</td>
<td>Silk brocade</td>
<td>ca.1762-1763</td>
<td></td>
</tr>
<tr>
<td>2002.35.7ab</td>
<td>Gown, stomacher</td>
<td>Silk, Lining=taffeta</td>
<td>ca. 1750-1760</td>
<td>Germany</td>
</tr>
<tr>
<td>2002.35.8</td>
<td>Petticoat</td>
<td>Silk satin, Lining=wool</td>
<td>ca. 1750s</td>
<td>Germany</td>
</tr>
</tbody>
</table>
panel is weighted silk and I believe was probably added in the late-nineteenth or early twentieth century.\textsuperscript{37} This gown might be from England or France.

There are also three bodices, belonging to this period, in the collection. The earliest bodice (1983.1.6) in the collection is dated ca. 1740-1749. This bodice has a center-front closure and so requires no stomacher. It is constructed in a cream silk floral brocade. As there is no information about its original petticoat, this bodice is often displayed with one of the eighteenth-century quilted petticoats. The other two bodices are open bodices. One (L1995.17.65ab), ca. 1762-1763, survives with its original petticoat, though an installation stomacher was constructed for exhibition purposes. Also for exhibition purposes, the KSUM developed a reproduction petticoat for the other bodice (L1995.17.66), also dated ca. 1762-1763, by photographing the original fabric and digitally printing the fabric for the petticoat. An installation stomacher was also developed for this bodice. The latter two bodices are probably French.

\textbf{1770s}

In the 1770s, both the \textit{robe à la française} and the \textit{robe à l’anglaise} remained fashionable. Trimmings on gowns became more sedate with the use of ruching and robing, though flounces were not altogether abandoned. Ruchings were pleated or gathered strips of fabric, which were then applied as trim.\textsuperscript{38} Robing was the term for the front edges of the robe, which were pleated back over the face of the garment. They were either continuous with the bodice or skirt or seamed on.\textsuperscript{39} Occasionally, stomachers with center-front buttons began to be sewed into the gowns and gradually gowns with edge-to-edge center-front closures replaced these.\textsuperscript{40}
The polonaise-style gown was introduced during this period, where the skirt was looped and arranged in puffs, with drawstrings or tapes sewn into the skirt, to reveal the petticoat. The fullness shifted from the side of the gown to the back and skirts became shorter to reveal the ankles. This style was inspired by French peasant women who looped up their skirts through the pocket holes, while engaged in active household chores or farm work. The robe à la polonaise soon replaced the robe à la française for normal wear.

As the century progressed, silk textiles became lighter in weight and color, with small-scale patterns. Accordingly, trimmings and laces too, became lighter and more delicate. Neoclassical themes influenced textiles as stripes, with small insects and single flowers scattered across them, began to dominate patterns. Printed cotton textiles were becoming fashionable.

Two gowns in the KSUM’s collection are dated 1770s. One gown (1983.1.9ab), probably English, is a robe à l’ anglaise with a partially reproduced petticoat. This ensemble is made in a light yellow silk brocade with a floral design. The gown was probably restyled from a mid-eighteenth century robe à la française into a robe à l’ anglaise with pleats, at center-back, stitched down at waist. The other gown (L1995.17.61ab) is a robe à l’ anglaise with matching petticoat. Both are fabricated in a blue and ivory stripe pattern with a floral supplementary weft pattern. The gown was altered in the nineteenth century and restored to its original eighteenth-century draped à la polonaise style.

One gown (1983.1.10ab) in the collection is dated ca. 1770s to 1790s. The fabric is ivory silk brocade with vertical self-stripes and small flowers typical of the style.
popular in 1770s. The gown is an open robe cut away from the center-front to reveal an under-bodice or an attached stomacher, which has a center-front closure. Gowns with center-front closures were first seen in the seventies. The *robe à l’anglaise* style remained popular till the nineties when the fashionable silhouette commanded a higher waistline. Hence this gown is dated from 1770s to 1790s. The gown survives with its petticoat and is said to be from England.

1780 to 1795

By 1780, the *robe à la française* faded out of fashion.48 It was worn only as a formal court dress in France and England.49 The *robe à l’anglaise* persisted, though with slight modifications.50 Gowns were now cut low and women wore them with a puffy kerchief that filled the neck area. The prominent chest and the fullness at the back of the skirts created an S-shaped posture, or a pouter pigeon effect.51 Sleeves became longer and tighter, shaped to curve over the elbows. These coexist with cuffed elbow-length sleeves.52

Marie Antoinette popularized the *chemise à la reine* or the *robe à la chemise* or the chemise dress. This gown resembled the chemise undergarment of the period, hence the name.53 It was a gown, made in white muslin or light gauze, with a soft, fully gathered skirt, attached to the bodice at the waist and often worn with a sash around the waist.54 This style was a harbinger of the trend towards simplicity in the following decade.

By the 1780s, silks became almost paperweight. The appeal for simplicity in design affected textile patterns too and small floral designs, tiny spot motifs, and narrow stripes became popular. Flat pleatings and ruching with pinked edges replaced puffed
Robings. Trimmings of contrasting materials like transparent gauze, net, and lace were also popular.\textsuperscript{55}

Only one gown (1995.68.1) in the collection is dated ca. 1780 to 1785. This gown is a \textit{robe à l’ anglaise} with the skirt draped \textit{à la polonaise}, and is probably from England. It has a low neck with center-front closure and shaped sleeves that end below the elbow. The purple-looking shot-silk fabric is an iridescent blue and red silk with green woven stripes, brocaded floral sprigs, and dots.

\textbf{Late 1790s}

The 1790s were years of transition, when neoclassical style influenced women’s wear and cotton and muslin influenced the cut of gowns. The soft gathered skirt with the waist sash of the \textit{robe à la chemise} and the low neck of the \textit{robe à l’ anglaise} covered with the puffy neckerchief were well suited to the soft fabrics that were coming into vogue.\textsuperscript{56} The waistline rose and gowns, though they retained a soft fullness, began to follow the natural roundness of the female body.\textsuperscript{57} Women gradually discarded the hoops and by 1800, many stopped wearing stays.\textsuperscript{58} Most gowns had trains at the back. Sleeves remained fitted but varied in length.\textsuperscript{59} Gowns were made in sheer, soft fabrics in light colors or small floral prints on white backgrounds.\textsuperscript{60}

In the KSUM’s eighteenth-century women’s costume collection, one costume, labeled ceremonial dress on the accession card, is dated 1725 to 1799. This dress is in blue silk damask and shows the influence of Turkish design. It is, however, difficult to assign an exact date for this costume since it might be a fancy dress in Turkish style.
Silk Industry in the Eighteenth-Century

In the eighteenth century, the European silk-weaving industry was flourishing especially at Spitalfields in England and at Lyons in France. The silk-weaving industry at Tours, France, which in the seventeenth century was the most important silk-weaving center in France, lost its ace position to Lyons in the eighteenth century. Both Spitalfields and Lyons became major silk-weaving centers and specialized in patterned woven silks.

There is considerable evidence that patterns of fashionable silk changed each year during the eighteenth century. The French were mostly responsible for this evolution in fashion. Louis XIV established and encouraged the silk industry in France. Special support was given to industries producing luxury goods. Aside from new charters given to silk weavers in Lyons and Tours, prohibitions were imposed on wearing foreign silks. As Europe became increasingly wealthy in the eighteenth century, the demand for new patterns in silk increased. Thus as output increased, it became easier to spread the cost of introducing new patterns. France became the leader in fashion. The rest of Europe, including Spitalfields in England, followed French fashions closely. Thus as the weavers of figured silk in other European countries followed French designs, there is a remarkable similarity between silks produced at any given stage in these different countries. The French were, however, able to maintain their lead in patterned silks.

Mounting a draw-loom to weave a new pattern was a long and expensive proposition and the weaver tried to produce as many silk pieces as possible before changing the set-up of the loom. The French were able to weave sufficiently large number of pieces to make a decent profit. Their foreign competitors, who were copying
French designs, could only weave a few pieces of pattern before the arrival of new French silks forced them to change the set-up of their looms again.68

The silk industry in Spitalfields, England, gained momentum largely due to the settlement of Huguenot refugees who left France due to religious persecution.69 By 1713, the English silk industry became well-established. The French industry suffered a serious depression during the War of the Spanish Succession (1701-1713). During this period, the English, with the help of their navy, were able to conquer some well-established French markets and sell their silks in these markets.70 The English silk industry was highly organized and was backed by extensive capital and technical expertise. They, therefore, produced silk of exceptional quality, even though the patterns were inspired from French originals.71 After England, Ireland was the largest consumer of English silks. Large quantities were also shipped to the colonies.72

Numerous attempts were made to start silk cultivation in America, in the seventeenth century, mainly to provide raw material for England’s silk-weaving industry. James I of England not only sent mulberry plantings and silkworms to America, but also offered bounties to encourage silk cultivation.73 Colonial American silk was generally of poor quality. The process of making yarn was not fully understood and weaving and finishing was amateurish, so the fabrics were stiff, fuzzy, dull, and lacked the color-fastness of English silks.74 Also, cotton and tobacco cultivation was more profitable so sericulture was gradually abandoned in the colonies.75 Hence the colonies mainly relied on imports for silk textiles.

Under the English mercantile policy, the colonies were supposed to be a chief source of raw materials for England and a major consumer of British products.76 Thus to
maintain this status, England passed the British Navigation Act in 1651 mostly to curb increasing competition from Dutch traders. According to this Act, goods brought to England from Europe could be carried in English or country of origin ships, however, goods brought from Asia, Africa, or America could go to England, Ireland, and any English colony only in British or Colonial ships. In 1660, another restriction was added to the Act, which stated that only merchandise brought in English ships navigated by Englishmen could be imported into the colonies. This meant that silk coming to America from India or China had to be brought to England first. Thus England was able to control trade in America and levy duties on colonial imports, which made textiles even more expensive for the colonists. Such acts instigated the colonists to produce their own textiles. Luxury goods such as brocades and damasks, however, still came from Europe. As an example, when the 1764 Sugar Act, which levied duties primarily on molasses, but also included silks from Persia, China, and East India, as well as calicoes, cambric, and French lawns, was passed, men of Philadelphia resolved to wear only American-made woolens. Though home production increased; so did smuggling from Holland and France.

Even with all the Acts and levies, England remained the chief supplier of silk textiles, to America, in the eighteenth century, although Americans used silk from other parts of the world as well. Kax Wilson, a prominent writer on textile history, mentions in her book *A History of Textiles* that the colonies, in the seventeenth century, exported some wool to France in exchange for silk. Natalie Rothstein, an expert on eighteenth-century silks, comments that the British East India Company was the main competitor of English textiles, exposing the American market to silk damasks and taffetas from India.
and China. According to Rothstein, the choice of English or Indian silks, in America, was based on whichever happened to be cheaper when the order was completed. She states that while French silk was considered more fashionable in London, in the colonies, English silk was certainly not considered provincial. By 1760s the import of dress fabrics and elegant figured silks from Spitalfields reached its peak.

It is seldom easy to identify the country of origin of silk textiles except where an original design may have been found and could be matched to the specimen. Many scholars have tried to distinguish between English and French silks. In his book *Baroque and Rococo Silks*, Peter Thornton comments that the English preferred to have their patterns on a light-colored ground as opposed to the French who often used dark colors. Also compositions of English silk patterns were loosely controlled, were often more open and even straggling than their French counterparts. He, however, goes on to say that these points are still not enough to proclaim the provenance of any silk textile with absolute certainty. The provenance of some eighteenth-century women’s costumes in the KSUM’s collection is not known and those which are known are not proven, except for one gown (1983.1.11), the fabric of which is definitely from Spitalfields. Most gowns are said to be from England. This is because Shannon Rodgers and Cora Ginsburg collected most of the costumes at auctions in London. Though English women might have valued French silks more, they wore mostly English silks because various Acts issued by the English Parliament prohibited the import of foreign silk materials, making French silks difficult to acquire legally. Therefore, most of the costumes collected at auctions in London are probably English rather than French.
The Silk Fiber

The silk fiber is obtained from the cocoons of the silkworm, which is actually a caterpillar of the silk moth. The most common source of silk is the *Bombyx mori* moth. This moth is truly domesticated, in that it has lost its ability to fly and live without human assistance. The larvae of *Bombyx mori* feed only on the leaves of the mulberry tree, especially the white species, and so produce cultivated silk. Coarser wild silks, like Tussah, are produced by the Saturniidae family that can feed on a wider variety of plants like oak and castor leaves.

The female moth lays her eggs on the leaves of the type of plant the caterpillar will eat and then dies. The caterpillars that hatch from the eggs are voracious eaters and shed their skin to grow in length from about three millimeters to eight centimeters in a span of about thirty days. Towards the end of this stage in its lifecycle, the caterpillar attaches itself to a twig and spins a cocoon around itself for protection during its metamorphosis from pupa to moth. The moth breaks out of the cocoon by emitting a liquid that dissolves the silk. As the moth breaks the long continuous silk fibers while emerging from the cocoon, it becomes essential to obtain the fibers before the moth’s full development.

Silk is a continuous protein filament fiber that consists of two parts – a fibrous crystalline bipolymer called fibroin, which is surrounded by a non-fibrous amorphous bipolymer called sericin. The caterpillar secretes the protein fibroin, surrounded by the gummy sericin, from two glands, which connect at the spinneret located under the caterpillar’s mouth. On extrusion into the air, the two fibroin filaments, known as brins, harden into a silk thread called bave. The bave consists of the two brins surrounded by
sericin. The main purpose of sericin is to bind the brins together and cement the cocoon.

**Weighting of Silk**

Fibroin accounts for 75 to 90 percent of the silk fiber and sericin for 10 to 25 percent. It is this small amount of sericin that makes raw silk dull, stiff, and harsh to the touch. As sericin is soluble in hot water, it is removed by a process called degumming, where the baves are treated in a mild alkaline solution at a temperature of about 95°C. This procedure improves the touch and gloss of the fiber and makes it more receptive to dyes. It, however, also causes a substantial decrease in the weight of the bave, which affects the drape of the fabric. To compensate for the loss of weight during degumming, silk can be weighted by various organic as well as metallic salts. Weighting is defined as the process of artificially adding weight to pure silk, by mixing dyes with metal salts, sugar, or other foreign matter, beyond what is needed for dyeing colors. This makes the fabric look thick or feel heavy. When the increase in weight is equal to the weight lost during degumming, silk is said to be at par. It is said to be below or above par when weight gained is less or more, respectively, than the weight lost during degumming.

Initially, the main purpose for weighting silk was to replace the weight lost during degumming. When it was discovered that silk could absorb a greater amount of weighting agent than the sericin lost during degumming, the practice became more widespread. This was because silk was sold by weight and manufacturers found silk-weighting extremely profitable. In her masters thesis, Merrill Horswill cited Frank Farrell and Sir Frank Warner, prominent twentieth-century writers on the silk industry,
who, writing in favor of the practice, claimed that silk-weighting made silk more affordable to a wider market. They argued that because weighting added bulk to the fiber, less fiber was required to weave a fabric, which was cheaper and heavier than unweighted silk and had a better drape. Weighting silk, they said, also helped conserve a valuable resource. In spite of all these arguments in favor of the process, there remains a chief drawback to the weighting phenomenon. Silk-weighting deteriorates the strength of the fiber and makes it extremely susceptible to light damage. This is evident in many weighted silk costumes from the late-nineteenth century and the early twentieth century, which are in an extremely fragile condition with evidence of severe cracking and tearing. During this period, however, it was believed that with rapidly changing fashions, the garment would be outdated long before the fabric showed any sign of wear, so the practice of weighting silk continued.

History of the Silk-Weighting Practice

Silk-weighting has been closely related to dyeing methods because weighting agents were often present in dyes. Prior to the nineteenth century, though dye books are generally silent about silk weighting, common weighting agents such as iron were used in dyeing silk. The Chinese or sixteenth-century Europeans discovered that silk had a strong affinity for certain metallic salts such as tin, lead, and iron that gave the fabric a stiff hand. As early as the seventeenth century, however, the detrimental nature of weighting agents such as iron was recognized and the practice was banned by a proclamation of King Charles I. In her thesis, Horswill mentions that no patents for weighting agents were issued during the seventeenth and eighteenth centuries. The use of tin, which later became an important weighting agent, was patented in 1748 as a mordant
for scarlet dyeing. That a large number of silk-weighting patents were issued in the nineteenth century indicates that the practice was gradually being accepted as a manufacturing process. This practice became especially rampant in the late-nineteenth century and the early twentieth century.105

By the turn of the nineteenth century, silk was weighted so heavily that it would crack and disintegrate, sometimes within a year. Black silk was weighted the most, sometimes as much as 300 percent, where a pound of silk was made to weigh four pounds.106 By the early twentieth century, though heavy silks were still in great demand, the practice of silk-weighting was considered reprehensible by most in the silk industry.107 In 1932, the Federal Trade Commission set regulations for labeling silk. “Pure dye silk” was silk that could be weighted up to 10 percent for colors and 15 percent for black. If silk was weighted above this amount, the label was required to include the term “weighted.” Fabrics labeled 100 percent silk contained no weighting material.108

Properties of Silk

An insight into the properties of silk is crucial to understand how silk textiles are affected by age, light, chemicals, and other factors, which would in turn influence storage decisions. Silk is a natural fiber with high tensile strength, rivaled only by nylon. Tensile strength is the ability of a fiber to be pulled without breaking. Silk is also very resilient; that is, it can resume its original position, over a period of time, from any deformation of stretching, bending, or twisting. It also has some degree of elasticity; that is, it will stretch 10 to 20 percent over its length without breaking.109 Though silk is one of the strongest fibers known to man, it was not meant to last forever. Nature intended it to last only for the duration of metamorphosis of the silkworm. Silk loses its physical
properties with age. Silk fabrics become brittle and often crack at folds as they age. The loss of its strength is accelerated by certain environmental factors. Silk becomes weaker when wet and is highly susceptible to light damage. Long exposure to sunlight causes the fibers to weaken and change color. White silk becomes yellow and dyed silk can fade. In spite of its high tensile strength, resiliency, and elasticity, silk is not very durable to abrasion. Silk is not as sensitive to acid as it is to alkali. Fresh perspiration is mildly acidic, but the bacteria on skin break down the ammonium compounds to form alkali. Overtime this damages the fibers, making the fabric brittle.

**Planning Storage for Eighteenth-Century Costumes**

The above properties are important considerations when planning storage for eighteenth-century silk costumes. Specific storage techniques should be determined on a case-by-case basis by carefully examining the fiber content, construction, shape, finish, dye or pigment, the presence of other components, such as beads and metal buttons, and the condition of each costume. Most museums, due to space constraints, hang their eighteenth-century costume collection, unless the condition of the costume requires flat storage. Some conservators are skeptical about hanging eighteenth-century costumes since they are more than two centuries years old. Eighteenth-century silk costumes, however, are in a better condition than nineteenth-century silk costumes. The latter are in a more fragile condition because of the use of weighting agents in silk textiles. In the late-nineteenth century and the early twentieth century, increasing mass production resulted in cheaper textiles, making textiles more expendable. Fashion changed faster so the durability of textiles was not an issue. Thus silk-weighting was not only acceptable, it was also encouraged. On the other hand, though weighting agents were present in
some dyes in the eighteenth century, their use was restricted. This was because the
detrimental affects of weighting agents were understood and textiles, because they were
expensive, were meant to last for generations as costumes were often altered to reuse the
expensive textiles.

If one decides to hang eighteenth-century silk costumes, it is important to keep in mind that these costumes were sewn with rather long stitches to facilitate future alterations of the costumes. Also most silk costumes were sewn with silk thread, and silk thread tends to dry and break overtime causing the seams to rupture. So even though the silk textile of eighteenth-century costumes is heavy, sturdy, and in a relatively better condition, the seams become the point of weakness in these costumes. In many cases the seams, for example in the shoulder area, might not endure the stress of hanging. Also, even though a costume might exhibit a somewhat stable fabric construction, it is important to remember that the basic chemical and morphological structure of the fiber itself limits its lifetime. These inherent properties of the fiber dictate how general ageing will affect the costume and hence influence every aspect of care including accession, documentation, conservation, restoration, exhibition, display, and storage. Therefore, historic costumes should be frequently examined to reassess the impact of the chosen storage on the garments.

Notes


2 Ibid., 107.

4 Cunnington and Cunnington, 106.


6 The stomacher was a triangle of richly decorated stuff that masked the bodice opening in the front. François Boucher, *20,000 Years of Fashion: The History of Costume and Personal Adornment* (New York: H. N. Abrams, 1987), 296.

7 Baumgarten, 216.


9 Baumgarten, 40.


11 Boucher, 294.

12 Ibid.

13 Waugh, 65.

14 Ibid., 66.

15 Ibid.

16 Ibid., 68; Tortora and Eubank, 238.

17 Waugh, 68.

18 Ibid.; Tortora and Eubank, 238; Boucher, 295; Baumgarten, 218.

19 Waugh, 69.

20 Baumgarten, 224.

21 Boucher, 296.
The blue silk panel in the lining of the gown # L1995.17.59 was weighted silk, and did not seem to be original to the eighteenth-century gown. Thus I believe that this panel was probably added in the late nineteenth or early twentieth century, when the use of weighted silk was very popular.
43 Boucher, 300.
44 Baumgarten, 230.
45 Waugh, 74.
47 Waugh, 74; Baumgarten, 230.
48 Tortora and Eubank, 240.
49 Waugh, 74.
50 Tortora and Eubank, 240.
51 Baumgarten, 219.
52 Ibid.
53 Tortora and Eubank, 241.
54 Ibid.; Baumgarten, 219; Boucher 307; Waugh, 74.
55 Waugh, 74.
56 Ibid., 131.
57 Ibid.
58 Baumgarten, 219.
59 Waugh, 131.
60 Baumgarten, 234.
63 Thornton, 18.
In 1589, Henry IV of France, grandfather of Louis XIV, had issued the Edict of Nantes, a political arrangement intended to bring peace between the warring Protestant minority, known as the Huguenots, and the Roman Catholic majority in France. In 1689, however, Louis XIV formally revoked the Edict of Nantes, taking away the rights enjoyed by the Huguenots, as the Edict went against his ideal of “one faith, one law, one king.” As a result of this revocation, as many as 200,000 Huguenots left France for England, the Netherlands, Prussia, and America. Among those who left were skilled silk textile workers, many of whom settled in Spitalfields, England, establishing the silk industry there. 

82 Ibid., 91.

83 Rothstein, Nov 1967, 151.

84 Wilson, 241.

85 Thornton, 61.


87 Ryder, 17.


89 Ibid.

90 Mattera, 25.


92 Robson, 421.

93 Horswill and others, 2.


97 Robson, 454.

98 Horswill and others, 3.


100 Leene, 16.


105 Ibid., 51.

106 Kolander, 129.

107 Ibid.


109 Mattera, 26.

110 Randall Bresee identified five types of ageing on textiles: physical ageing where the physical structure of the fiber changes without the application of additional energy; photochemical ageing, which results from chemical changes when textiles are subjected to additional energy such as ultraviolet light; thermal ageing occurs when structural changes result from the absorption of thermal energy or heat; chemical ageing happens when textiles are subjected to external chemical agents such as peroxide bleach or even environmental pollution; and ageing from mechanical stress whereby costumes are adversely affected by the strain of display or storage. Randall R. Bresee, “General Effects of Ageing on Textiles,” Journal of the American Institute for Conservation 25 (1986): 39.


114 Kolander, 12.


CHAPTER III

CURRENT STORAGE RECOMMENDATIONS AND PRACTICES

Few visitors realize that costumes and textiles on display in museum galleries constitute only 5 percent or even less of the entire collection because the major portion of a museum’s collection is preserved in storage.\(^1\) Storage, therefore, is one of the most important aspects of a museum. Up until the twentieth century all textiles were made from natural sources; that is plant (cotton and linen) or animal (wool and silk). Due to their organic nature they are extremely susceptible to deterioration. Proper storage of these costumes and textiles, therefore, is of utmost importance if museums want to preserve their collections for generations to come. On a more profound level, the collection storage is more than just a physical facility for a museum – it reflects the museum’s programs and its role in the community and the institutional world.\(^2\)

This chapter presents current recommendations, views, and concerns of various experts on the topic of storage of historic costumes based on a review of published and unpublished literature. It also explores current storage practices incorporated by various museums and historical societies based on interviews conducted with their respective curatorial staff. These museums were Los Angeles County Museum of Art, California; The Western Reserve Historical Society, Ohio; Colonial Williamsburg Foundation,
Virginia; Philadelphia Museum of Art, Pennsylvania; Cooper-Hewitt Museum, New York; The Museum of the City of New York, New York; The Museum at FIT, New York; American Textile History Museum, Massachusetts; and the Victoria and Albert Museum, U.K. As mentioned before, this research primarily focused on eighteenth-century women’s costume. Most literature on storage practices, however, is not specific to any particular period in history. So I gathered information from all sources, pertaining not only to historic costumes from various periods in history, but also to textiles and accessories such as hats, shoes, parasols, and gloves. I then applied my findings to the eighteenth-century women’s costumes at the Kent State University Museum (KSUM).

Costume conservation is a fairly new field. In the past, costume collections were often inadequately stored due to lack of information on storage methods and a shortage of safe materials and supplies. For example, up until 1970s, most conservators preferred to hang costumes to prevent creases. Today, most agree that some costumes, even if they are in a good condition, are better boxed than hung. Teresa Heard and Sara Kadolph of Iowa State University conducted a study evaluating storage of textiles and costumes at six museums including art museums, university collections, ethnographic museums, and historical societies. They found that most storage problems arise due to ignorance in conservation techniques and materials. Heard and Kadolph found that the literature on costume and textile storage, though full of recommendations, was incomplete and contradictory. In the end, they concluded that though storage is intended to preserve objects, improper storage often creates problems.
Factors Adversely Affecting Costumes and Textiles

The main purpose of a good storage system is to provide long-term, safe and secure accommodation for collections by protecting them from degrading factors that damage them or shorten their existence. It should also provide easy access to collections for staff and visitors. Objects should be stored in such a way that examination is possible with minimum handling. Lastly, a good storage system should have provisions for future acquisitions.

In order to implement an effective storage system for costumes and textiles, it is important to understand the factors that adversely affect these objects and how to protect objects against these degrading factors. Anne Lambert, a renowned Canadian conservator, gave a detailed yet simple explanation of problems faced by costumes and textiles in her report *Storage of Textiles and Costumes: Guidelines for Decision Making*. She identified numerous degrading factors – light, humidity and temperature, microorganisms such as mold and mildew, pests such as insects and rodents, dust and atmospheric pollutants, acid, and physical handling.5

Clothing and textiles constitute a fundamental aspect of our everyday lives. They are subjected to stresses of wear, washing, bleaching, drying, and ironing. Because of their mundane and universal application in our households we forget that they are very susceptible to damage from degrading factors mentioned above.6 Museum storage should therefore protect costumes and textiles from such elements if they want to preserve their collection.
Light

According to Lambert light damage fuels the process of degradation as it is cumulative and irreversible.\(^7\) Other experts agreed that while Ultraviolet light (UV) is most damaging to textiles, the entire light spectrum can damage fibers and hence textiles. Light damage causes textiles to fade and change color. It also weakens fibers, making the textile brittle.\(^8\) To prevent light damage, one needs to consider the proportion of UV radiation, the intensity of light, and the period of exposure.\(^9\)

Daylight and fluorescent lights have a greater proportion of UV rays. Ideally storage rooms should have no windows and UV-filtering sleeves should be put over fluorescent bulbs or bulbs with low UV output should be chosen.\(^10\) Historic costumes and textiles should be stored in archival boxes with lids, in drawers and cupboards, or under blackout cloths.\(^11\) Patsy Orlofsky, Director of The Textile Conservation Workshop, New York, advised that costumes and textiles should be exhibited for short periods only and those items which are part of a permanent exhibition should be rotated with other examples from storage.\(^12\) Marjorie Shelley, museum conservator of prints and drawings, recommended an exhibition time of no more than three months per calendar year for museum fabrics.\(^13\) Lucy Commoner, textile conservator at the Cooper-Hewitt, National Museum of Design, New York, agreed that exhibitions and loans should be limited to a three-month period.\(^14\)

Some experts recommended that the amount of light exposure can be limited by ensuring that exhibits are illuminated only when visitors are viewing them.\(^15\) At the Calico Museum in Ahmedabad, India, attendants switch on lights whenever visitors enter a room and switch it off when it is empty. This, however, is possible only if the number
of visitors is small and controlled. Lambert suggested the use of devices such as visitor-initiated timed switches or movement detector activation.

Orlofsky and Commoner recommended that light levels for textiles and costumes on exhibit should be limited to five, at most ten, footcandles (50 – 100 lux). Shelley recommended five to eight footcandles (50 – 80 lux) of light. Lambert, however, argued that as color differences are perceptible at 10 to 30 lux, 50 lux should be adequate for most viewing. She recommended controlling light in storage areas by using portable lighting, sectionally controlled lighting, and/or reostats.

Relative Humidity and Temperature

Extreme fluctuations in temperature and humidity should be avoided to prevent deterioration. Fibers become brittle at high temperatures and heat accelerates the rate of chemical reactions. In her report, Lambert explained that warm air contains high amount of moisture. Saturation point is reached when the air contains the maximum amount of moisture it can hold. If there is a drop in temperature, the air reaches its saturation point and moisture condenses. It is, therefore, important to maintain stability of relative humidity and temperature at a set value. Changes in humidity can cause stress changes in fiber dimensions, eventually weakening the textile. High humidity can lead to water stains on textiles and the development of mold and mildew. It accelerates degradation by air pollution and light, thus increasing the rate of fading. On the flip side, lack of humidity causes some fibers to become brittle and hence break during handling. It also creates static electricity that attracts dust.

Most experts recommended that for a textile collection relative humidity should be maintained at approximately 50% ± 5% with temperature within a range of
approximately 60° to 70° F. Orlofsky recommended relative humidity within a range of
40% to 50% and a temperature between 55° to 68° F (12.7° - 20° C).24 Shelley
recommended that relative humidity be maintained at approximately 50% and
temperature in the range of 68° to 72° F (20° - 21° C).25 Commoner recommended
controlling relative humidity in the range of 35% to 50% and temperature in the range of
60° to 70° F.26 Christine Giuntini, Conservator at the Metropolitan Museum of Art, New
York, suggested that relative humidity should not exceed 60% or fall below 40% with the
optimum level at 50% ± 5%. She recommended a temperature of 68° F (20°C) or less.27
All experts, however, agreed that it was more important to maintain a stable climate than
worry about the numbers. In the numerous museums that do not have environmental
controls, fans, portable humidifiers, or dehumidifiers can improve the conditions for
storage.28

Storerooms for textile collections should be located within an interior space
because moisture may condense on the interior of an outside wall during winters. Also,
storerooms in basements or on the top floors should be avoided to reduce the probability
of water entering the area.29 If, however, the storeroom is located in a space with exterior
walls, storage cabinets, especially metal cabinets, should be moved away from the
exterior walls. Circulating air with a fan during winter months could reduce the
possibility of ice and water problems.30

Possible Water Damage Caused by Water-Based Fire-Suppression Systems

Another point worth mentioning here is the danger to costumes and textiles
from moisture accidentally leaked or discharged from a water-based fire-suppression
system. A sprinkler system is usually avoided by museums largely due to fears of
accidental sprinkler discharge and a massive water clean-up job after the discharge.\textsuperscript{31} As water can easily damage costumes and textiles, a fire-suppression system that used gas instead of water was a preferred fire-extinguishing system for a long time.\textsuperscript{32} Lately, however, environmental concerns have caused museums to switch back to water-based fire-extinguishing systems. This has led to the need to protect costumes and textiles from water in the event of a water discharge, accidental or otherwise, by waterproofing wardrobes or using waterproof dustcovers.

Colonial Williamsburg once used a Halon gas fire-extinguishing system.\textsuperscript{33} Halon is a colorless, odorless, non-toxic gas that extinguishes fire by chemically reacting with the combustion process. It does not leave a residue, which can harm collections, and does not require extensive clean up.\textsuperscript{34} Due to these properties, the Halon gas fire-suppression system was very desirable. Halon is now known to be environmentally damaging, especially towards the earth’s ozone layer. It was hence mandated that Halon gas would be phased out by developed nations by the year 2000 and by developing nations by the year 2010.\textsuperscript{35} Colonial Williamsburg, therefore, has adopted a wet-pipe sprinkler system for fire suppression and now their wardrobe units are waterproof.\textsuperscript{36} The Philadelphia Museum of Art is also installing a wet-pipe sprinkler system in their new storage building, which is currently under construction. They plan to use Tyvek® dustcovers, which are waterproof yet breathable, to protect their collections from any water leaks.\textsuperscript{37} Museums also have the option of switching from the banned Halon gas to other alternative gases such as carbon dioxide. This would, however, involve extensive pipe modifications due to differing agent flow factors.\textsuperscript{38} Carbon dioxide, though it poses no
threat to the environment or costumes and textiles, is toxic and its use is not recommended where people may be present.

Switching from a gas-based fire suppression system to one that uses water also involves high costs. Arrangements have to be made to protect collections from water damage; this includes waterproofing wardrobe units. Though some people may be wary of the sprinkler system, fearing accidental water discharge, others support the safety and reliability of the system stating that it is relatively easy to maintain and modify.39

Microorganisms and Pests

Cellulosic fibers, such as cotton and linen, are particularly susceptible to damage by microorganisms such as mold and mildew caused by fungi. Protein fibers, like wool and silk, can also be damaged by bacteria and fungi specific for protein fibers. Starches and soiling enhance fungal formation. Deterioration is rapid in such cases and result in staining, weakening, or almost total decomposition of fibers.40 High humidity and lack of air circulation present favorable conditions for fungal growth. Prevention is always better in these cases.41 Temperature and humidity control are important measures. Costumes and textiles should not be stored in plastic bags as condensation can occur in such an enclosed environment and hence promote the growth of microorganisms.42

Protein fibers, like wool and silk, are susceptible to insect damage. New acquisitions should be carefully examined for insects before they are integrated into the storage system.43 Vacuuming costumes and textiles not only protects against insect infestation but also removes dirt and dust. Before vacuuming, the costume should be covered by a piece of smooth, plain, woven nylon net so that the nozzle of the vacuum cleaner does not come in direct contact with the costume and also to prevent abrasion of
Vacuuming should also be done on low suction to prevent damage to costumes with beads or other loose decoration. It is also a good idea to check the bag of the vacuum cleaner for any costume part that might have come off during vacuuming like buttons, hooks, or beads. The cleaning process should be stopped at once if it seems to be causing damage to the costume.

Though fungicides and insecticides may be used, it is not usually recommended for historic costumes and textiles and should be used only in extreme cases of fungal or insect infestation. If it is inevitable, fumigation of museum collections with insecticides or fungicides must be handled by a certified personnel using approved equipment. Fumigation involves the use of chemical pesticides that can stain textiles or produce chemical changes in materials. These toxic chemicals are hazardous to people and the environment. Therefore many conservators suggest freezing as an alternative to fumigation.

Freezing as an Alternative to Fumigation for Insect Eradication

Freezing is one of the latest techniques of pest control, common in many museums. Conservators and curators, who have used freezing for insect eradications, agree that most organic materials, including textiles, are not harmed by freezing if the freezing procedure is followed precisely. The freezing method is more effective, simple, inexpensive, readily accessible, and non-hazardous to humans. It is also reported that freezing at -20°C (-4°F) is lethal to the vegetative stage of fungi.

Experimentation in this process of insect eradication began in late 1970s and since then this technique has been used for preservation of books as well as textiles. The Yale University Library used the deep-freeze technique to eliminate beetles and other
insects infested in their rare books collection, some dating as far back as the sixteenth century. Mary-Lou Florian, a conservation scientist from the British Columbia Provincial Museum, has done extensive research on this subject and is the author of numerous papers. Though she recommended freezing as an alternative to fumigation for insect eradication, she stated that little information is available on how the freezing temperatures, required in freezing for insect eradication, would affect the artifacts. She also cautioned that most literature on insect eradication procedures, used in museums, report only the successful ones.

For successful freezing, it is imperative that the procedure be followed precisely. The first step is to place the costume or textile, folded or rolled, in a clean, clear 3-4 mil. weight polyethylene bag. The package is made air-tight and sealed with duct tape to prevent condensation from forming next to the textile. Water vapor does not freeze at the temperatures required for insect eradication so if the artifact is completely dry when placed in the bag and as much air as possible is removed from the bag and the bag is sealed, condensation does not form inside the bag during freezing and thawing. If required, pretreated silica gel or other absorbent materials like archival paper can be placed in the bag, along with the artifact, to absorb excess moisture due to cooling of the air around the artifact and to maintain a relative humidity below 100 percent.

An important condition for effective insect eradication through freezing is the rate of freezing and thawing so as to prevent the insects from getting acclimatized to the drop in temperature. The bagged artifact should therefore be kept at room temperature (above 18°C or 65°F) until placed in the freezer. When placed in the freezer, there
should be adequate air circulation around the bagged artifact to allow it to cool to at least 0°C (32°F) in four hours. The minimum temperature required for killing typical museum insects is -20°C (-4°F) for a minimum period of forty-eight hours.\(^6^2\)

A slow rate of thawing, whereby the temperature of the freezer is increased to 0°C (32°F) over a period of eight hours, is recommended. If the rate of temperature increase cannot be controlled, the bagged artifact can be replaced in a refrigerator, directly from the freezer, until it thaws.\(^6^3\) Writing in 1986, Florian recommended repeating the freeze-thaw cycle.\(^6^4\) More recent work, however, suggested that a single exposure for at least two weeks at -18°C (-0.4°F) or an exposure for three days at a temperature of -30°C (-22°F) can kill all museum pest species.\(^6^5\)

After the freeze-thaw procedure is completed, the bagged artifact should be left sealed in the polyethylene bag till it reaches room temperature so as to prevent condensation from forming on the artifact.\(^6^6\) The costume or textile should be carefully inspected and vacuumed to remove any insect remains.\(^6^7\) Finally, the above procedure should be recorded along with the condition report of the artifact.\(^6^8\)

Freezing too, has its own potential drawbacks. Costumes are composite artifacts and may include not only textiles, but also other materials such as glass beads or metal hooks and buttons, fur, and leather. Changes in moisture content might cause these different materials to react differently. Moisture content changes can cause damage through dimensional swelling or shrinkage.\(^6^9\) Higher moisture levels and condensation can encourage fungal growth, rot, rust, and corrosion.\(^7^0\) So, in the end, as vacuuming, fumigation, and freezing all have certain limitations, cleanliness and regular condition checks remain the best preventive measures for microorganisms and pests.\(^7^1\)
Dust and Atmospheric Pollutants

Dust and atmospheric pollutants can also damage costumes and textiles. Dust particles not only cause abrasion and chemical interaction, thus weakening the fibers, but also affect the visual qualities of the costume or textile. Dust is acidic thus promoting degradation of cellulosic fabrics. It absorbs moisture, causing the relative humidity on the surface of the textile to increase thus creating an environment conducive to mold. Pollutants such as sulphur dioxide, oxides of nitrogen, and ozone can cause fading, or changes in color, and/or weakening of fibers depending on the type of fiber and dye. Vacuuming the storage area as well as costumes and textiles can prevent dust damage. A filtration system installed in the storage area can protect the collection from pollutants. Dust covers are also very effective in protecting costumes from dust and pollutants.

pH Factor of Storage Materials

Costumes and textiles can also be damaged by storage materials or objects such as wood, paper, and cardboard. Acid and other impurities in wood, paper, and cardboard adversely affect cellulosic textiles like cotton and linen causing them to darken and become brittle. Textiles made from protein fibers such as wool and silk are more susceptible to alkali than acid. Most museums use archival materials such as tissue paper and archival cardboard boxes to store costumes. Alkaline buffered storage materials are used for cellulose-based textiles and unbuffered archival materials are used to store protein-based textiles. This topic is discussed in detail later in this chapter.

Wood can be treated with a sealant to prevent acids from migrating to the costumes. If this is not possible or desirable, layers of archival tissue paper or washed muslin can be used as a buffer between the wood and the costume or textile.
Physical Handling

According to Lambert, physical handling is a major cause of degradation of costumes and textiles. Therefore extreme care should be taken while handling historic costumes and textiles. Good storage should minimize handling. It should provide support for costumes and textiles while in storage and be designed so that they can be moved without being touched.

Hands should be clean with cut and filed nails. Any jewelry, like rings, watches, bracelets, and necklaces, that might snag the costume or textile while handling, should be removed. Long hair should be tied so that their natural oils do not come in contact with costumes and textiles. While handling costumes and textiles, one should avoid touching makeup, dirty surfaces, and other sources of soiling.

Many museums require white, cotton gloves to be worn while handling costumes and textiles to protect them from body oils and dirt on the surface of the hands. White gloves are recommended because dirt can easily be seen on them and they should be changed frequently to prevent dirt from transmitting from one object to another. This procedure, however, is an issue for discussion. Dirt is often transferred to gloves from the costumes. If the gloves are not regularly washed, the dirt may then transfer to other costumes from the gloves. Many conservators also believe that objects can slip out of hands more easily when gloves are worn. Also, while wearing gloves, one loses ones tactile sensation and hence the ability to feel the fragility of the costume or textile. To gain more sensitivity, while some conservators wear gloves with the thumb and next two fingers cut out, other conservators have abandoned the use of gloves altogether. Instead
they prefer to wash their hands frequently while working with historic costumes since it is easier to feel dirt on one's hands than on the gloves.

Historic costumes and textiles should be handled as little as possible, and when handled, touched as little as possible. For example, costumes stored on hangers should be held from the hanger and never from the costume. Similarly, rolled textiles should be held from the supporting rod. While lifting costumes or textiles, avoid lifting from one part or putting stress on one part of the costume or textile.

Other Miscellaneous Potential Problems in Storage

Historic costumes and textiles should be protected from harm by limiting potential hazards in storage and work areas. Ballpoint or ink pens or markers should never be used in the vicinity of historic costumes and textiles; only pencils should be used. Food and beverages should never be brought into the storage area or where work is being done with costumes and textiles. Worktables should be clean. They should be covered with cotton padding, with a sheet of washed muslin stretched over it. Ideally another sheet of muslin should be placed on top, which should be changed daily because muslin can pick up grime from costumes, which can be transferred to other costumes.

Costumes can also be damaged by other costumes. Historic costumes often have trimmings, embellishments, and fastenings that when hung close to other costumes tend to rub against them causing the threads to abrade. Costumes should be fully fastened when stored and such embellishments like embroidery and bead work that are hard, sharp, or rough should have sufficient padding or protection covering them in storage so that they cannot rub against other costumes in storage. This, however, is not always possible and fastenings often tend to come undone, so dust covers prove very
effective in preventing abrasion of costumes from other costumes. The subject of dustcovers is discussed in detail later in this chapter.

**Challenges in Allocating Storage Space in Museums**

As mentioned in the beginning of this chapter, while only 5 percent or even less of a museum’s collection is displayed in their galleries, the major portion of a museum’s collection is preserved in storage. Ideally, the storage space in any museum should be as large as the exhibition area. As a rule of thumb, museum space is proportioned at a 40-40-20 ratio. This means that of the total amount of space in a museum, 40 percent should be reserved for collections, 40 percent for exhibits, and 20 percent for everything else like offices, restrooms, and work areas.

**Lack of Space**

There is, however, a vast difference between ideal storage conditions and real storage situations. Many storage problems arise due to insufficient space for storage. A major challenge for museums, while planning storage space, is to provide space for future acquisitions. Sooner or later all museums have to face the problem of inadequate storage space because as collections grow due to new acquisitions, storage space diminishes. As a result, museums have to redirect donations to other museums, historical societies, and collectors. So museums are engaged in constant planning of their storage space so as to derive optimum results. Visible storage and compact storage are two of the latest trends in museum storage whereby museums can maximize storage space in a limited area.

**Visible Storage**

Visible storage allows visitors to view objects while still in storage. Objects are mounted in glass cases or drawers with glass lids. At Colonial Williamsburg, some
costumes and textiles are stored in a set of drawers, which are located in the exhibition
gallery itself (see figure 3.1). The drawers vary in depth to accommodate objects of
different thickness. Each drawer is topped with a glass lid and the drawers are locked.
Visitors who want to study the collection stored here need to make an appointment.

Visible storage, such as the one described above, allows the public to view even
fragile costumes that are stored flat in drawers. The glass lid prevents visitors from
touching the objects and also protects objects from dust and pollution. Also when
costumes and textiles are displayed as they are stored, they are not subjected to the stress
of mounting procedures. Costumes and textiles can be a part of a permanent exhibition
because as drawers are opened only when objects are required for study, there is
minimum damage from light.

Costumes and textiles, however, which are stored in glass cases, are subjected to
extended exposure to light. Secondly such a glassed-in storage, whether drawers or
cases, does not allow for a closer study of objects.94 Objects stored in drawers can shift
when drawers are opened or closed, especially when handled by the general public who
might not be as careful as museum personnel. Visible storage can sometimes make
access for staff and scholars difficult, awkward, or dangerous.95 Opening display cases
and removing or rearranging objects in public areas can create security problems. Some
institutions therefore temporarily close off aisles or other areas during these procedures.96

Several museums are adopting the concept of visible storage. In addition to
visible storage areas, museums also provide computer access to their catalog records.97
The general belief is that allowing greater public visibility and access to collections will
Figure 3.1. Visible storage. Costumes on display at the Colonial Williamsburg Foundation. Photograph by author, 26 July 2004.
generate more public interest in museums and help them understand the basic purpose of collections and the critical role they play in the life of every museum.\textsuperscript{98}

**Compact Mobile Storage**

Another trend in storage is compact mobile storage. This system consists of units of holding shelves, drawers, or racks set on carriages equipped with wheels that run on tracks.\textsuperscript{99} These mobile units can be moved, either electronically or manually, together or apart to create one or more aisles for easy access to specific stored objects.\textsuperscript{100} The compact storage system at Colonial Williamsburg moves directly on the floor without tracks. Tracks, however, provide greater control and safety.\textsuperscript{101} The Textile Museum at Lowell, Massachusetts, recently adopted a manually operated compact storage system that runs on tracks for their costume collection.\textsuperscript{102}

The primary advantage of compact storage is the storage space that is saved when the units are compacted together without aisles. This is especially useful in cases such as Colonial Williamsburg where costumes and textiles are stored flat on trays that are 9 feet by 11 feet. The staff at Colonial Williamsburg, instead of handling the artifact in the storage room, prefers to remove the entire tray and take it to the study room. So the aisle between two units has to be more than 9 feet so that the trays can be removed easily. With compact mobile storage, they are able to save space, which would not have been possible with fixed storage units with an aisle of 9 feet between each unit. Compact mobile storage also allows the collection to be better preserved by minimizing fabric creasing since the efficient use of space alleviates crowding.\textsuperscript{103}

Installing a compact mobile storage system can be an expensive proposition, especially for smaller museums and historical societies. Some conservators have also
raised concern over the effect of vibration on costumes and other objects stored in compact mobile storage units when the units are moved. Even though there has been no documented damage to costumes and textiles from vibration, hanging costumes can swing, when the storage unit is moved, causing stress on seams.\textsuperscript{104} Light objects such as shoes and hats can topple over and artifacts can slide from the movement of the units.\textsuperscript{105} Properly securing and supporting artifacts with archival material and lining shelves and drawers with Ethafoam sheets can solve some of these problems. Compact storage systems today are equipped with anti-vibration features such as vibration-absorbing bumpers on units and drawers.\textsuperscript{106}

Another concern is dust that collects on top of units that can be disturbed when the units are moved. This dust may filter inside the units and onto the stored artifacts.\textsuperscript{107} To prevent dust from seeping into the units, the units and the storage room should be regularly cleaned. A dust seal at the top and ends of the units and an efficient air filtration system will also prevent dust from seeping into the units.\textsuperscript{108}

It is more difficult to maintain a uniform temperature in and around compact closed storage units due to reduced air circulation.\textsuperscript{109} Also there might be a greater risk of fire since the lack of aisles hinders detection of and access to any fires that may break out. Extensive wall insulation can minimize the effects of fluctuations in outdoor temperature on indoor relative humidity. Fire detection and alarm systems should be installed in storage areas. Hydraulically operated compact mobile storage units can eliminate the danger of short circuits possible with electrical systems.\textsuperscript{110}
Insufficient Monetary Funds

A majority of storage problems are caused by insufficient monetary funds. Since the fundamental purpose of a museum is education, most museums either have a low admission charge or none at all. They, therefore, have to depend on grants from public or private organizations or, on a larger scale, an annual budget from tax support. If the government unit needs to make budget cuts, museums, which are considered as recreational frills by many politicians, are often the first to suffer.\(^{111}\) When forced to survive on a limited budget, museums usually skimp on storage because it is generally not visible to the visitor and hence not considered as important as exhibition and other high-profile areas of the museum.\(^{112}\)

In an ultimate storage situation, costumes should be stored flat, with no folds or creases. This, however, would require a lot of space. So curators and conservators have to devise the best possible storage method for each object, where the object can be stored safely with optimum use of space. The following pages review various methods of storing costumes incorporated by museums and historical societies. Museums and historical societies select a storage method for their diverse costume collections based on their respective budgets, available storage space, and storage needs of individual costumes.

**Storage Methods for Costumes**

Costumes are most commonly stored flat or folded on a horizontal surface, like drawers or trays, or supported on hangers and hung on rods, which are either suspended from ceilings or walls or enclosed within wardrobe units.
Horizontal Flat Storage

Horizontal flat storage is probably the best method for storing costumes because costumes can be stored on a horizontal surface where the stress from gravity is equally distributed throughout the costume and the costume is uniformly supported in all areas.\textsuperscript{113} The entire costume is level against the storage unit or archival material without any folds or creases thus reducing strain on the warp and weft yarns.\textsuperscript{114} This method requires minimum preparation of costumes with least amount of layering with archival materials.\textsuperscript{115} It also allows visual inspection of the costume with minimum handling, if the costume remains within its own storage unit and other objects are not layered on top of it.\textsuperscript{116}

Shelves, drawers, trays, or boxes of various depths, heights, or widths are used for horizontal flat storage.\textsuperscript{117} Ideally, shallow drawers are recommended for flat storage.\textsuperscript{118} This eliminates layering of objects on top of one another and hence reduces the risk of deterioration due to compression from added weight. Layering objects also results in poor ventilation because of compact storage.\textsuperscript{119} An additional risk of abrasion and tearing occurs when objects are retrieved from the bottom layer by pulling the objects out, without first removing the objects on top.\textsuperscript{120}

Since most of the time layering objects in drawers, trays, or boxes is unavoidable, layering up to three objects is often considered acceptable as long as archival tissue paper or washed muslin is layered between each object and on top of the layer.\textsuperscript{121} While layering objects, fragile and lighter weight textiles and costumes should be placed on top of heavier and more stable costumes. Each time an object is placed on
top of another, the weight and the condition of all the objects in that unit should be considered.¹²²

In case of drawers and trays, care should be taken that the costume does not abrade against the drawer or tray above, each time the unit is accessed. Therefore, archival tissue paper or washed muslin should be placed on the top of the last object. Also, the depth of each drawer or the distance between two trays (if the trays are stacked on top of one another) should be more than the thickness of the stored artifact plus any archival material used.

Horizontal flat storage requires more space than folded or hanging storage. It is ideal for small, fragile costumes or textiles, beaded artifacts, costumes cut on bias, and some ethnic costumes. It is not recommended for storing highly structured three-dimensional costumes, which would require large quantities of archival material to support the layers and maintain the shape of the costume.¹²³

Horizontal flat storage at Colonial Williamsburg consists of an aluminum storage unit with trays produced by a company called Crystalization Systems Inc. (see figure 3.2). These trays are 9 feet by 11 feet and consist of an aluminum frame with a canvas base. Textiles are stored flat on these trays. In cases where the textile is too long, it is folded once and the fold is padded with tissue paper so as to avoid a sharp crease. Each artifact is placed on a separate tray and not layered on top of one another. The aisle between the storage units is maintained at 11 feet so that when a costume or textile is required, instead of handling the artifact, the entire tray is removed and taken to the study room. This allows visual inspection of the costume or textile with minimum handling.¹²⁴
Figure 3.2. Horizontal flat storage. Garments and textiles stored flat at the Colonial Williamsburg Foundation. Photograph by author, 26 July 2004.
Horizontal Folded Storage

In folded storage, costumes are folded or bent so as to fit within the storage unit, which can be a drawer, tray, box, or shelf. Folded storage creates stress on the warp and weft yarns wherever the costume is folded. Therefore costumes should be folded along seams and lines of the costume and each fold should be padded with archival tissue paper or washed, unbleached muslin.\(^{125}\) It is also recommended that the first fold be put parallel to the warp yarns as it would hang out more easily than a fold along the weft yarns.\(^{126}\) Folded costumes should be examined regularly since the crease created by the fold can be a feeding and nesting environment for insects and vermin.\(^{127}\) Costumes should also be refolded in different places each time they are unfolded to prevent breakage of yarns or threads.\(^{128}\)

Though folding and creasing is not recommended for most costumes, this method is commonly used in most museums to save space.\(^{129}\) There are no standardized methods for folding costumes, so conservators and curators have to learn from their experiences and study each costume carefully to determine the best method of storing it.\(^{130}\)

Hanging Storage

In hanging storage, costumes are hung on hangers of various styles and materials, where the hanger directly supports a small portion of the entire costume.\(^{131}\) The hangers are hung on rods suspended from walls or ceiling or within wardrobe units. If cabinets with built-in rods are not available, some experts suggest using metal pipes or bars for rods.\(^{132}\)
Hanging storage allows storage of costumes without folds or creases at the same time utilizing less space. Costumes are supported in a three-dimensional manner as originally intended during wear. Costumes are easily accessible. They can be removed from the wardrobe units by holding the hangers so the actual costumes need not be touched. Larger costumes should be cradled as they are removed from storage by holding the hanger in one hand and supporting the costume with the other. This distributes the weight of the costume evenly and prevents larger costumes such as gowns from dragging on the floor.

Only those costumes should be hung that can withstand the strain, stress, and creasing from hanging. Fragile costumes, beaded costumes, costumes that are bottom heavy, and those cut on the bias should not be hung. When costumes are hung, there is a tendency to crowd costumes close together to conserve space. This should be avoided as over-crowding and compression can cause creasing and abrasion of one costume from other costumes. Therefore sufficient space should be maintained between costumes. Some experts recommend stuffing sleeves with tissue paper or washed unbleached muslin to prevent crushing or creasing in storage. Muslin covers over hangers and costumes protects costumes from dust and abrasion. Attention must also be given to the type of hanger used. It must correctly fit or be narrower than the costume’s shoulder width. The slope of the hanger should correctly match the shoulder slope of the costume to avoid distortion and the hanger must be strong enough to support the costume.

When larger costumes such as gowns are hung on hangers, the weight of the entire costume is suspended from the shoulders. This adds stress to the costume, which
can rupture seams at the waistline, armhole, and shoulders and cause distortion. Many conservators and curators, therefore, sew cotton twill tapes in the waist-seam or side seam of gowns or other areas that might require additional support. The tapes are looped over the hangers and help distribute the weight of the costume.\textsuperscript{142} This method, however, can cause strain and distortion at the attachment points.\textsuperscript{143} Twill tapes must, therefore, always be attached to seam allowances and costumes must be regularly inspected to watch for any sign of strain.

**Review of Storage Materials for Costumes**

The choice of storage method depends on the costume or textile. Sturdy or draped costumes can be hung in closets. Costumes that are heavy, fragile, or those exceptional in construction should be stored flat in boxes or drawers with minimum amount of folds or creases.\textsuperscript{144} Folds should be cushioned with archival tissue paper or washed, unbleached muslin to prevent sharp creases and periodically the folds should be changed.\textsuperscript{145} While in flat storage, heavier garments should be placed at the bottom, with lighter ones above. Brittle silks, heavily starched costumes, and feathers can be easily damaged and therefore should be placed on top.\textsuperscript{146}

**Storage Furniture**

Generally, storage furniture should be constructed of metal and have a baked-enamel or powder-coated finish. This coating should be inert and should not off-gas any aggressive substance after curing. High-quality stainless steel is also recommended and it has the advantage of requiring no further coating. Handles, hinges, and bolts should have corrosion-resistant plating. Metal storage containers are, however, very responsive to changes in environment. In conditions of high humidity, a sudden drop in temperature
can result in condensation of moisture on metal surfaces. In the event of a fire, metal will rapidly conduct the heat towards the interior of the cabinet. The advantages of metal’s structural stability, smooth surface, lighter weight, and inertness, however, far outweigh the disadvantages.147

Hardwood storage containers are not suitable for storing costumes and textiles because acid can migrate through wood. If, however, this type of storage cannot be avoided, then the wood should be coated with moisture-cured polyurethane to seal in wood acids.148 Also wooden shelves and drawers should be lined with archival cardboard, archival tissue paper, Mylar®, or washed, unbleached muslin. As a substitute, aluminum foil too is a very effective acid-barrier.149 Plywood should not be used under any circumstances. There are some cabinet-manufacturers who have worked with museums to produce archival-quality storage products.150 Though their products are expensive, they are worth considering. When closets are not available, hanging garments should be covered with washed, unbleached muslin and then with black polyethylene sheeting as a light shield. The polyethylene sheet should not be sealed so as to allow air to circulate thus preventing condensation.151

Archival Storage Materials

Costumes and textiles can easily get damaged if they are stored in contact with non-archival materials; therefore, any material that comes in contact with costumes or textiles, including closet, shelf, drawer, box lining, and hangers should be archival. Archival tissue paper is used most commonly to line boxes, drawers, and between layers of costume. It is also used to pad folds and sleeves to avoid sharp creases. Tissue paper
also protects against dust, prevents abrasion by costumes rubbing against each other, and allows the weight of the costume to be evenly distributed.\textsuperscript{152}

Archival quality refers to products that are appropriate for use in contact with historic costumes and textiles and will not damage them.\textsuperscript{153} These products are treated to remove harmful substances, like lignin, that might cause acid deterioration in costumes and textiles. Lignin is a very large complex organic molecule which binds the cellulose together in a tree. It can break down in many different ways to yield different acids and peroxides.\textsuperscript{154}

The term acid-free is often used to describe a product which has a pH of about 7.0 or higher.\textsuperscript{155} This term is misleading because it is virtually impossible to produce a paper product that is absolutely free of acids. Acid is present in paper due to the presence of impurities such as lignin. Alum-rosin sizing, which is added during the paper-making process, is a prime acid producer. Various deteriorative by-products, such as acetic acid, are produced as paper and wood age naturally. Acid can also be absorbed from the surrounding environment. For example, acidic gases and pollutants from the atmosphere can form sulfuric and nitric acid. Ozone can promote carbohydrate acid through the oxidation of carbonyl and hydroxyl groups. Acid can also migrate from adjacent acidic materials.\textsuperscript{156} Therefore, even paper that is considered to be “acid-free” will have a certain amount of acid present in it.

Cellulosic textiles, such as cotton and linen, are plant products and just like paper produce their own acid as they age, which causes deterioration in these textiles. For this reason, these textiles are stored in alkaline-buffered materials to help neutralize the acid produced by them.\textsuperscript{157} Alkaline-buffered materials contain a base such as calcium
carbonate to neutralize any acids that are present or retard the formation of acids in the future. These buffered archival materials usually have an alkaline reserve of 3 to 5 percent.

Protein-based textiles, like wool and silk, are more susceptible to alkali than acid hence they should be stored in archival unbuffered materials that have no alkaline reserve and a pH of approximately 7.0. In due course, these archival materials can absorb acids from the environment and the objects stored in them and become acidic. Hence they should be replaced regularly.

Dust Covers

Some museums use polyethylene bags to store costumes as they allow visual examination of objects with minimum handling at the same time protecting costumes against dust and insects. They inhibit costumes from rubbing against each other, thus preventing damage by abrasion. They are also inexpensive and easily available. The Museum of the City of New York used polyethylene bags to store costumes.

While conservators and curators who use polyethylene bags for storing costumes believe them to be inert, others disagree, claiming that these bags could off-gas and thus emit harmful gases which could react with dyes, fibers, and finishes. Many leading suppliers of archival products, like the Hollinger Corporation, University Products, etc., claim polyethylene bags to be “completely inert.” They advertise these bags in various dimensions for storing books, documents, photographs, and other collectibles (see figure 3.3). Similar to cotton and linen textiles, books, documents, and photographs are paper products; hence cellulosic. They do produce acid as they age and
Figure 3.3. Polyethylene bags. These bags, advertised by Hollinger Corporation, are used for storing garments, books, and documents. “Archival Polyethylene Storage Bags,” The Hollinger Corporation Catalog (2007): 55.
are prone to constant deterioration. So one could argue that if polyethylene bags can be used to store books and historic documents then why not costumes and textiles?

Many conservators and curators, however, are still not comfortable using polyethylene bags for storing costumes and textiles. They believe that the enclosed environment of plastic bags can create condensation within the bag creating an environment conducive to mold or mildew.\textsuperscript{166} Due to static, dust and soil may cling to the outside of the plastic bag, which could soil the object stored in the bag when it is handled.\textsuperscript{167} Lastly, as these bags are transparent, they allow light to penetrate and hence do not protect costumes from light, which is one of the most degrading environmental factors.\textsuperscript{168}

A recent trend in many museums is Tyvek\textsuperscript{®} covers to protect costume collections. Los Angeles County Museum of Art (LACMA) was planning to replace muslin dust covers with Tyvek\textsuperscript{®} covers.\textsuperscript{169} The Philadelphia Museum of Art also had plans to use Tyvek\textsuperscript{®} covers for costumes.\textsuperscript{170} Tyvek\textsuperscript{®} bags are also used at the Victoria and Albert Museum (V&A), London.\textsuperscript{171}

Tyvek\textsuperscript{®}, from DuPont, is made from high density polyethylene fibers. It is water resistant, which is a bonus since many museums are now opting for a water-based fire-suppression system. It is also strong, lightweight, flexible, resistant to chemicals, abrasion and aging, and provides a barrier against UV radiation. It is breathable, allowing trapped moisture to escape, thus preventing mold and mildew. Furthermore, it can easily be sewn into bags or dust covers.\textsuperscript{172} It is opaque thus offering some protection against light as compared to polyethylene bags. Though Tyvek\textsuperscript{®}, due to static, attracts dust; it can be finished with anti-static treatment to prevent the development of static.\textsuperscript{173}
Tyvek® is available through various archival suppliers in rolls as well as sheets, though I was unable to find readymade Tyvek® dustcovers.

Traditional fabric dustcovers are most commonly used in museums and historical societies to store costumes. Muslin dust covers are used to protect the eighteenth-century costume collection at the Colonial Williamsburg. These dust covers are made from unbleached muslin that is washed to remove any sizing or finishes that might harm the costumes. Muslin dust covers are also less expensive to make and maintain than polyethylene bags and Tyvek® covers because once made they can easily be washed and reused. Ideally, these covers should be washed at least once a year to remove dust and any acids absorbed from the environment. Many suppliers of archival products sell readymade muslin dustcovers, though it is cheaper to make them than to buy readymade.

Other advantages of muslin dustcovers are that they create no static electricity to attract dust. They allow air to circulate, thus preventing mold and mildew. They also block light to some degree, protecting costumes from light damage. Lastly, there is no fear of off-gasing from muslin dustcovers. On the flip side, muslin dustcovers are not waterproof or chemical resistant. They are conducive to mold and mildew themselves and have to be washed regularly.

Hangers

As mentioned earlier, the decision to hang a costume is based on the style and condition of the costume. Fragile costumes that are in a delicate condition or made in delicate fabrics like chiffons and gowns with heavy trims or beads, with more weight on bottom than on top, should not be hung as hanging these might put excessive stress on the
costume. Unstructured costumes like those cut on the bias should also not be hung as they may distort and stretch out of shape. If the costume is hung, the slant of the hanger should match the shoulder slant of the costume and the hanger must be strong enough to support the weight of the costume. The shank of the hanger should be long enough so that the collar does not crease or come in contact with the support rod of the wardrobe unit (see figure 3.4).\textsuperscript{176}

Skirts should be hung on a two-bar skirt hanger instead of from metal clips on hangers. For further protection, a rectangular piece of washed, quilted fabric or acid-free tissue paper can be draped over the top of the skirt before it is clamped between the bars of a two-bar hanger. The two-bar skirt hanger evenly distributes the weight of the skirt while metal clips on hangers can not only damage the fabric, but also put stress on the skirt as the weight of the skirt is suspended from just two points where it is held by the metal clips of the hanger.\textsuperscript{177}

Hangers are made of metal wire, plastic, or wood. Wire hangers are not ideal for costumes since they can rust, are flexible and bend easily. These hangers are narrow, which means that the weight of the entire costume is suspended from a small area, creating stress on that area and thus causing tears, creases, abrasion, or distortion.\textsuperscript{178} Though some experts recommend plastic hangers, others caution that these hangers might off-gas.\textsuperscript{179} Some plastic hangers lose strength, distort, or become brittle. If plastic hangers must be used, polypropylene plastic hangers are considered better than ordinary plastic ones.\textsuperscript{180}

Wooden hangers are commonly used for costumes. They provide a stronger support than wire or plastic hangers. Wood, however, contains acids, vapors, and resins,
Figure 3.4. Hangers with long shanks. These are used at the Colonial Williamsburg Foundation. Photograph by author, 26 July 2004.
which are detrimental to textile fibers.\textsuperscript{181} Therefore wooden hangers must be sealed with several coats of polyurethane varnish, which is thought to be inert and thus non-toxic.\textsuperscript{182} Also a low-resin wood, such as poplar, should be chosen for hangers.\textsuperscript{183} All hangers, whether wooden, plastic, or wire, should be padded with polyester fiberfill to cushion the shoulder area and widen the area of support. This should then be covered with a washed, unbleached muslin cover that can be removed easily for cleaning.\textsuperscript{184} Padding and covering wooden hangers also prevents problems such as acid migration from unsealed wood and splintering which may catch on fibers and yarns and damage costumes.\textsuperscript{185}

Many museums prefer to custom-make their hangers from Ethafoam blocks. Some costume hangers at LACMA are made from Ethafoam and foam Backer Rods.\textsuperscript{186} Many archival suppliers also supply hanger kits, which include an aluminum hanger embedded in an Ethafoam block and a nylon cover with which to cover the hanger once it is carved in the required shape. The advantage of these custom-made hangers is that one can carve them to match the shoulder slope of the costume. These hangers, however, are slightly more expensive than the wooden, plastic, or wire hangers. The hanger kits are even more expensive.

The eighteenth-century gowns at Colonial Williamsburg are stored on special hangers with a shoulder frame that supports the shoulder and a hip frame that holds the weight of the skirt. The two frames are covered with a quilted cotton fabric. A central rod runs through the two frames and this rod can be adjusted to conform to the length of the gown’s torso (see figure 3.5). A hook attached to the top of the rod allows the hanger unit to be hung. The entire unit can be placed in a holder, which allows easy examination and study of the costume with minimum handling.\textsuperscript{187} A similar hanger was also
Figure 3.5. Hangers with a hip frame. These hangers are used to hang eighteenth-century gowns at Colonial Williamsburg Foundation. Photograph by author, 26 July 2004.
developed at the Costume Institute of the Metropolitan Museum of Art, New York. This type of hanger provides a three-dimensional form to the costume, making it available for sketching with little need to handle the costume.\textsuperscript{188} It does, however, require more space than conventional hangers.\textsuperscript{189} Secondly, the shape of this hanger might not be suitable for some nineteenth-century silhouettes like the empire-waist gowns or gowns with bustles.

**Summary**

Even though the storage area in museums is not visible to the general public, it is one of the most important aspects of any museum or historical society. Artifacts, collected by museums, are their building blocks and provide a window to the past and to other cultures and societies. Proper care and storage of these artifacts, in this case costumes and textiles, is crucial for their survival and longevity in museum settings. A good storage system should protect costumes and textiles from degrading factors such as light, extremes in temperature and humidity, pests such as rodents, insects, and microorganisms, and dust, pollution, acid and other impurities from the surrounding environment. It should be simple, efficient, and provide easy accessibility with minimal handling of the costumes and textiles.

Costume and textile conservation is a fairly new and dynamic field and is constantly evolving as curators and conservators develop techniques learned from their past successes and failures through methods of trial and error. As new methods of storage and conservation are devised and implemented and as an influx of archival storage products became available, what was once considered acceptable for costume and textile storage and conservation, is today rejected or refined. For this reason, literature
available on costume and textile storage and conservation is often contradictory as ideas and procedures are reexamined and reevaluated.

For instance, at one time caretakers of costume and textile museums often wore items from their collection during fashion shows and balls to promote their museum. They believed that wearing historic costume not only gave the wearer a feel of that time in history, but also provided the visitors with a better idea as to how that historic costume moved with the body. To a certain extent, a garment draped on a live human body looks more appealing than on a lifeless mannequin, however wearing historic costumes can lead to their further deterioration by exposing them to body oils, perfumes, perspiration and stresses of wear and tear. Today curators and conservators abhor such practices, devising methods of storage whereby costumes and textiles are handled as little as possible.

Methods of fire-suppression are also being reconsidered and the earlier unpopular method of water sprinklers is being brought back into practice as gas-based fire-suppression systems are being phased out. Innovative storage methods, such as visible storage and compact mobile storage, are being implemented to maximize storage space in a limited area. Various archival storage products are available, ranging from cabinets designed specifically for museum use to all sorts of hangers, dustcovers, and archival paper products like tissue paper and cardboard boxes.

Based on the individual requirement of each costume, curators and conservators try to devise the best and most appropriate method of storing costumes. Costumes, depending on their fabric, cut, construction, and condition can be stored flat, with or without folds, or hung on hangers. The chosen method of storage not only depends on
the individual costumes, but also on the budget and space available to the museum or the historical society. Whatever method of storage is eventually selected, it is important to keep in mind that it is improper storage that often creates the biggest problems.

Notes


3 Ibid.


6 Ibid.


9 Lambert, 13.

10 Ibid., 15; Wolf, 115; Christine Giuntini, “Storage of Historic Fabrics and Costumes,” in Conservation Concerns, 71.

11 Commoner, 86.

13 Shelley, 52.

14 Commoner, 86.

15 Buck and Leene, 114.

16 The Calico Museum allows visitors only twice a day, during set hours, when a docent gives a tour of the museum. Other visitors, who are interested in studying specific collections, need to make an appointment. This way the museum controls the flow of visitors to its galleries.

17 Lambert, 17.

18 Orlofsky, 80; Commoner, 86.

19 Shelley, 52.

20 Lambert, 16.

21 Wolf, 115.


23 Lambert, 18.

24 Orlofsky, 80.

25 Shelley, 58.

26 Commoner, 88.

27 Giuntini, 71.

28 Lambert, 19; Shelley, 58.

29 Giuntini, 70.

30 Lambert, 19.

32 Giuntini, 71.


34 Artim, “Fire Suppression Systems.”


36 Baumgarten interview.


38 Artim, “Fire Suppression Systems.”

39 Ibid.

40 Lambert, 22.

41 Ibid.; Wolf, 117.

42 Lambert, 21.

43 Ibid., 22.


45 Ibid.

46 Ibid.

47 Commoner, 88.


49 Lambert, 22; Wolf, 117.
50 Wolf, 117; Ordoñez, 20.


54 Florian, 9.


56 Wolf, 117.

57 Ibid.


59 Ibid., 9.

60 Ibid., 2.

61 Ibid., 9.

62 Ibid.; Wolf, 117.


64 Ibid.


66 Ibid., 2; Florian, “Freezing Process,” 9; Wolf, 117.


“An Insect Pest Control Procedure,” 2.

Ibid.

Lambert, 22; Finch and Putnam, 42.


Wolf, 117.

Lambert, 23.

Ibid.

Wolf, 117.

Lambert, 26.

Ibid., 28.


Lambert, 27; Shelley, 62.

Bissonnette, 60.

Lambert, 27.

Ibid.; Bissonnette, 60.

Bissonnette, 59.

Ibid., 60.

Lambert, 26; Shelley, 53.

Lambert, 26.

Ibid., 27.

Shelley, 53.
90 Buck, 121.

91 Ibid., 121; Finch and Putnam, 42.

92 Buck, 121.


94 Beaudoin-Ross and Burnham, 3.

95 Hilberry, 37.

96 Ibid.

97 Beaudoin-Ross and Burnham, 4.

98 Hilberry, 40.

99 Beaudoin-Ross and Burnham, 5.

100 Ibid.

101 Ibid.


103 Beaudoin-Ross and Burnham, 6.

104 Ibid., 7.

105 Ibid.

106 Ibid.

107 Ibid., 6.

108 Ibid.

109 Ibid.

110 Ibid.
111 Burcaw, 48.

112 Beaudoin-Ross and Burnham, 2.


114 Ibid., 25.

115 Ibid., 133.

116 Ibid., 25.

117 Ibid.

118 Ibid., 26.

119 Ibid., 27.

120 Ibid., 28.

121 Ibid., 27.

122 Ibid.

123 Ibid., 29 & 133.

124 Baumgarten interview.

125 Heard, 38; Shelley, 59.

126 Heard, 39.

127 Ibid.

128 Ibid.; Ordoñez, 13; Shelley, 59.

129 Heard, 38.

130 Ibid., 135.

131 Ibid., 131.

132 Ibid., 46.
133 Ibid.

134 Ibid., 138.

135 Shelley, 60.

136 Heard, 46.

137 Buck and Leene, 118; Ordoñez, 4; Finch and Putnam, 41.

138 Heard, 50; Finch and Putnam, 41.

139 Heard, 50.

140 Ibid., 47.

141 Ordoñez, 6; Wolf, 118.

142 Heard, 49; Wolf, 118; Shelley, 60; Finch and Putnam, 41.

143 Heard, 49.

144 Shelley, 59.

145 Ibid.

146 Ibid.

147 Giuntini, 73.


149 Wolf, 118.

150 Giuntini, 73.

151 Shelley, 60.

152 Ibid., 59.


155 Wolf, 118; “Glossary,” 3.


157 Wolf, 118; Ordoñez, 11.

158 Ibid.


160 Wolf, 118; Ordoñez, 11.

161 “Glossary,” 3.

162 Heard, 21.


164 Heard, 21.


166 Heard, 21; Ordoñez, 9; Finch and Putnam, 40.

167 Heard, 21; Finch and Putnam, 40.

168 Ordoñez, 12.

169 Melinda Kerstein, Collections Administrator at Doris Stein Research Center, LACMA, interview by author, Los Angeles, CA, 21 May 2004.

170 Reiter interview.

171 Suzanne Smith, Housekeeper of Furniture, Textile, and Fashion Department, Victoria and Albert Museum, email correspondence with author, 4 February 2005.


173 “Tyvek®.”
174 Baumgarten interview.
175 Ordoñez, 9.
176 Wolf, 118.
177 Ordoñez, 9.
178 Heard, 47.
179 Ibid., 48
180 Ordoñez, 6.
181 Heard, 15.
182 Butterfield and Stack, 10; Ordoñez, 13.
183 Butterfield and Stack, 10.
184 Wolf, 118.
185 Heard, 48.
186 Kerstein interview.
187 Baumgarten interview.
188 Buck and Leene, 118.
189 Heard, 51.
CHAPTER IV

STORAGE PROBLEMS AND SOLUTIONS

The storage facility at the Kent State University Museum (KSUM) was established in 1985 and modeled along the lines of the Costume Institute of the Metropolitan Museum of Art in New York. At that time this storage facility was considered state-of-the-art. Twenty-two years hence, storage and conservation techniques have been reevaluated. Such immense developments have been made in the areas of artifact storage, archival products, and archival storage units for museums that the KSUM storage facility might today be considered outdated.

Due to environmental concerns, museums that used a gas-based fire-suppression system, especially Halon gas, are switching to a water-based fire-suppression system. The KSUM has a gas-based fire-suppression system that uses carbon dioxide. Carbon dioxide is one of the major greenhouse pollutants and due to its toxicity is not recommended where people might be present. Even though at present the KSUM has no plans of switching to a water-based fire-suppression system, it is possible that sooner or later they might have to rethink their choice. If the museum does opt for a water-based fire-suppression system, the storage units would have to be made waterproof.

At present, the museum’s storage facility consists of wardrobe units and drawers, made of particle board with a veneer of melamine laminate glued to the visible
Costumes are hung in these wardrobe units or stored flat in drawers. When stored in drawers, costumes are placed on and interleaved with archival tissue paper. They are stored with minimum folds and each fold is padded with archival tissue paper to prevent sharp creases and reduce stress on the warp and weft yarns. A few wardrobe units have double doors, while most have blinds. Blinds allow air to circulate while offering a certain degree of protection from light and dust. The storage rooms are kept clean. Temperature and humidity is controlled by a centralized computer system at the Campus Environment and Operation and maintained at 68° to 72°F and 50% RH. The storage areas have sectionally-controlled lighting, which are lighted only when required.

When I initially examined the eighteenth-century costumes, most eighteenth-century women’s costumes (one bodice, nine gowns, nine original and two reproduction petticoats, and some stomachers) and a six men’s vests were hung in a single wardrobe unit with double doors (see figure 4.1). The rest of the men’s costume collection – other vests and breeches – were stored flat, with minimum folds, in drawers. Two gowns, two bodices with their petticoats, and one petticoat were on display and so were not in storage. With almost thirty garments in a single wardrobe, the wardrobe unit was crowded. Furthermore, when one removed a garment from the wardrobe, the other garments had to be pushed to the side so that the required garment could be removed safely without the fear of it falling off its hanger. For these reasons Dr. Anne Bissonnette, Curator of the KSUM, suggested that the eighteenth-century women’s costumes be stored in two wardrobe units instead of one.
Figure 4.1. The KSUM storage unit. The wardrobe contained the eighteenth-century women’s and some men’s costumes. Photograph by author, 8 June 2005.
The wardrobe floor and drawers were lined with archival tissue paper (see figure 4.1). Many eighteenth-century gowns have trains which touched the floor of the wardrobe unit and so the archival tissue paper formed a barrier of protection from the non-archival surfaces of the wardrobe units.

The storage area – where the eighteenth-century women’s costume collection is stored – is located on the second floor, away from any exterior wall. The west wall of this storage room, however, touches the atrium, which is somewhat vulnerable as the glass roof of the atrium has been known to leak. Although water has never reached the second floor wall, such an event cannot be ruled out completely. Also there is slight trouble with the roof on the third floor, which is directly over this storage area. As the storage for the eighteenth-century costume collection is already designated and established, this research mainly focused on the physical placement of eighteenth-century women’s costumes within the storage units.

**Observation of Problems in Storage**

As explained in Chapter I, my initial examination of the storage of the eighteenth-century costume collection led me to identify certain key issues which had to be addressed to arrive at an optimum storage solution for these costumes. Teresa Heard of Iowa State University, for her master’s thesis, conducted a study evaluating storage of textiles and costumes of six museums including art museums, ethnographic museums, historical societies, and university collections.² She categorized storage problems into five general areas – problems relating to the storage unit itself, to insufficient use of archival materials, to improper protection in storage, to improper support to artifacts, and
to incorrect or improper storage practices.\textsuperscript{3} I reevaluated the storage of the eighteenth-century women’s costumes based on her observations.

Problems Related to Storage Units

According to Heard’s observations, the first problem related to storage units is where objects were in danger of being abraded by the storage unit itself. Vibration of moveable racks could cause objects to fall. Damage was caused to objects by being caught in the door of the storage units, and objects were not accessible.\textsuperscript{4}

The most crucial problem with the storage units at the KSUM was that they were not archival, being composed of particle board and melamine laminate. The eighteenth-century gowns were hung in one wardrobe unit with hinged doors (see figure 4.1). The costumes, especially the gowns and petticoats, touched the walls and the floor of the wardrobe unit. Therefore, they were not only in danger of being abraded by the surface of the wardrobe unit, but also damaged from possible off-gassing from the non-archival unit. Secondly, even though the floor of the unit was lined with archival tissue paper, if the paper shifts or if the wardrobe unit is not cleaned regularly, dust that might cling to the surface of the wardrobe unit might affect the costumes.

The costumes were also in danger of being caught in the hinged doors and care had to be taken each time the doors were shut to ensure that this did not happen. There was no danger from vibrations as the wardrobe unit is stationary. The units, however, are placed above a set of drawers and so one has to climb a footstool to reach the costumes. This poses a slight problem as the gowns, which are hung on padded hangers, are front-open, have no buttons or hooks, and their necklines are wide. They tended to fall off the hanger while being removed from the wardrobe unit.
Problems Related to Insufficient Use of Archival Materials

The second problem identified by Heard was related to insufficient use or lack of archival materials especially in folds and creases. Insufficient use of archival material in storage units, such as drawers and boxes, where objects were laid flat in storage, resulted in shifting of those objects when the units were moved. She also noted stress or compression, caused to objects, from storage materials.\(^5\)

As the wardrobe unit, where the eighteenth-century women’s costumes at the KSUM are stored, is non-archival, there is a need to create a barrier between the costumes and the surfaces of the wardrobe unit. Though unsealed wooden hangers were and are being used to hang gowns, these hangers are padded with polyester batting and then covered with washed, unbleached muslin (see figure 4.2). Wooden two-bar skirt hangers were used to hang stomachers and petticoats. Stomachers were covered with archival tissue and then caught between the bars of the two-bar hanger (see figure 4.3). Similarly, archival tissue was placed over the petticoat waistline, which was then clipped in the hanger (see figure 4.4).\(^6\) I was also concerned about the use of some labels on which the accession numbers were marked. These labels were not archival and a couple of labels had a soft, metal band around the edges (see figure 4.5). These labels were attached to the costumes with brass safety pins.

Problems Related to Improper Protection in Storage

The third storage problem, in Heard’s research, related to improper protection in storage where objects were not protected from dust, light, moisture, and other degrading factors. Secondly, as storage space is at a premium at most museums and historical societies, objects are inclined to be placed close to each other. This posed a danger of
Figure 4.2. Hangers used at the KSUM. Wooden hangers are padded with polyester batting and then covered with washed, unbleached muslin. Photograph by author, 8 June 2005.
Figure 4.3. Method of hanging stomachers. One side of the stomacher was covered with archival tissue paper and then caught between the bars of the two-bar hanger. This method of storage could cause distortion. Photograph by author 12 April 2004.
Figure 4.4. Method of hanging petticoats. Archival tissue paper was placed over the petticoat waistline, which was then clipped in the hanger. Photographs by author, 8 June 2005.
Figure 4.5. Non-archival card labels. The accession number and other information is written on these labels. Photographs by author, 11 April 2007.
compression and abrasion from other objects as well as a danger of dye and color transfer. Lastly, Heard noted that objects could be damaged by rust from pins and metal components of objects.7

The storage area of the KSUM is well organized and costumes are well-protected from dust, light, and other degrading factors. The temperature and humidity is monitored regularly. The only concern here is the use of non-archival storage units, which might cause off-gassing or acid to migrate through the wood to the costumes.

The eighteenth-century gowns, petticoats, and stomachers were crowded together in a single wardrobe unit and hence there was the danger of compression and abrasion from other costumes. I was particularly concerned about one silver brocade gown (L1995.17.60ab) trimmed with silver lace, which, when hung next to other costumes, tended to rub against them causing their threads to abrade.

At the KSUM, a research experiment was conducted in 2001 when fabrics were digitally reproduced to properly display three eighteenth-century garments in the collection. The original fabric of the costumes selected was photographed to digitally reproduce the fabric. The digitally reproduced fabric was then used to make the missing components such as a petticoat or stomacher. This facilitated exhibition of the costume as an ensemble. Garments made from digitally-printed textiles were stored in the same wardrobe unit with the other historic costumes for easy retrieval. Although these garments were washed and tested before they were put in storage, it was still recommended by one of the researchers in the team – Camille Myers Breeze, a professional textile conservator from Andover, Massachusetts – that the digitally
reproduced textiles be stored separately. This was a preventive approach in dealing with how the ink used in digitally-printed textiles might affect historic costumes.

A couple of reproduction stomachers had pins which held ribbons in place. These stomachers were constructed for exhibition purposes to complete an ensemble and were usually made before an exhibition. Due to lack of time and staff, the trims were pinned in place on the stomachers instead of being sewn in place. As these stomachers were stored along with the original gowns, it was necessary to remove the pins as they could cause rust or get caught in a costume and snag a thread.

Problems Related to Improper Support

The forth problem identified by Heard related to improper support of objects. She found objects at risk of falling over, distortion of objects caused by sagging support, objects compressed by the weight of other objects, distortion of fabric and stress on costumes caused by waist tapes, and stress caused by over-packing of archival material and improper shaping.8

All eighteenth-century women’s costumes at the KSUM were hung on hangers, so some of the problems mentioned above did not relate to this method of storage. There was no evidence of stress caused by over-packing of archival material and improper shaping. All hangers were strong and there was no evidence of sagging which could cause any distortion. As mentioned earlier, the single wardrobe unit, however, was a little crowded for all the costumes and some gowns tended to fall off the hanger while being removed from the wardrobe unit.

Gowns were hung on wooden hangers, which were padded and covered with washed, unbleached muslin. Some robe à la française gowns needed additional support
at the back where the pleats were arranged on the center of the back neckline. Also, Dr. Bissonnette believed that a special hanger was needed that would support the gowns from the shoulder as well as the waist so that the weight of the gown could be distributed and not all the stress lay on the shoulder area of the gown.

Two-bar skirt hangers were used to hang petticoats (see figure 4.4). A rectangular piece of washed muslin or archival tissue paper was draped over the waist of the petticoat, which was then clasped between the bars of the hanger. This method posed a problem for one petticoat (L1995.17.65b) which was heavier than the others and so kept slipping from between the bars of the hanger. Stomachers were hung the same way as the petticoats. Archival tissue paper was draped over the side of the stomacher, which was then clasped between the bars of a two-bar hanger (see figure 4.3). This method of hanging stomachers might cause distortion.

Problems Related to Incorrect or Improper Practices

Problems related to incorrect or improper storage practices extended from the previous set of problems to sum up the list of problems Heard found in the existing storage of museums, university collections, and historical societies. She discovered folds or creases on costumes from previous storage methods and creases on rolled textiles due to improper rolling. One object was stored upside down. There was stress or compression on objects from other objects and from being packed in too small an area. Then there were hanger problems where hangers were too wide, objects were being compressed by the hanger, and improper use of hanger.9

The most common problem at the KSUM was with the hangers. Wooden hangers are bought in two sizes and volunteers pad and cover the hangers with washed,
unbleached muslin. These hangers are made and stored to be used as and when required. This saves the museum time and money. The eighteenth-century gowns were hung on these hangers and for some of the gowns the hangers were a bit too wide and so poked into the sleeves. If the narrower hanger was used the gown simply fell off the hanger. So using a wider hanger was less damaging to the gowns. One gown (2002.35.7ab) was supported by a hanger with a slope that did not match the shoulder slope of the gown (see figure 4.6). This caused stress on the shoulder-armhole area of the gown and could eventually cause distortion.

Another issue with these hangers was the muslin covers, which were stitched all around the hanger with no openings (see figure 4.2). This meant that if the covers had to be washed, as they should be washed at least once a year, they had to be ripped open and then sewed back on after washing. This is a time-consuming job especially when time, staff, and money are limited.

Petticoats and stomachers were suspended from two-bar skirt hangers, as explained earlier. First, these hangers crushed the fabric and trims. Second, heavy petticoats tended to slip from the hanger’s grip. Third, these hangers were not covered with washed, unbleached muslin. A piece of archival tissue paper or muslin, which was draped over the waist of the petticoat and the side of the stomacher, formed a buffer between the unsealed wood and the costume. I found it cumbersome to hang the costumes, especially the petticoats, in this manner because sometimes the archival tissue paper or the muslin strip would slip from between the hanger bars and leave the unsealed wooden hanger in contact with the petticoat.
Figure 4.6. Incorrect hanger. The incorrect shape of the hanger causes distortion at the shoulder area of the gown. See figure 4.10 for the correct shape of hanger for this gown. Photograph by author, 10 August 2005.
Finally, there was the dilemma of storing lace, trims, and fabric scraps that were removed from historic costumes during restoration. These were stored in a plastic ziplock bag, which was pinned to the hanger of the gown or pinned to the twill tape extending from the waist band of the petticoat. It is not advisable to store historic costumes and textiles in plastic bags. As explained in Chapter III, the enclosed environment of plastic bags can create condensation within the bag promoting the growth of microorganisms. Some such bags can emit harmful gases which could react with dyes, fibers, and finishes. Due to static, dust and soil might cling to the outside of the plastic bag. This could not only soil the lace and fabric scraps placed in the bag, but also transfer onto the costumes since the bag was stored with the original costumes. Lastly plastic bags allow light to penetrate. For these reasons it was important to devise a better method of storing these lace and fabric scraps; one that would preserve them and, if possible, allow them to be stored with their respective costumes.

Of all the problems Heard discussed in her thesis, the most frequently occurring problem was compression or stress of objects caused from being packed in too small an area. This led to abrasion of objects; either from other objects or the storage unit itself. All the eighteenth-century women’s costumes at the KSUM faced similar problems of stress and compression from being crowded in a single wardrobe unit and abrasion from the unit itself and other costumes. Table 4.1 summarizes the various problems that needed to be addressed to provide a better storage solution for the eighteenth-century women’s costumes at the KSUM.
Table 4.1. Problems Observed in the Storage of the Eighteenth-Century Women’s Costume Collection at the KSUM.

<table>
<thead>
<tr>
<th></th>
<th>Problem</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Costumes packed in a single wardrobe unit.</td>
<td>• Compression and abrasion of costumes from other costumes.</td>
</tr>
</tbody>
</table>
| 2 | Costumes touched the walls and floor of the wardrobe unit, which is non-archival. | • Abrasion from the unit.  
• Danger of off-gassing and acid migration.  
• Transfer of dust from the surface of the wardrobe unit onto the costumes. |
| 3 | Costumes in danger of being caught in the hinge doors.                  | • Abrasion from the unit.  
• Could snag a thread or cause damage due to tear.                      |
| 4 | Gowns tend to fall off their hangers.                                   | • Transfer of dust from surface.                                       |
| 5 | Non-archival labels safety-pinned on costumes to mark the accession numbers. | • Possible damage to fabric from metal degradation, acids, and other impurities. |
| 6 | Reproduction costumes made from digitally-printed textiles stored in the same wardrobe unit as historic costumes. | • Transfer of color and dye onto historic costumes.                     |
| 7 | Pins on reproduction stomachers.                                        | • Damage from rust.  
• Could get caught in a costume causing tear.                             |
Table 4.1. Problems Observed in the Storage of the Eighteenth-Century Women’s Costume Collection at the KSUM, continued.

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Impacts</th>
</tr>
</thead>
</table>
| 8.  | Petticoats hung from two-bar skirt hangers slipped from between the bars of the hanger. | - Cumbersome method.  
- Crushed the petticoat at the waist area. |
- Crushed the fabric and trims of the stomacher. |
| 10. | Gowns hung on wooden hangers needed additional support.                      | - Caused strain on the shoulder area of the gown.                       |
| 11. | Hangers too wide.                                                            | - Poked the sleeves causing abrasion.                                   |
| 12. | Hanger slope not matching the shoulder slope of the gown.                    | - Stress on the shoulder-armhole area causing distortion.               |
| 13. | Muslin hanger covers had no opening.                                        | - Covers were not being washed so dirt could transfer from the hanger cover to the costume. |
| 14. | Lace and fabric scraps removed from historic gowns stored in plastic ziplock bags and hung with the respective costumes. | - Created an environment conducive to microorganisms.  
- Could soil not only the lace and fabric scraps, but also transfer dust onto costumes. |

**Applications**

At the very beginning of this project, Dr. Bissonnette and I had decided that the eighteenth-century women’s costumes would be spread out into two wardrobe units instead of one. This would reduce the compression, stress, and abrasion faced by these
garments. After examining the costumes, we also determined that they could continue to be hung. Hanging these costumes would save space and costumes would be stored without folds or creases. The textiles of these gowns were still in a good condition. Eighteenth-century silks were woven so tightly that they remained sturdy even after so many years. Though the linings of some gowns (L1995.17.59 and 2002.35.7ab) were torn and they had been reinforced with silk crêpeline, these costumes were still considered viable for hanging (see figure 4.7).  

Another point discussed at that time was the development of a hanger with some sort of a hip frame that would distribute the weight of the eighteenth-century gowns and support the gowns from the shoulder as well as from the waist. In the first half of the eighteenth century, silk textiles were heavy (see Chapter II, p. 15). Even though silks became lighter in texture and weight as the century progressed, some gowns were still heavy because of the sheer volume of fabric used. The robe à la française gowns, especially, needed additional support on the center back where pleats were arranged in two layers. All gowns were being hung from traditional hangers, which probably laid too much stress on the shoulder area of the gowns. A hanger with a hip frame would help distribute the weight of the gown and lend support at the waist. Secondly, as all the eighteenth-century gowns at the KSUM belong to the period after 1740, when these gowns had side-fullness and were worn over paniers, a hip frame on the hanger would help maintain the shape of the skirt.

Experiments for Hangers with a Hip Frame

As explained in Chapter III, the eighteenth-century gowns at the Colonial Williamsburg Foundation are hung on custom-made hangers, which lend support to the
Figure 4.7. Gowns with torn linings. (Above: L1995.17.59; Bottom: 2002.35.7ab) These gowns were reinforced with silk crêpeline. Photographs by author, 10 August 2005 and 27 April 2006.
gowns at the shoulder and the waist. These hangers have a shoulder frame and a waist frame, which are connected with two rods, one inserted into the other. The two rods allow the distance between the shoulder and the waist frame to be adjusted, to conform to the length of the gown’s torso, by removing a push pin and adjusting the position of the rods. A hook attached to the top of the rod allows the hanger unit to be hung. The hanger can be placed in a stand, which allows easy examination and study of the gown with minimum handling (see figure 3.5).

It was not possible to manufacture such a hanger at the KSUM because of limited funds, a deficiency of engineering skills on my part, and lack of staff who could help develop such a hanger. Hence alternative approaches to developing a similar hanging technique were explored.

Sara Reiter, Associate Conservator of Costume and Textiles at the Philadelphia Museum of Art, Pennsylvania, suggested using a sausage-shaped roll of polyethylene foam rod, which is flexible and chemically inert, for the waist support. The two ends of the roll would be tied with twill tape, thus making a horseshoe-shape, which would conform to the shape of the gown’s skirt. As the gowns would be stored in wardrobe units, the depth of which are 22 inches, this twill tape would regulate the width of the skirt, ensuring that it is no more than 20 inches wide so that the doors of the wardrobe unit can be shut without compressing the gowns. Another twill tape, inserted through the center of the horseshoe-shaped roll, would be knotted around a hanger’s hook. The length of this twill tape would be adjusted according to the length of the gown’s torso (see figure 4.8).
Figure 4.8. Hanger with hip frame. Polyethylene foam rod is used to construct the waist support.
The maximum diameter available for the polyethylene foam rod was 1 ¼ inches. This width would not support the weight of the gown’s skirt. Due to budget constrictions it was not possible to custom order polyethylene foam rod with the desirable diameter so this idea could not take shape. The above technique was then tried using an ordinary medium-size stocking, padded with polyester batting and with a wire inserted through the stocking, in place of the polyethylene foam rod. This provided a diameter of 3 to 3 ½ inches once padded. This technique, however, only flared out the skirt of the gown but was not able to lend adequate support to the gown and reduce the strain from the shoulder area of the gown.

We then decided that instead of using a horseshoe-shaped roll that stretched along the sides of the gown’s skirt, a doughnut-shaped roll, suspended from the shoulder hanger to the waist of the gown, would better support the waist area and help redistribute the weight of the gown, reducing the strain on the shoulder region of the gown. A wooden base instead of a wire center would add more strength to the waist support. This led to the construction of a wooden hanger with two stainless steel wire eye screws, one on each side, through which twill tape was passed through (see figure 4.9). This twill tape was knotted around the hook of the hanger supporting the shoulder area of the gown. The length of the twill tape was adjusted according to the length of the gown’s torso.

Once this structure was assembled, the gowns were tested one by one on this assemblage. The twill tape connecting the shoulder hanger with the waist hanger was adjusted for each gown so that the waist hanger lay at the waistline of each gown. It was, however, noted that for most of the gowns, the waist hanger provided no support. The side of the gown skimmed the hanger edge. This hanger would support the skirt of the
Figure 4.9. Hanger with hip frame. The waist hanger was made in wood and had two stainless steel wire eye screws through which twill tape was passed.
gown only if the skirt were to rest on it. So a length of twill tape was stitched on the inside of the gown, at the front waist seam, on both sides of the gown. The two tapes were then tied together to ensure that the skirt sat on the hanger. It was then, however, observed that the side seam creased. If the waist hanger was lowered to remove the crease on the side seam, it no longer supported the gown. Hence it was decided that the gowns were better off stored on the hangers as before. At most, twill tapes would be stitched on each gown as needed for additional support, which would be knotted around the hanger’s hook.

Development of Hangers for Gowns and Bodices

Since Dr. Bissonnette and I decided that the previous method of storing the eighteenth-century gowns and bodices on hangers would be continued, it was imperative that these hangers provide adequate support to the costumes without causing them any harm. This meant that each hanger would have to adhere to the shape of its respective gown or bodice. The shoulder slope of the hanger should match the shoulder slope of the costume and the width of the hanger should be appropriate for that costume; neither too narrow so that the costume fell off from the hanger, nor too wide so that the hanger poked into the sleeves causing abrasion and distortion.

The KSUM used wooden hangers, which came in two sizes. The narrower hanger fitted only one gown (2002.35.7ab), while the wider hanger was cut to size to fit the other gowns and the three bodices. The hangers were cut to correspond with the across-shoulder measurement of each gown so that the hanger ends did not poke into the sleeves. They were then generously padded with polyester batting. This increased the surface area of the hanger at the shoulder so that when a costume was hung from that
hanger, it would prevent a sharp crease on the shoulder by cushioning the shoulder seam and spreading the area of stress.

Previously the hangers were padded only to the hanger bar (see figure 4.2). The length of the padding was increased to about 10 to 12 inches so that when the gown or bodice was hung, the padded hanger ended below the neckline (see figure 4.10). I believe that this would add additional support to the costume as well as prevent any hooks that may be present on the front interior of the costume from rubbing against the back interior of the costume. The hangers were then covered with washed, unbleached muslin covers.

Construction of Muslin Covers for the Hangers

To make the muslin cover for the hangers, the shape of the padded hanger was traced out on two layers of washed, unbleached muslin. The length of the muslin cover was kept at least three inches longer than the padded hanger. The fabric was cut and the sides stitched leaving the bottom open and a one inch gap at the center-top where the hanger hook would be inserted. The bottom edge was turned twice and top-stitched to finish the edge. The cover was then mounted on the padded hanger (see figure 4.11).

Previously, the muslin covers for the hangers had no openings as they were stitched down all around the hanger. As a result these hanger covers were not being washed. Now, the covers are mounted on the hangers in a manner that makes it possible for them to be removed and washed. I recommend that these covers be washed at least once every year since when the costume is handled, it is held from the hanger. So the hanger covers can easily get soiled from oils and dirt transferred from hands, which can then be transferred to the costumes. As each hanger was constructed as per the costume
Figure 4.10. Hangers developed for gowns and bodices. Twill tape was sewn to the inside of the two front bodice panels on all the gowns. When these tapes were knotted together, it held the gown together, preventing it from slipping off the hanger. Photographs by author, 16 May 2007 and 27 April 2006.
Figure 4.11. Hangers for gowns and bodices. Unsealed wooden hangers, already used by the KSUM, were cut to the required size, padded, and covered with washed, unbleached muslin covers. The padded hanger and the muslin cover were labeled. Photographs by author, 27 February 2007.
it supported and each cover was stitched based on the dimensions of its respective hanger, a label with the accession number of the costume was stitched on the hanger cover as well as on the padded hanger. This ensured that when the cover was removed from the hanger for cleaning purposes, the right cover was returned to the right hanger and the right hanger was used on its respective costume.

Procedure Followed for Hanging the Gowns

Once the hangers were developed as specified above, the costumes were suspended from their respective hangers. The three bodices did not require any additional support, but wherever gowns required support, the position was noted and twill tape was sewed on the inner seams to provide the required support to those gowns. For example, robe à la française gowns needed additional support at the back where the pleats were arranged on the center of the back neckline. Twill tape was sewed on the center of the seam that held the pleats down, at the inner side of the back neckline, and knotted over the hanger’s hook (see figure 4.12). On gown L1995.17.59, the stomacher was attached to the bodice on one side and the other side hung loose. So twill tape was sewed to the center of the stomacher, which was looped over the hanger hook, and to the side of the stomacher, which was looped over the hanger’s shoulder (see figure 4.13). This enabled the stomacher to hang straight without creases and thus removed stress from the side of the stomacher which was stitched to the bodice. Twill tape was also sewed to the inside of the two front bodice panels, near the waist, on all the gowns. When these tapes were knotted together, they held the gown together, preventing it from slipping off the hanger (see figure 4.10).
Figure 4.12. Twill tapes provide additional support. Twill tape was sewed to the back of the gown 2002.35.7.a, where the pleats were arranged, for additional support. This tape was looped over the hanger’s hook. Photographs by author, 10 August 2005.
Figure 4.13. Position of twill tape on gown L1995.17.59. The stomacher was attached to one side of this gown and hung loose, causing creases and stress on the stitches which joined the stomacher to the gown. Twill tape was sewed to the center and the side of the stomacher to make it hang straight. Photograph by author, 10 August 2005.
While sewing the twill tape a few things were kept in mind. First, the twill tape was sewed to the seams wherever possible. Second, at least 1 ¼ inch of twill tape was sewed down to the costume so that, when the tape is stretched taut after the garment is hung, the force of pull would be spread over a larger area. This way there is less danger of the costume tearing at the place where the twill tape is stitched. Third, the twill tape was stitched with long stitches in such a manner that its future removal was easily possible, in accordance with the latest principles in conservation and restoration that all conservation and restoration methods be reversible.

Finally, the tape was knotted over the hanger’s hook instead of being looped over it because over time it is possible that the tape might expand and become loose and thus not provide adequate support to the costume. If the tape is knotted it can be re-knotted to correct the tension. If, however, the tape is looped over the hanger hook then the twill tape would have to be re-stitched to the area to correct the tension and the support. As it is desirable that the costume should be handled as little as possible, it seemed reasonable to knot the tape instead of looping it over the hanger’s hook.

The twill tape was looped over the hanger hook instead of being knotted only in the case of gowns L1995.17.59 and 2002.35.7.a. As explained earlier, gown L1995.17.59 had a stomacher attached to the bodice of the gown and so required two lengths of tape sewed to the stomacher; one of which was stitched to the center of the stomacher and was looped over the hanger hook and the other, stitched to the side of the stomacher, was suspended over the hanger’s shoulder (see figure 4.13). Gown 2002.35.7.a was a robe à la française gown and its center back was so heavy that it needed two lengths of twill tape sewed to the pleats at the back so as to distribute the
weight of the pleats (see figure 4.12). Both tapes were then looped over the hanger hook. As, in both the cases, there were more than one length of twill tape suspended from the hanger, it was decided that knotting the tapes would create too much bulk around the hanger. Looping the tapes instead would keep the storage method simple for volunteers and other staff members who might handle the costumes and not pay attention to the proper storage method. As improper storage can cause more harm, storage methods should be simple enough so that others, like non-curatorial staff and volunteers, can follow them easily and correctly.

Method for Hanging Petticoats

Petticoats were hung from two-bar skirt hangers (see figure 4.4). I regarded this as a rather cumbersome method because a piece of archival tissue or washed, unbleached muslin was draped over the waist of the petticoat, which was then clasped between the bars of the hanger and sometimes the archival tissue or the muslin strip would slip from between the hanger and leave the unsealed wooden hanger in contact with the petticoat. These hangers also tended to crush the fabric and one petticoat, due to its weight, kept slipping from between the hanger’s grip. Therefore, a more efficient method for hanging the petticoats was required.

Dr. Bissonnette suggested stitching twill tape to the waist of the petticoats. This tape had tabs stitched to it, which were knotted (see figure 4.14). Once the tape was sewed to the petticoats, the knotted tabs were clamped between the bars of the two-bar skirt hanger (see figure 4.15). This way the original fabric of the petticoat did not come in contact with the hanger and the knots on the tabs prevented the petticoats from slipping from between the hanger’s grip.
Figure 4.14. Twill tape with tabs. Photograph by author, 8 June 2005.

Figure 4.15. Method for hanging petticoats. The twill tape with tabs was stitched to the waist of the petticoat. The tabs were knotted and held between the bars of the hanger. Photograph by author, 20 July 2005.
Dutch linen tape of one-inch width was used. This tape is often used for bookbinding purposes. It is unsized and unbleached and its sturdy plain weave was ideal for this project. The tape was cut according to the waist measurement of the petticoat plus one inch extra on either side so that the unfinished edge of the tape could be folded inside. Five-inch long strips were cut for tabs (see figure 4.14). The tabs were sewed along the tape at equal distances and the tape was then sewed to the waist of the petticoat such that the tabs were on the inner side (see figure 4.15). This way, when the petticoat is displayed on a mannequin, the tabs could be inserted out of sight inside the petticoat.

While attaching the tape to the waist of the petticoat, the tape was not stitched to the petticoat by just catching a few yarns of the petticoat’s fabric. Instead the stitches had to go through all the layers of the petticoat. This ensured that the tape was strongly secured to the petticoat and when hung, a few threads would not bear the load of the whole petticoat. This, however, was no easy task to accomplish because most eighteenth-century silk textiles were woven quite tightly and the pleats in the petticoats meant that sometimes the needle had to go through almost five layers of fabric. With lots of broken needles and sometimes bloody fingers (when they got poked by the needle while trying to push it through the multiple layers of fabric), the volunteers at the KSUM accomplished the task of stitching the Dutch linen tape on the petticoats. The trick was to use a sharp, strong needle and though some volunteers used a thimble, I discovered that using the surface of the table, than the fingers, to push the needle through the fabric was more effective and less painful.

Though this method proved quite successful for the petticoats, there were, however, some problems. One main problem was that the waist of some petticoats was a
lot wider than the width of the two-bar hangers. So the tabs were stitched to the waist
band, spaced evenly, according to the measurement of the hanger and not according to
the waist measurement of the petticoat because the tabs had to be clamped between the
bars of the hanger. So the tabs were mainly stitched towards the center of the petticoat
and when they were clamped into the hanger, the sides of the petticoat hung loose with
no support (see figure 4.15). In an ideal storage situation the hanger would be as wide as
the petticoat waist so that the tabs could be distributed evenly throughout the waist of the
petticoat and all the tabs could be clamped into the two-bar hanger thus evenly supporting
the petticoat.

Once in storage, the petticoats were regularly inspected to check if this method
had any adverse affect on the condition of the petticoats. After about six months of
hanging in this manner, it was noted that some of the tabs stitched on petticoat
L1995.17.65b, which was a heavy garment, had slipped out from between the bars of the
hanger and the petticoat was hanging precariously by the remaining tabs. To rectify the
situation, the hanger was replaced with a new two-bar skirt hanger with a tighter spring
mechanism so that the bars closed on the tabs more tight than before. This petticoat will
need to be inspected regularly to ensure its proper storage. Flat storage is recommended
for this petticoat if the current storage method does not work for it and it keeps slipping
from the hanger.

Lastly, the one-inch wide Dutch linen tape used for this project was in stock at
the KSUM. The maximum width of the Dutch linen tape, however, available through the
various suppliers listed on the web was ¾ inch (Dutch linen tape is readily available in
widths of ¼ inch, 3/8 inch, ½ inch, and ¾ inch). Though there was enough tape in stock
for this project, anyone else wanting to replicate this procedure might have to use \( \frac{3}{4} \) inch wide Dutch linen tape or use another product altogether.

Dust covers

Once the gowns, bodices, and the petticoats were hung properly from their respective hangers with adequate support, the next step was to prepare dustcovers for all these garments. Dustcovers would shield the costumes from dust, light, and abrasion from other costumes as well as from the walls and the floor of the wardrobe units. They would act as a barrier between pieces preventing any possible transfer of color and dye. Lastly, they would prevent the garments from being caught between the hinge doors or from falling off their hangers, as each piece would be enclosed within its respective dustcover.

Unbleached muslin was an obvious choice for the dustcovers. Muslin is inexpensive, readily available, and comes in different widths. Variable widths mean that one which gives the best fabric-consumption efficiency can be chosen. Muslin dustcovers are easy to sew, can be washed regularly, and are durable; thus they would last through numerous cycles of wash and use. For this project, an unbleached muslin fabric of 90 inches width was chosen.

Dust Cover for Gowns

The height of the wardrobe unit is 63 inches and the depth is 22 inches. The length of the dust covers for the gowns was kept at 70 inches to accommodate for the longest dress, which had a train (see figure 4.16). (It seemed more practical to make all the dust covers of the same length instead of according to the length of the individual
Figure 4.16. Cutting plan of the dustcover for the gowns.
gowns as this saved time and minimized handling of the costumes). The width of the
dust cover was 22 inches according to the depth of the wardrobe unit.

The length of the dust cover was placed crosswise and the width along the
selvedge (see figure 4.16). This provided the most efficient use of fabric. As mentioned
earlier, the width of the fabric was 90 inches and the length of the dust cover had to be no
less than 70 inches. One inch was kept for seam allowances. Two inches was allowed
for shrinkage; one inch along the length of the dust cover and one inch along the bottom
flap. The remainder of the fabric (17 inches) was kept for the bottom flap, which was
required to fold over the hem of the gown, so that no part of the gown would touch the
wardrobe floor.

Required length = 70 inches
Seam allowance = 1 inch
Shrinkage along the length of the dustcover = 1 inch
Bottom flap + shrinkage = 18 inches
Total fabric = 90 inches (Width of the fabric).

The width of the dust cover had to be 22 inches, so the back of the dust cover
was made 22 inches plus 1 inch for shrinkage. Both front panels were 13 inches plus ½
inch for shrinkage and 1 inch seam allowance each, that is, 14 ½ inches (see figure 4.16).

Back = 23 inches
Under front panel = 14 ½ inches
Top front panel = 14 ½ inches
Total fabric = 52 inches (Yardage required for one gown dust cover).
To sew the gown dust cover, the bottom flap was folded at 18 inches. The raw edges on both sides of the dust cover were turned \( \frac{1}{4} \) inch twice and top-stitched to finish the edges, with twill tape ties evenly spaced and inserted into the top front panel (see figure 4.17). One twill tape was sewed on the under front panel where it met the bottom flap and a corresponding twill tape was sewed on the bottom flap (see figure 4.17). This was done so that when the dust cover was hung, the bottom flap would not drag down.

Maintaining the measurements for the top front panel at 13 \( \frac{1}{2} \) inches, the under front panel at 13 \( \frac{1}{2} \) inches, and the back at 23 inches, the fabric was folded (see figure 4.17). At the top of the dust cover where the hanger would be inserted, 1 \( \frac{1}{2} \) inches was marked at both sides of the center and 2 inches was marked along both the sides (see figure 4.18). The fabric was cut along this line and French-seamed, leaving a 1-inch opening for the hanger hook. Twill tapes ties were sewed on the under front panel to match the ones on the top front panel. The dust covers were washed twice, to remove any sizing or finishes that could harm the costumes, before they were used for storage.

Instead of preshrinking the muslin before cutting the required lengths for the dustcovers, Dr. Bissonnette suggested adding an allowance for shrinkage to the dustcovers. She said that this would prevent the fabric from fraying in wash and we would not have to iron the fabric before stitching, which would make sewing easy. Since we had different lots of muslin each of which would probably shrink differently, I added a shrinkage margin of two inches, both along the length and width of the dustcover for the gowns (see figure 4.16). I presumed that this allowance should be sufficient for the different lots of muslin and that the fabric might shrink less and not more than two inches.
Figure 4.17. Construction of the dustcover for the gowns.
Figure 4.18. Construction of the dustcover for the gowns.
along the length and the width of the dustcover. I stitched one dustcover in this manner. I washed it twice and then checked the measurements for shrinkage to ensure that the length of the dustcover was not less than 70 inches and the width was not less than 22 inches.

I would, however, suggest to anyone replicating this method of stitching the dustcovers, to wash and preshrink the muslin before cutting the dustcovers. This would eliminate the process of testing the fabric for shrinkage or any guesswork in determining shrinkage. It would also take care of bowing, if any, in the fabric as well as remove any sizing or finishes that could harm the costumes. I had washed and preshrunk muslin before I cut the covers for the hangers and encountered no problems in fitting the cover over its respective hanger.

Storage of Stomachers and Fabric Scraps, Lace, and Trims Removed from Historic Costumes

As mentioned earlier, stomachers were stored clamped in a two-bar skirt hanger (see figure 4.3). This method crushed the fabric and trims of the stomachers. It could also cause distortion as the side of the stomacher, which was on bias, was clamped into the hanger. It was, therefore, essential to devise a method whereby the stomachers could be stored along with their respective gowns and one which would better preserve the stomachers.

To achieve this goal, twill tape was sewed at the two sides, on the back, towards the top of the stomacher (see figure 4.19). A flap, according to the dimensions of the stomacher, was sewed on the back of the dust cover (see figure 4.19). The flap was
Figure 4.19. Storage of stomacher, fabric scraps, lace, and trims.
sewed to the dustcover as illustrated by the dotted lines in figure 4.19. Space was left on the top-center of the flap for the twill tape, which was sewed to the stomacher, to pass through to the hanger. The bottom of the flap was also left loose and not stitched down to the dustcover.

To store the stomacher, the dust cover was first draped over its respective gown. The stomacher was then inserted into the flap from the bottom of the flap, which was left loose, and then suspended from the hanger by the twill tape (see figures 4.19 and 4.20). This way the stomacher can be stored alongside its gown without the danger of abrasion from the gown or any adjoining costume. This method eliminates compression caused by the two-bar skirt hangers and minimizes distortion. It also protects the stomacher from dust and light. Pins, which held ribbons in place on the reproduction stomachers, were removed and the ribbons were stitched in place. These stomachers were also stored in the manner described above in the dustcover of their respective gowns.

Fabric scraps, lace, and trims, removed from historic costume, were also stored similarly. A pocket bag was sewed on the back of the dust cover, just below the flap for the stomacher (see figures 4.19 and 4.20). The mouth of the pocket bag was secured to the dust cover with buttons. Fabric scraps, lace, and trims were placed in an individual muslin bag, which was then placed into the pocket bag sewed on the dust cover. It is important to reiterate that all the pocket bags and finished dust covers were washed twice, to remove any sizing or finishes that could harm the costumes, before they were used for storage.
Figure 4.20. Storage of stomacher, fabric scrapes, lace, and trims. Photographs by author, 27 February 2007 and 27 April 2006.
Dust Cover for Petticoats

Petticoats, when they were hung from the two-bar skirt hangers, did not fall straight like the gowns but in an A-line silhouette. This was because the petticoats had more bulk than the skirt of the gowns. Some petticoats were quilted while others were trimmed with frills and flounces, which added bulk to the petticoats. Therefore the dust covers for the petticoats, though constructed similar to the dust cover for the gowns, had a slight difference. First, the shape was made slightly A-line to accommodate for the shape of the petticoats. Second, as the petticoats did not touch the floor of the wardrobe unit, they did not require the bottom flap. The bottom flap was essential for the gowns as most had trains which swept the floor of the wardrobe unit.

The length of the petticoat dust cover was cut at 54 inches. This measurement included a seam allowance of 1 inch and a shrinkage margin of 1 inch. (Similar to the dustcovers for the gowns, I presumed that a one-inch allowance for shrinkage would be sufficient for a 54-inch length dustcover and that the fabric would shrink less and not more than this). So the final length, after the dustcover is stitched and washed, would be 52 inches. The other measurements for this dust cover are shown in figure 4.21. These measurements included the seam allowance and shrinkage. The length of the dust cover was cut on straight grain along the selvedge, unlike the dust covers for the gowns. This was done solely to save fabric.

The side seams of the front and back of the dust covers were French-seamed together. The raw edges of both the front panels were turned ¼ inch twice and sewed to finish the raw edges, with twill tape ties inserted into the top front panel. The panels were folded along the side seams. The top of the dust cover, where the hanger would be
Figure 4.21. Dustcover for the petticoats.
inserted, was French-seamed leaving a 1 inch opening for the hanger hook. Twill tapes were sewed on the under front panel to match the ones on the top front panel. The bottom hem was turned ¼ inch twice and sewed to finish the raw edge. The dust covers were washed twice, to remove any sizing or finishes that could harm the costumes, before they were used for storage.

Storage of Reproduction Petticoats made from Digitally-Printed Textiles

There were three reproduction petticoats made from digitally-printed textiles in the KSUM’s eighteenth-century women’s costume collection. The first reproduction petticoat was made for a late-eighteenth century, yellow *robe à l’ anglaise* gown (1983.1.9a). The side and back panels of its petticoat had been replaced with a solid taffeta fabric so the gown’s skirt could not be draped *à la polonaise* as per the structure of the gown. The second petticoat was reproduced for a mid-eighteenth century, olive green iridescent *robe à la française* gown (L1995.17.59) and the third petticoat was made to pair with a mid-eighteenth century bodice (L1995.17.66). All three examples were an important part of the eighteenth-century costume collection of the KSUM. Exhibiting them as complete ensembles, as they were meant to be worn, would much enhance the educational purpose of the artifacts. Thus petticoats, and in the case of gown 1983.1.9a and bodice L1995.17.66 the stomachers too, were reproduced in digitally printed fabric to complete the ensembles.

The initial use of a digital printer in a museum setting was to prepare chat panels, which explained the purpose of the exhibits. Today, when it is being used to make costume components for exhibition purposes, such as those described above, its service in a museum environment raises a few concerns. The first question to ask is
whether these textiles will be colorfast to washing, crocking, and light? The second question is will digitally-printed textiles emit any gases that might harm historic textiles? Will they cause any health and safety hazards and, lastly, what are the advantages of these textiles?

A complete ensemble provides a better understanding of historic costumes and the way they were worn than individual pieces. Since education is the main purpose of the museum, both sides of the argument were studied thoroughly and a professional textile conservator, Camille Myers Breeze, was consulted. Samples of digitally-printed textiles were tested for colorfastness to washing and crocking. The fabrics that were digitally printed included samples of cotton sateen, cotton broadcloth, a fabric that was 56 percent cotton and 44 percent linen, silk crêpe, and silk taffeta. No apparent dye loss was noted on any sample with the exception of silk crêpe, which exhibited some transfer of color to adjacent undyed areas after machine washing.

Once the reproduction fabric was printed, it was steamed, which set the dye. The fabric was then washed and rinsed in cold water and then washed again in hot water and rinsed in cold water. This process washed off any excess dye and ensured that the colors were fast. Reproduction petticoats made from these digitally-printed textiles were placed in separate dustcovers, like the ones described above for the eighteenth-century petticoats. Even though they were then stored in the same wardrobe unit alongside the original costume, there seemed to be no apparent danger from dye transfer or off-gassing.

Labels

The method of digital printing described above was also used to print labels for each eighteenth-century garment. Each label was sewed on the front of its respective
dustcover (see figure 4.22). A front and back picture of the garment, along with the accession number, date and provenance, description of the garment and the fabric used for its construction, and a brief description of its specific storage method was printed on the labels. This latter point was important because it listed all the components of the garment and how and where they were stored. For example, it mentioned that the stomacher was hung over the dustcover, towards the back, and inserted into the flap stitched on the back of the dustcover and the petticoat was stored in a separate dustcover.

Since the dustcovers were made in muslin, which is opaque and provides no view of the costume within, these labels imparted visual and other detailed information regarding the garment stored within the dustcover. Hence anyone looking for a particular costume could easily locate that costume without having to look inside each dustcover.

While the labels were being printed for this project, the printer broke down with a few labels still left to be printed. These were those labels on which only the accession numbers were written and which had to be sewed on to the muslin hanger covers. In case the printer could not be fixed on time, I had to explore other options for writing the accession numbers on the hanger covers. One option was to write the accession numbers on twill tape with a permanent fabric marker. After washing the twill tape twice to ascertain that the ink did not bleed and that the writing was indeed permanent, I planned to sew these on to the muslin hanger covers.

The other option was to embroider the accession numbers on twill tape or ribbon and then sew these on to the muslin hanger covers (see figure 4.23). The Shannon Rodgers and Jerry Silverman School of Fashion Design and Merchandising, at the Kent State University, has embroidery machines whereby the accession numbers could be
Figure 4.22. Labels. A front and back picture of the garment, along with the accession number, date and provenance, description of the garment and the fabric used for its construction, and a brief description of its specific storage method was printed on the labels. Photographs by author, 27 April 2006.
Figure 4.23. Alternative methods for marking the accession numbers. These labels were required for the hangers. The initial plan was to print these labels on fabric. As, however, the printer broke down, other options were explored. On the top twill tape, the accession number was embroidered and on the twill tape on the bottom, the accession number was written with a permanent fabric marker. Photograph by author, 28 April 2007.
punched into the machine’s memory and the machine could then embroider the
information on a strip of twill tape or ribbon – the machine operator just has to feed the
tape or ribbon into the machine.

The digital fabric printer, however, was rectified and the labels were finally
printed from it. The labels written with the permanent marker, however, I stitched to the
batting on the hangers, underneath the muslin covers (see figure 4.11).

An alternative option to printing labels on fabric – especially for museums and
historical societies that do not have access to such printing methods – would be to stitch a
patch pocket made of a transparent or translucent fabric, such as lightweight cotton voile
or even tulle or net on the dust cover. A picture of the garment and an information sheet
printed on paper, containing all relevant information about the garment, can then be
placed inside the pocket. The photograph should be visible through the transparent
pocket. Or else, the accession number can be written with a permanent marker on twill
tape, which could then be sewed to the dustcover, just above the patch pocket, for quick
and easy access. An advantage of this method is that if the information sheet needs to be
updated, it is easier to print on paper than it is on fabric. Also one would only need to
insert the updated information sheet inside the pocket. If any change in information is
required on the fabric label, the old label has to be unpicked and the new label sewed in
its place.

A couple of gowns had their accession number and date written on card labels,
which were believed to be non-archival, and pinned with brass pins on to the costume
(see figure 4.5). These labels had come with the gowns when they were first accessioned
by the KSUM and were never removed even though the accession number was written on
archival labels and twill tape attached to the gowns. As the accession number was already written on twill tape and sewed into the inside of the sleeve of the gown, these non-archival labels were removed from the costumes and pinned to the dustcovers instead.

**Conclusion**

It took me three years to complete the work I had planned for the eighteenth-century women’s costumes at the KSUM. This project got extended because I had to work in breaks due to the birth of my daughter and a short, semester-long teaching assignment that I undertook in the midst of the project. Working in this sporadic manner gave me and the staff at KSUM time to critically analyze the storage solutions that I had already prepared and judge which concepts worked and which did not.

One of the things I noticed, when I returned to the museum to finally complete my project after almost a year’s absence, was a few changes in the position of the twill tapes that I had sewed to the gowns for additional support. I had stitched twill tape to some gowns to provide additional support so that when they were hung from hangers the entire weight of the gowns did not fall on the shoulder area alone. For example, *robe à la française* gowns needed additional support on the back where the pleats were arranged so I had sewed twill tape on the center-back seam, where the pleats were stitched down, and knotted the twill tape over the hanger’s hook.

One gown (L1995.17.59) had a stomacher attached to the bodice on one side only and the other side hung loose (see figure 4.13). I had stitched twill tape to the side of the stomacher, which I looped over the hanger’s shoulder, and to the center of the stomacher, which I looped over the hanger’s hook. I believed this would prevent the
stomacher from hanging loose and creating stress at the seam where it was attached to the bodice as well as prevented creasing. Resuming work almost a year later, however, I observed that the twill tape sewed to the side of the stomacher, which was looped over the hanger’s shoulder, had been removed.

The KSUM is a teaching museum. The collection is open for students and scholars who study fashion, history, and culture through the medium of clothes. The garments in the collection are handled by staff and volunteers and hence it is imperative that the storage methods be simple for volunteers and other staff members who might handle the costumes and not pay attention to specific details in storage. For this reason, I believe that the twill tape sewed on the side of the stomacher on gown L1995.17.59 was removed. It is possible that, even with all the storage instructions printed on the label on the dustcover, a volunteer or staff personnel might loop this twill tape over the hanger’s hook instead of the hanger’s shoulder, which could cause severe damage to the garment. So it is better to remove this twill tape and have a slight crease on the garment than risk tearing the garment due to improper storage.

I had also sewed twill tape to the inside of the two front bodice panels, near the waist, on all the gowns. The purpose was to prevent the gowns from slipping off their hanger once the two tapes were knotted together. On some gowns, however, I observed that the position of these two tapes was altered and raised from the waist area to the chest region of the gowns. Staff handling the gowns might have realized that if the position of the twill tape was raised to the chest area it would better serve the purpose of preventing the gowns from slipping off the hangers.
Petticoats, which were hung on two-bar skirt hangers, were suspended from tabs that were stitched to the twill tape attached to the waist of the petticoats (see figure 4.15). Regular inspections of these petticoats have showed no detrimental effects on the petticoats, such as distortion, tear, or seam slippage. One petticoat (L1995.17.65b), which was heavier than the rest, kept slipping from between the bars of the hanger, but a new hanger with a tighter spring mechanism on the clamp solved this problem. If this problem persists then it would be better to store this petticoat flat. It is important, however, to regularly inspect these petticoats for any sign of damage due to this storage technique.

Gowns and bodices were hung on wooden hangers, which were padded and covered with washed, unbleached muslin. These hangers were made to conform to the shoulder slope and the across-shoulder measurement of its respective garment. All garments were placed in individual muslin dustcovers. Dustcovers prevented costumes from abrading against one another as well as offered protection from dust, light, and the non-archival surfaces of the wardrobe units. As the gowns were contained within the dustcovers, this prevented the gowns from slipping off the hangers while being removed from the closet. Dustcovers also prevented the costumes from getting caught between the doors of the wardrobe units.

In addition to all this, dustcovers also provided storage for the lace and fabric trims, which were removed from the costumes during restoration, and stomachers – both original and reproduction. Pocket bags and flaps were stitched on the back of the dustcovers within which lace and other trims and the stomachers were stored. This method enabled us to store the stomachers and lace and trims together with their
respective gowns. Anyone handling these costumes, however, needs to be careful that they remove the stomacher from the dustcover before they remove the dustcover from over the costume.

Labels, stitched on the dustcovers, provided front and back views of the garment as well as other details such as accession number, date and provenance, description of the garment and the fabric used for its construction, and a brief description of how the garment and its various components were stored. Non-archival labels were removed from the costumes and these were pinned to the dustcovers instead.

Designing a storage system for costumes is an evolutionary process. In 1985, KSUM’S storage was considered state-of-the-art. Since then immense developments have taken place in the areas of artifact storage, archival products, and archival storage units for museums. There are numerous companies that specialize not only in the manufacture of archival storage products, but also cabinets designed specifically for museums. Today, when space is at a premium, many museums are opting for compact storage units. In this regard, the storage facility at the KSUM might today be considered outdated as many wardrobe units used at the KSUM are not even archival.

For the time being, however, the present storage facilities at the KSUM are quite adequate and have proven to be quite effective in protecting costumes, textiles, and accessories from degrading factors. My main objective in this project was to further the effectiveness of the existing storage method of the eighteenth-century women’s costumes. The solutions offered were simple, mundane, and inexpensive, which can be easily incorporated by other museums and historical societies. I believe that the most
effective storage systems are those that are simple and easy to follow because in most cases it is incorrect storage that causes the maximum harm.

Notes

1 Particle board is non-archival because it emits deteriorative agents such as acids. A veneer of melamine laminate was glued to the visible surfaces of the particle board wardrobe units, at the KSUM, as an attempt to make these units archival. While some conservators believe that melamine laminate is inert and would contain the acids of the particle board, others disagree. They believe that acids can migrate through the veneer. Also, the museum’s wardrobe has a track for inserting screws through which the particle board surfaces are visible. So I too doubt that these wardrobe units are archival.


4 Ibid., 126.

5 Ibid.

6 This method of storing stomachers and petticoats created other problems, which is discussed later in the chapter under “Problems Related to Improper Support” and “Problems Related to Incorrect or Improper Practices.”

7 Heard, 127.

8 Ibid., 128.

9 Ibid.

10 Ibid., 21.


12 A panel in the lining of gown # L1995.17.59 is made in weighted silk, which I believe was probably added in the late late-nineteenth or early twentieth century as it does not seem to be original to the eighteenth-century gown. The panel was stabilized with silk crêpeline. Though it was decided that this garment could continue to be hung, it
is important that this gown be regularly inspected to ensure that the chosen method of storage continues to be appropriate to the gown’s condition.

CHAPTER V

SUMMARY AND CONCLUSIONS

I did not realize, in the beginning of this project, that what I had started as a simple project of reorganizing the storage of the eighteenth-century women’s costumes, at the Kent State University Museum (KSUM), would open a Pandora’s Box of storage problems. The initial plan was to simply redistribute the eighteenth-century garments – some thirty odd pieces, which were packed into a single wardrobe unit – into two wardrobes. The second scheme in the plan was to develop a hanging mechanism for the eighteenth-century gowns, whereby they were supported not only at the shoulders, but also at the waist. A detailed examination of how these garments were stored, however, led me to identify storage problems that may seem trivial but if left ignored could have escalated into major tribulations.

In 1985, the KSUM acquired a brand new, state-of-the-art storage facility, modeled along the lines of the Costume Institute of the Metropolitan Museum of Art in New York. Since then such immense developments have been made in the field of artifact storage for museums that the storage facility at the KSUM might be ready for an upgrade. This research, however, mainly focused on the physical placement of eighteenth-century women’s costumes within the already designated and established storage units.

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The Decision to Continue the Hanging Storage

The main considerations for the storage of any historic costume are the shape of the garment and the fragility of the material and the piece itself. Three-dimensional garments are mainly hung on hangers or stored flat – with or without folds. If garments are stored folded, the folds should be as few as possible. Wherever possible, garments should be folded along seams and along the warp yarns as this crease would hang out more easily than one created by a fold along the weft yarns. Each fold should be padded with archival tissue paper or washed, unbleached muslin to minimize the stress on the warp and weft yarns. Garments cut on bias, or those with heavy trims especially on the bottom of the garment, should not be hung. Flat storage should be considered for garments in fragile conditions or those made of fragile fabrics like lace and chiffon.

All eighteenth-century women’s costumes, namely the gowns, bodices, petticoats, and even stomachers, at the KSUM were stored on hangers within a closet (see figure 4.1). My initial concern, since these garments were more than two hundred years old, was whether or not it was safe to continue hanging them. The fabric of most of the garments, in the eighteenth-century women’s costume collection at the KSUM, is silk, ranging from satins, to damask and brocades, to faille and taffeta (see table 2.1). Eighteenth-century silk textiles are heavier, sturdier, and in a better condition than late-nineteenth century and early twentieth century silk fabrics, when silk textiles were treated with weighting agents.

Silk was weighted chiefly to replace the weight lost during degumming. It also increases the fiber’s affinity to dyes. Weighting, however, deteriorates the strength of the silk fiber and makes it extremely susceptible to light. Though weighting agents were
present in some dyes in the eighteenth century, their use was restricted because the
detrimental affects of weighting agents were understood. The production of textiles, in
the eighteenth century, was expensive. Fabrics were meant to last for generations as
garments were often altered and fabrics reused to keep up with changing fashions.

In the late-nineteenth and twentieth century, fashion changed more rapidly than
in the eighteenth century. The industrial revolution and mass production resulted in
cheaper textiles, making fabrics more expendable so that people no longer cared to
refashion their outdated clothes according to the latest styles. Silk weighting was
predominant during the late-nineteenth and early twentieth century because with rapidly
changing fashions, the garment would be outdated long before the fabric showed any sign
of wear. Silk costumes, belonging to this period, have caused nightmarish situations for
museum curators and conservators because of the presence of weighting agents in silk
fabrics, which has caused severe cracking and tearing (see figure 4.7, gown #
L1995.17.59). These textiles are simply turning to dust and there, at present, seems to be
no solution to this problem. Garments made of weighted silk fabrics cannot bear the
stresses of hanging and should be stored flat, ideally with no folds. Upon examining each
piece in the eighteenth-century costume collection, Dr. Anne Bissonnette, Curator of the
museum, and I determined that most, if not all, of the garments could continue to hang.

Most eighteenth-century silk costumes were hand-sewn with silk or linen
thread. In many cases, where the costume was lined in linen, linen thread was used;
however, silk thread was used to sew the silk parts together. Silk thread tends to dry and
break overtime causing seams to rupture. I was concerned that during hanging some
seams, especially the shoulder seams, might not endure the stress of hanging. Another
point that added more weight to this concern was the fact that as eighteenth-century costumes were often remodeled to reuse the expensive fabrics, the interior construction was not exceptionally neat and often displayed rather long stitches. I was concerned that such substandard stitching might make the seams more prone to rupture.

I, however, decided to proceed with my decision to hang these costumes because of the following arguments. The bodice area of the gown is almost always lined, which adds strength to the construction. The shoulder seam falls towards the back of the gown so that when hung the entire weight of the gown is not suspended from the seam. The hangers eventually used were richly padded, which increased the surface area of the hanger at the shoulder. Thus when a costume was hung from that hanger, it prevented a sharp crease on the shoulder and spread the area of stress.

**Hangers with Hip Frames**

Most pieces in the collection date from around the 1740s to 1770s when the shape of the skirts was oval with wide sides. Women wore oval hoops or *paniers* under their petticoats to achieve the exaggerated side fullness. This was one of the reasons for developing a hanger with hip support for the gowns (see figure 3.5). Silk textiles were heavy in the first half of the eighteenth century but became lighter in texture and weight as the century progressed. Considering the sheer volume of fabric used, some gowns were heavy even though the fabric used was lighter. Dr. Bissonnette and I thought that a hanger with hip support would not only help maintain the shape of the gown’s skirt, but would also help distribute the weight of the gown, lending support at the waist, so that the entire weight of the gown was not suspended from the shoulders.
Once a simple, but what we thought effective, prototype of the hanger was constructed, we realized that the hip structure did not take the weight of the gown’s skirt, rather the sides of the skirt skimmed the edges of the hanger’s hip frame (see figure 4.9). We then stitched a length of twill tape on the inside of both sides of the front bodice and tied the tapes together to make the skirt sit on the hip frame. This procedure, however, created a crease on the bodice’s side seam, which was undesirable. We hence decided to continue hanging the gowns on traditional hangers as before.

An article, published in 1972, written by Anne Buck, who was the Keeper of The Gallery of English Costume at the Manchester City Art Galleries, and Jentina E. Leene described a hanger with wire shoulder and hip frames covered with polyurethane foam.¹ According to Buck and Leene, this hanger was designed by the Costume Institute of the Metropolitan Museum of Art, New York. Chris Paulocik, who is a Textile Conservator at the Metropolitan Museum of Art and has been with the museum for the past seventeen years, said that she had not seen examples of this kind of hanger being used; however, they might have been used in the past.² It is possible that a prototype of a hanger with shoulder and hip frame was developed at the Costume Institute, but its effectiveness in terms of the cost of production and its ability to support the gowns better than traditional hangers was questioned and hence the hangers were not developed further.

Hangers with hip frames are currently being used to hang eighteenth-century gowns at the Colonial Williamsburg Foundation, where the main collection is comprised of eighteenth-century clothes (see figure 3.5). More research, however, is required to
probe the effectiveness of such hangers especially for eighteenth-century gowns with side fullness.

The Final Method Chosen for Hanging the Costumes

Regular wooden hangers, already being used at the KSUM, were used to hang the gowns and bodices. The sides of the hangers were cut to conform to the across-shoulder measurement of each gown and bodice. The hangers were generously padded with polyester batting and the length of the batting was kept at 10 to 12 inches from the hook of the hanger. Making the hangers this long, I thought, would add additional support to the costume as well as prevent any hooks that might be present on the front interior of the costume from rubbing against the back interior of the costume. The hangers were covered with washed, unbleached muslin covers. A label with the accession number of the costume was stitched to the padded hanger and the muslin cover of each hanger so that when the covers were removed for washing, the right cover could be returned to the right hanger and the correct costume was hung on that hanger (see figure 4.11).

Robe à la française gowns needed additional support on the center back where pleats were arranged in two layers. To provide this additional support, twill tape was sewed on the center of the seam that held the pleats down, on the inside of the gown, and knotted over the hanger’s hook (see figure 4.12). Twill tape was also sewed on the inside of both sides of the front bodice, near the waist, on all the gowns. When these tapes were tied together, it held the gown together, preventing it from slipping off the hanger (see figure 4.10).
We continued to hang the eighteenth-century petticoats on two-bar skirt hangers. Instead of clamping the petticoat between the bars of the hanger, a twill tape with tabs stitched to it at regular intervals was hand-sewed to the waist of the petticoats (see figures 4.14 and 4.15). These tabs were knotted and then clamped between the bars of the two-bar skirt hanger. This method prevented the petticoat from being crushed by the hanger and the original fabric of the petticoat did not come in contact with the non-archival surfaces of the hanger.

**Dustcovers for Gowns and Petticoats**

Washed, unbleached muslin was used to make dustcovers for the gowns and petticoats. Dustcovers protected the costumes from dust, light, abrasion from adjacent garments, and non-archival surfaces of the wardrobe units. As the costumes were contained within the dustcovers, this prevented the garments from getting caught between the doors of the wardrobe unit as well as prevented the gowns from slipping off their hangers while being removed from the wardrobe.

A pocket bag was stitched on the back of the dustcover, which provided storage for lace and other trims original to the gown that were removed during restoration. Similarly a flap was stitched to the back of the dustcover into which the stomacher – both original and reproduction – was inserted. In this manner, dustcovers allowed the storage of lace and other trims as well as stomachers with their respective gowns (see figures 4.19 and 4.20).

All dustcovers were given fabric labels which provided the front and back views of the garment within, the accession number, the date and provenance, a brief description of the garment and the fabric used to construct that garment, and a brief description of its
specific storage. This latter point listed all the components of the garment – like stomacher and petticoat – and how and where they were stored.

**Conclusion**

Initially all the eighteenth-century costumes - three bodices, ten gowns, eleven original and three reproduction petticoats, and some stomachers – were enclosed within a single wardrobe unit (see figure 4.1). Once all the gowns, petticoats, and bodices were stored on their proper hangers and enclosed within their respective dustcovers, they were reorganized within two wardrobe units (see figure 5.1). This allowed sufficient space between the garments, so that they were not crowded together. A garment could now be easily removed from the wardrobe unit without having to push the other costumes aside. This prevented the costumes from being crushed or abraded.

During the three years that I worked on this project, another project was being carried out by Ms. Jean Druesedow, Director of the KSUM. This involved a dress which was constructed in eighteenth-century fabric but was altered many times in the nineteenth and twentieth centuries.³ As a result the original intent of this dress was completely lost. Also the dress was so badly assembled – it had heavy machine stitches running up the front of the dress – that it was not possible to display it. Lastly, there was no provenance to the dress apart from where it was bought. So Ms. Druesedow decided to restore the dress as far back to its probable date as was possible.

Ms. Druesedow and Kristina Hill, a senior student who made this project into her senior Honors thesis, worked meticulously and very conservatively to remove the machine stitches. When they initially started on this project, they had no idea that the dress would metamorphosize into a gown with an eight-panel skirt or that it would be so
Figure 5.1. The final storage. The eighteenth-century women’s costumes at the KSUM were reorganized within two wardrobe units, which allowed sufficient space between the garments, thus preventing compression and abrasion.
small. The restored gown is a spectacular example of the eighteenth-century style of exaggerated side-fulness, which probably outshines the other eighteenth-century gowns at the KSUM (see figure 5.2). There are not many extant gowns of this style except in royal collections so this dress is an important addition to the KSUM’S eighteenth-century costume collection.

This gown, with an eight-panel skirt, would have to be stored flat because hanging storage would not be able to provide support to the skirt, which is too wide. Ms. Druesedow mentioned that a similar gown at the Costume Institute is stored flat in a drawer.

Designing and maintaining a storage system is an evolutionary process. As space is at a premium in most museums, new acquisitions can test the limit of existing storage space. As collections grow older, their storage needs might change. A costume that was once hung might be considered too fragile to be continued to be stored in the same manner and might have to be stored flat. Developments and innovations being made in archival storage products and units, designed specifically for museum use, can render existing storage obsolete. Therefore storage of costumes and textiles is a dynamic field and is constantly evolving.

Ideal storage should protect artifacts from degrading factors such as light, extremes in temperature and humidity, pests such as rodents, insects, and microorganisms, dust, pollution, acid, and other impurities from the surrounding environment. A good storage system grows and changes according to the needs of the collection as time and age can alter the storage needs of artifacts. An effective and efficient storage system is one that is simple and easily accessible, while safeguarding
Figure 5.2. Gown with the eight-panel skirt. This gown was recently restored and would have to be stored flat as hanging storage would not be able to provide support to the skirt.
artifacts from the degrading factors mentioned above, and at the same time adequately supporting the objects based on the conditional requirements of each object. I believe that the method of storage that was incorporated for the eighteenth-century women’s costumes at the KSUM meets the above requirements. I hope that this research project will benefit other museums and historical societies.

Notes


3 Jean Druesedow, Director of the Kent State University Museum, Kent, Ohio, email correspondence with author, 9 April 2007.

4 Ibid.

5 Ibid.

6 Ibid.
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Sources

Interviews

Baumgarten, Linda, Curator of Textiles and Costumes at the Colonial Williamsburg Foundation. Email correspondence with author, 2 March 2004.

______. Interview by author, 26 July 2004, Williamsburg, VA.


Druesedow, Jean, Director of the Kent State University Museum, Kent, Ohio. Email correspondence with author, 9 April 2007.

Herbaugh, Karen, Curator at The Textile Museum. Interview by author, 29 July 2004, Lowell, MA.

Kerstein, Melinda, Collections Administrator at Doris Stein Research Center, LACMA. Interview by author, 21 May 2004, Los Angeles, CA.


Petersen, Glenn, Assistant Conservator at The Museum at FIT. Interview by author, 28 July 2004, New York, NY.


Spagnolo, Megan, Curator of Costumes and Textiles at The Western Reserve Historical Society. Interview by author, 14 July 2004, Cleveland, OH.

Artifacts

List of Costumes at the Kent State University Museum

1983.1.3 Petticoat
1983.1.4 Petticoat
1983.1.5 Ceremonial gown
1983.1.6 Bodice
1983.1.8ab Gown, petticoat (reproduction stomacher)
1983.1.9ab Gown, partially reproduced petticoat (reproduction stomacher)
1983.1.10ab Gown, petticoat
1983.1.11 Gown (reproduction petticoat)
1983.1.24abc Gown, petticoat, stomacher
1983.1.2158 Petticoat
1995.68.1 Gown
L1995.17.59 Gown (reproduction petticoat)
L1995.17.60ab Gown, petticoat-apron
L1995.17.61ab Gown, petticoat (reproduction stomacher)
L1995.17.65ab Bodice, petticoat (reproduction stomacher)
L1995.17.66 Bodice (Reproduction petticoat and stomacher)
2002.35.7ab Gown, stomacher
2002.35.8 Petticoat
Catalogs


*Light Impressions* (December 2004).

*Preservation Products: Products for Preservation Applications and for the Museum Community.*


Secondary Works

Books


**Articles**


163


“To Freeze or Not to Freeze.” *CSA News* 16, no. 3 (Winter 1991): 9.


Theses


Electronic Documents from Internet


APPENDIX A

HUMAN SUBJECTS APPROVAL

July 26, 2004

Archana Mehta
9001 Portage Poine Dr., Apt. 8107
Streetsboro, Ohio 44241

Ms. Mehta:

The University of Akron's Institutional Review Board for the Protection of Human Subjects (IRB) completed a review of the protocol entitled "Storage of Eighteenth-Century Costumes and Textiles". The IRB application number assigned to this project is 20040716.

The protocol was reviewed on July 26, 2004 and qualified for exemption from continuing IRB review. The protocol represents minimal risk to subjects. Additionally, the protocol matches the following federal category for exemption:

Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless: (i) information is recorded in such a manner that subjects can be identified, directly or through identifiers linked to subjects, AND (ii) any disclosure of responses outside the research could reasonably place the subjects at risk of civil or criminal liability or be damaging to subjects' financial standing, employability or reputation

Annual continuation applications are not required for exempt projects. However, if you propose changes to this protocol, an Application for Continuing Review Form, indicating the changes, must be completed and submitted to the Office of Research Services.

Enclosed is a copy of the informed consent document, which the IRB has approved for your use in this research. A copy of this document is to be submitted with any application for continuation of this project.

Please retain this letter for your files. If the research is being conducted for a master's thesis or doctoral dissertation, the student must file a copy of this letter with the thesis or dissertation.

Sincerely,

Sharon McWhorter, Associate Director

Cc: Richard Getzler, Department Chair
Virginia Gann, Advisor
Phil Allen, IRB Chair
APPENDIX B

INFORMED CONSENT

INFORMED CONSENT

This research is conducted by Archana Mehta, a master’s level student from the College of Fine and Applied Arts, School of Family and Consumer Sciences, The University of Akron, Akron, Ohio. The main purpose of this research is to identify techniques of proper storage for costumes (and textiles) so as to be able to plan and execute a storage system for the eighteenth-century costumes at Kent State University Museum (KSUM). The prime focus of the research would be on the physical placement of costumes within storage units with a brief overview on ideal storage conditions in terms of the physical environment and effective storage facilities.

Costume storage is a relatively new field and is constantly developing as new materials and techniques for storage are tried and tested. Only time can judge the effectiveness of a storage technique for any particular costume. So, as costumes in collections become older, conservators and curators discover the affects of storage techniques on costumes, whether favorable or otherwise, which enables them to learn from their mistakes and build on their successes, thus developing optimum storage solutions.

Through this research, I hope to document, evaluate, and compare storage methods incorporated by various museums and historical societies. This would enable me to propose an effective storage solution for the eighteenth-century costume collection at KSUM. This research would also benefit other museums and historical societies. If there are any questions regarding this research, I can be reached at 330-626-1774. The University of Akron Institutional Review Board has approved this project. Ms. Sharon McWhorter, Associate Director of Research Services can be contacted at 330-972-7666 if there are any questions regarding your rights as a research participant.

I agree to meet with Archana Mehta and show her and discuss with her the storage facilities of which I am in charge.

I am willing to be cited in her thesis. Yes/No
I give Archana Mehta permission to take photographs. Yes/No

Name

Organization

Date

APPROVED
JUL 26 2004

INSTITUTIONAL REVIEW BOARD
THE UNIVERSITY OF AKRON
APPENDIX C

LIST OF CONSERVATION SUPPLIERS

- American Hanger and Fixture Corporation
  410 Clermont Terrace
  Union, NJ 07083
  Tel: 800-221-2790, 908-282-1982
  Fax: 908-282-6874
  (Metal, plastic, and wood hangers and hanger accessories)

- Archival Methods
  235 Middle Road
  Henrietta, NY 14467
  Tel: 866-877-7050, 585-334-7050
  Fax: 585-334-7067
  (General conservation supplies and presentation products)

- Archivart Products
  40 Eisenhower Drive
  Paramus, NJ 07652
  Tel: 800-804-8428
  (Archival paper products)

- Clothes Hangers
  7500 NW 25th Street, #2
  Miami, FL 33122
  Tel: 305-477-4250
  Fax: 305-477-4254
  (Hangers and custom-made hangers)

- Conservation Resources International, LLC
  5532 Port Royal Road
  Springfield, VA 22151
  Tel: 800-634-6932, 703-321-7730
  Fax: 703-321-0629
  (General conservation supplies)
• Gaylord Bros., Inc.
P.O. Box 4901
Syracuse, NY 13221
Tel: 800-448-6160, 800-634-6307
Fax: 800-272-3412
(General conservation supplies and furniture)

• Hanger Works
P.O. Box 379, 985 Comstock St.
Marne, MI 49435
Tel: 877-688-6700, 616-677-1270
Fax: 616-677-1295
(Hangers)

• Light Impressions
P.O. Box 787
Brea, CA 92822
Tel: 800-828-6216
Fax: 800-828-5539
(General conservation supplies)

• Needle & Thread
2215 Fairfield Rd.
Gettysburg, PA 17325
Tel: 717-334-4011
Fax: 717-334-1819
Website: www.woodedhamlet.com
(Tapes, braids, threads, and lace)

• Preservation Products
A division of Gladon Company
310 West Forest Hill Ave.
Oak Creek, WI 53154
Tel: 800-448-6070
Fax: 800-322-6525
(General conservation supplies)

• Talas
20 West 20th Street, 5th Floor
New York, NY 10011
Tel: 212-219-0770
Fax: 212-219-0735
(General conservation supplies)
The Hollinger Corporation
P.O. Box 8360
Fredericksburg, VA 22404
Tel: 800-634-0491
Fax: 800-947-8814
(General conservation supplies)

University Products
P.O. Box 101
Holyoke, MA 01041
Tel: 800-628-1912
Fax: 800-532-9281
(General conservation supplies)