

THE TEXTILE SPECIALTY GROUP
POSTPRINTS
PAPERS DELIVERED AT THE TEXTILE SUBGROUP SESSION

American Institute for Conservation
of Historic & Artistic Works
33rd Annual Meeting
Minneapolis, Minnesota
June 2005

VOLUME FIFTEEN



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Edited by
Kathleen MacKay
Beth Szuhay
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PREFACE

The fifteenth volume of POSTPRINTS contains papers and two tips presented at the Textile Specialty Group (TSG) session of the annual meeting of the American Institute for Conservation of Historic & Artistic Works (AIC), in Minneapolis, Minnesota from June 8-13, 2005. Also included is one poster presented at the poster session.

TSG POSTPRINTS is a non-juried publication. Submission of these papers to juried publications, such as the *Journal of the American Institute for Conservation*, is encouraged. The papers, chosen from abstracts submitted to meeting chair Nancy Pollak, Textile Specialty Group Vice Chair 2004-2005, are published as submitted by the authors. Editing of papers was done according to the *Journal of American Institute of Conservation*'s Guidelines for Authors and AIC's best practices for print publications. Materials and methods presented within the papers should not be considered official statements of either the Textile Specialty Group or of the American Institute for Conservation of Historic & Artistic Works.

The Editors wish to thank the contributors to this publication for their cooperation and timeliness. Without their enthusiasm and hard work this publication would not have been possible. Special thanks are extended to Carole Sinclair, Archaeologist at the Museo Chileno de Arte Precolombino (editor in charge), and Isabel Alvarado, Textile Conservator at the Museo Histórico Nacional, both from Santiago de Chile, and Patricia Lisa, Textile Conservator at the Museo Isaac Fernández Blanco, Buenos Aires, Argentina, for translating the Abstracts into Spanish. All are TSG members from the Comité Nacional de Conservación Textil, Chile. Thanks also are due to Maya Luna, who provided additional translation services, and to Robin Hanson, who laid out the volume using Quark XPress desktop publishing software.

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COLLECTIONS CARE AT THE ANTONIO RATTI TEXTILE CENTER METROPOLITAN MUSEUM OF ART, NEW YORK

REBECCA FIFIELD AND GIOVANNA FIORINO-IANNACE

ABSTRACT—The Antonio Ratti Textile Center (RTC) at the Metropolitan Museum of Art (MMA), New York provides one approach to collections care for a large and diverse textile collection. Formed around the tenets of preservation and access, the RTC opened in 1995 to make the MMA's departmental textile holdings more accessible to researchers by housing them in a central, modern storage facility. In the 10 years since the facility opened, standards of preventive care and collections management have continued to evolve. This paper highlights recent efforts in the operation of the facility, discusses challenges, and addresses the continual shaping of collections care policies and processes.

TITULO—CUIDADO DE COLECCIONES EN EL CENTRO TEXTIL ANTONIO RATTI DEL MUSEO METROPOLITANO DE ARTE, NUEVA YORK. **RESUMEN**—El Centro Textil Antonio Ratti del Museo Metropolitano de Arte de Nueva York, nos entrega una aproximación al cuidado de grandes y diversas colecciones. El Centro Textil Ratti, formado sobre la base de una doctrina de preservación y acceso, se inauguró en 1995 para lograr que el patrimonio del departamento textil del MMA fuera más accesible a los investigadores, almacenándolos en un servicio de depósitos moderno y centralizado. En los 10 años que este servicio lleva abierto, los estándares de cuidado preventivo y manejo de colecciones han continuado desarrollándose. En esta ponencia se destacarán los recientes esfuerzos que se han realizado en el funcionamiento de este servicio, se discutirán los desafíos que esto implica, así como se tratará la continuidad de las políticas y procesos de cuidado de colecciones.

1. INTRODUCTION

Incredible foresight and extensive planning were vital in the successful realization of the Antonio Ratti Textile Center at the Metropolitan Museum of Art, New York. Opened in December 1995, the Ratti Center provides specialized study facilities, storage, and collections care for over 33,000 textiles held by nine different curatorial departments. After 10 years of operation, development of higher preservation standards and the growing needs of the Ratti Center's users provides continual motivation for evaluation and change. This paper, presented in Minneapolis, Minnesota in June 2005, highlights select collections care policies and procedures, discusses current challenges, and presents one approach to collections care for a large and diverse textile collection.

2. ANTONIO RATTI TEXTILE CENTER

2.1 STRUCTURE AND OPERATION

The Metropolitan Museum of Art acquired its first textiles in 1879. Collected by several departments rather than one central textile department, the museum's textile holdings include 36,000 objects, the majority of which are stored in the Ratti Center's 19,000 square foot facility in the museum's Fifth Avenue building. Ranging from 3,000 BCE (Before Common Era) to the present, textiles stored in the Ratti Center represent numerous techniques from various cultures, including tapestries, quilts, woven silks, select costumes, lace, embroidered caskets, ecclesiastical objects, and fiber art. Separately, approximately 70,000 costumes and accessories are curated and stored by the museum's Costume Institute.

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The Ratti Center is somewhat unique within the museum in that it is neither a curatorial nor a conservation department. The Center acts as a liaison between all museum staff who affect collections care, not only the curatorial and conservation departments, but also the Photo Studio, Engineering, and Security.

2.2 RESEARCH FACILITIES

The first Textile Study Room, which opened in 1907, provided a precedent for facilitating public access to the museum's textile collections. Today, visitors to the Ratti Center have access to an image database based on the collections management database The Museum System (TMS) (fig. 1). The staff access portion of the program records descriptive information, location history, and storage comments. A 3,500 volume textile reference library and two study rooms for the examination of textiles are available for staff and public use (fig. 2). Visitors to the Ratti Center include curators and conservators from other institutions, independent



Figure 1. Computer workstations provide public access to select collections information on over 36,000 textile objects owned by the Metropolitan Museum of Art.



Figure 2. A graduate textile design class views textiles in one of the Center's two study rooms.

scholars, students, designers, and textile enthusiasts.

2.3 STOREROOMS

Seven storerooms house textiles in a variety of formats. Steel cabinetry with a powder-coated epoxy finish stores flat and rolled textiles. Mounted and boxed objects are supported on both cantilevered and four-post powder-coated steel shelving units, while racks on compacting carriages store large rolled objects (fig. 3). A Preparatory Room provides a workspace away from collections storage for the construction of object supports and containers. Storage materials are housed in bays and closets in corridor spaces within the Ratti Center, as well as in the Preparatory Room.

2.4 STAFFING

The Ratti Center's seven staff members are crucial in providing regular, systematic collections care. The Supervising Curator, who is also curator of the European textile collection, serves as the depart-

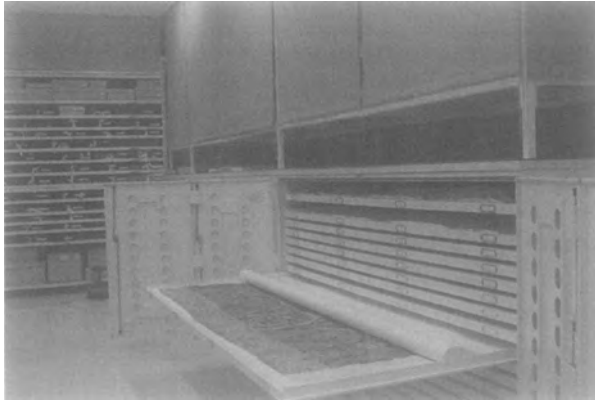


Figure 3. Powder-coated epoxy steel cabinetry, shelving, and rack systems are used throughout the Center's seven storerooms.

ment head. The Collections Manager and Assistant Collections Manager oversee operation of the Center, plan storage rehousing projects in conjunction with Textile Conservation staff, and evaluate and develop improvements in the collections care systems. Three Storage Assistants prepare objects for examination, assist researchers during object viewings, monitor storeroom conditions, and upgrade storage housings (figs. 4, 5). As a facility with public access, the Administrative



Figure 4. Storage Assistants Leslie Gerhauser and Grace Hernandez retrieve objects from a cantilevered shelf unit in one of the Center's storerooms.

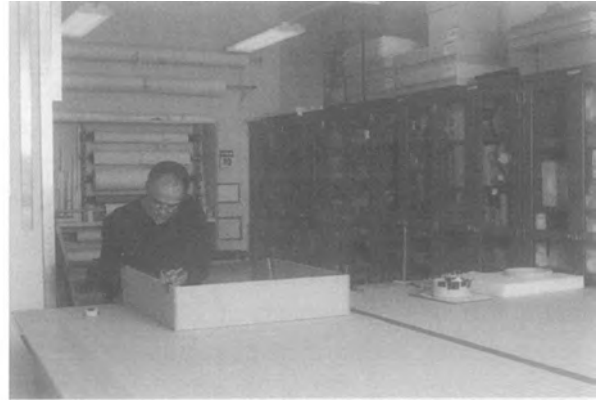


Figure 5. Senior Storage Associate Toma Fichter prepares storage housings in the Preparatory Room.

Assistant provides a necessary interface for the Ratti Center's users. Several museum fellows from the curatorial departments conduct their research within the Ratti Center, interns observe collections care systems, and dedicated volunteers work with the staff on library and storage projects.

The Ratti Center and the Textile Conservation department work together on assessing and implementing long-term care needs. This includes coordination of storage upgrade projects, selecting new storage materials, and general collections care planning. Ratti Center staff working daily with the collection notice condition or storage issues that need to be addressed and relay this information to conservation staff.

3. COLLECTIONS CARE DOCUMENTATION

3.1 OBJECT CONDITION DOCUMENTATION

Documentation is a necessary part of the collections care process. As objects are accessed for

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public and staff viewers, the Ratti Center's staff is able to more frequently assess condition and storage of broader sections of the collection than in the past. Recording storage upgrades, handling, and brief condition observations enhance the history of an object's care. Whereas this data was stored in stand-alone databases until recently, this information will be centralized within the conservation and storage planning components of TMS. This documentation also assists in planning future storage projects, such as rehousing large groups of related textiles.

3.2 OVERALL USE OF THE RATTI CENTER

Monthly and annual statistics that track use of the database and library and object viewings provide insight into the operation of the facility. In 2004, over 2,750 objects were viewed by the staff and public researchers in the Ratti Center Study Rooms alone. Statistics such as these require time and effort to track, but they assist in planning improvements and illustrate need when applying for budget funds, increased staffing, or on grant applications. The Photo Studio recently photographed the Center to document the numerous physical changes to the space that have occurred during the last 10 years. Together with the regular digital photographs taken by the Ratti staff throughout the year, a detailed photo archive has been established of how the Center has and continues to develop, including new storage furniture and equipment, problems and their solutions, and overall use of the Center.

3.3 MONITORING OF STORAGE FURNITURE

As a recognized part of preventive conservation theory, storage furniture offers the first line of

defense against long-term deterioration. Monitoring of storage systems is an integral part of the collections care documentation maintained by the Ratti Center. This information assists in identifying problems and planning improvements. In 2002, it became evident that the track systems of some of the Interior Steel cabinetry that was installed in 1995 required adjustments due to a design flaw. Dragging of the drawers, scraping of the powder-coat surface, jamming glides, bending roller bearings, and faulty spot-welds were some of the problems encountered. To correct these issues, Ratti Center staff worked with Viking Metal Inc. (which purchased Interior Steel's museum cabinet division) to design a replacement stainless steel track system, which will be used in cabinets experiencing these problems. While still in the initial stages of this long-term retrofitting project, continued testing of the new cabinet tracks has indicated that the pre-existing design defects have been resolved.

3.4 ENVIRONMENTAL MONITORING

Environmental monitoring is an accepted part of preventive conservation, but meaningful interpretation of collected data is essential to its usefulness in maintaining an ideal storage environment. The museum's Engineering staff maintains the Ratti Center's environmental conditions within the context of the entire building envelope. This is a monumental task, as the museum is comprised of 21 wings. Public areas of the Ratti Center are also located around the intersections of several previous exterior walls. Monitoring equipment used within the Center includes dataloggers and recording hygrothermographs. Written reports compiled

by Ratti Center staff are sent to Engineering to complement data collected by their own sensors, which are centrally monitored. For long-term interpretation, the logger data is uploaded into Climate Notebook software, an environmental monitoring program developed specifically for museum collections by the Image Permanence Institute and the Rochester Institute of Technology. Within this program, data graphs can be annotated to explain environmental fluctuations.

An important preventive measure is a Ratti staff walk-through of the facility each morning and evening. A Storage Assistant visually examines all areas of the Center, including storerooms, closets, spaces under shelving, hygrothermographs, and water sensors for any irregularities.

4. DISASTER PLANNING

Recently, the Ratti Center composed and adopted its first comprehensive Disaster Action Plan. The Center is located on the ground floor of the Museum, a situation shared by collections storage areas in many museums. Even though the facility is relatively new, it is subject to the aging Museum building which surrounds the Center.

Collections emergency response functions are outlined in the museum's Disaster Action Plan, administered by a committee representing administration, curatorial and conservation departments, security, facilities management, and engineering. A museum-wide staff response program, the Collections Emergency Team, or CET, designates an emergency contact person for each department, to be contacted by pager in the event of an after

hours emergency. The Ratti Center Disaster Action Plan includes contact information, guidelines for first responders, health and safety specifications, a list of maintained disaster supplies, and relevant floor plans. Guidelines for photographic and written documentation, as well as when to collect environmental data after the event, are also outlined.

A successful disaster plan must consider issues that will affect staff response during an emergency. One of these issues for the Ratti Center staff is the museum's location within New York City. Many staff members do not own cars and must rely on public transportation that may be unsafe or unavailable during nighttime. To provide safe and reliable transport for staff responding to emergencies, a car service was contracted for late night emergencies.

While equal treatment for all collections is a prime directive of collections stewardship, post-disaster object reclamation requires quick prioritization of work. In the event of a widespread collections emergency, curators are asked to identify 20 of the most important objects to first secure after an incident. Cabinetry housing these objects is marked with an easily visible magnet denoting this status. Future plans include the marking of drawers containing these objects as well as stenciled indicators on the object support. These visual indicators will allow rapid assessment of collections in affected areas during reclamation.

Emergencies within collections storage can initiate facility assessment and provide motivation for improvements. Aging surroundings of the museum building around the Ratti Center require constant

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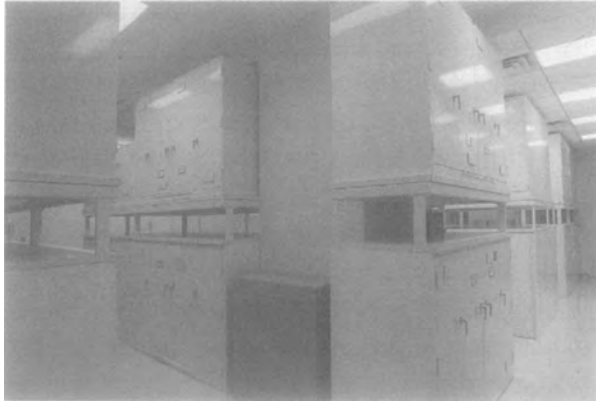


Figure 6. A floor-mounted steel framework supports original cabinetry during a post-initial construction storeroom project. The original design required suspension of the upper tier of cabinetry by steel rods bolted into I-beams above the ceiling.

diligence for possibly undesirable conditions. For example, recurrent water seepage in an area above one of the storerooms led to flooding in 2000. Fortunately, gasketed cabinetry prevented any damage to collections, but it was evident that repeated leaks in this area mandated the relocation of the storeroom and the collections it housed. The Preparatory Room was exchanged with this store-

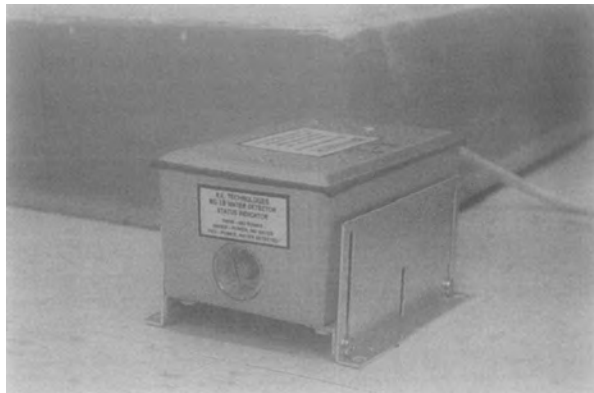


Figure 7. Kele water sensors installed in the Center in 2004 alert security electronically and have flashing red visual indicators when moisture is detected.

room area. While this project posed an unexpected and complex challenge, the new storeroom design incorporated the original ceiling-suspended cabinetry on a floor-supported steel framework (fig. 6). The Preparatory Room ceiling was painted white and HVAC and other equipment were not concealed by a suspended ceiling, allowing rapid detection of any future leaks. Drains were also installed in the Preparatory Room floors. In addition, a new water sensor system was installed in all problematic areas in March 2004. When moisture is detected, the sensors communicate the issue to Engineering via software link, as well as provide a flashing red visual indicator (fig. 7).

5. SPACE UTILIZATION AND COLLECTIONS GROWTH, CURRENT ISSUES

Space constraints are common themes for collections of all sizes. The Ratti Center is fortunate to have approximately 10% of its overall storage space available for growth due to acquisitions and storage housing upgrades. However, expansion of collections occurs unevenly. The storage area for large rolled tapestries, carpets, and large flat textiles such as copes, is near capacity, as is flat shelving where framed textiles and custom storage boxes are stored. This situation has led to the regular reassessment of object storage systems.

One recent challenge concerns large fiber art. The definition of what is a textile object is changing, requiring adaptation to meet storage needs. *Tri-Color Arch* (1983-1984) by Claire Zeisler (fig. 8) is approximately 1.8m (6') tall and .9m (3') square at the base when in storage. Storage space for large-scale three-dimensional fiber art was not

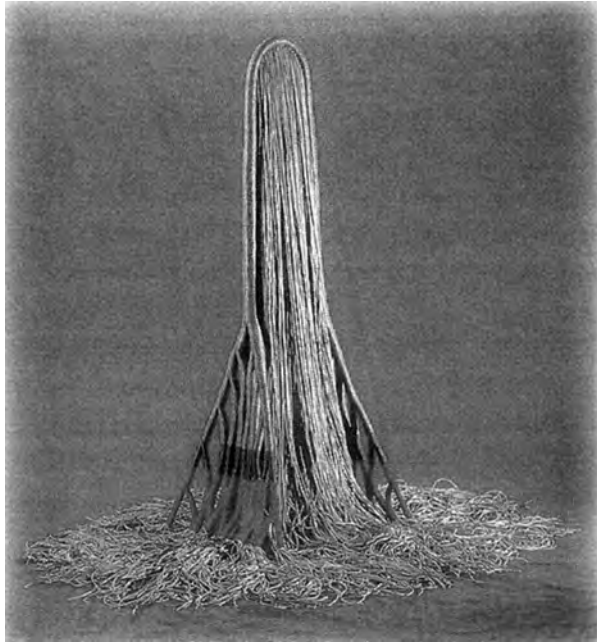


Figure 8. Claire Zeisler, *Tri-Color Arch*, 1983-1984. Gift of Peter Florsheim, Thomas W. Florsheim, and Joan Florsheim-Binkley (1987.371).

included in planning the Ratti Center. The Zeisler artwork required the construction of a custom acrylic sheeting case with a sliding Ethafoam base. The long sisal strands are bundled and wrapped for storage and a cotton blackout cover protects the object container from light and dust. The storage case is mounted on casters, allowing flexibility and easy transport within the storeroom and gallery.

The deinstallation of the Islamic Galleries prompted by museum renovation projects in 2003 required further adjustment of storage space allocations. Several large rugs were removed from display and housed in the Ratti Center. To accommodate these somewhat brittle objects, 50.8cm (20")

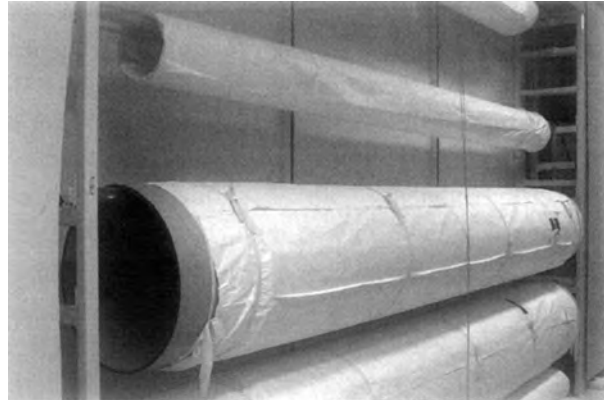


Figure 9. The 50.8cm (20") interior diameter of these custom tubes provides a large support surface for the brittle fibers of oversized Islamic rugs. The tubes are suspended on steel tubes placed in powder-coated brackets mounted on a Unistrut frame system.

diameter archival tubes were custom made by Archivart for this project. The tubes were suspended on steel pipes between powder-coated epoxy brackets mounted on a Unistrut frame system (fig. 9). In order to ensure the safety of the object and the handlers, the Ratti Center is working with the Buildings Department and the Rigging Shop to develop a specialized lift for the retrieval and transport of these large textiles.

6. CONCLUSIONS

Collections management solutions are specific to the institution and depend on its organizational structure, the collection, and its users' needs. Through daily interaction with the collections, the Ratti Center proactively considers the care of textile collections in storage and facilitates the work of conservation and curatorial departments. Information collected in the process of routine col-

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lections care contributes to an overall account of an object's handling and long-term care. It identifies and guides the work that must be performed in order to protect collections access.

NOTES

Figure 8 photograph copyright The Metropolitan Museum of Art, 1987.

ACKNOWLEDGEMENTS

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SOURCES OF MATERIALS

archival tubes and materials

Archivart

40 Eisenhower Drive

Paramus, NJ 07652

www.archivart.com

Climate Notebook

Image Permanence Institute

Rochester Institute of Technology

70 Lomb Memorial Drive

Rochester, NY 14623-5604

www.climatebook.org

water sensors

Kele

3300 Brother Boulevard

Bartlett, TN 38133

www.kele.com

replacement cabinet track systems

Viking Metal Cabinet Company

5321 West 65th Street

Chicago IL 60638-5692

www.vikingmetal.com

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DOCUMENTING AND IMPLEMENTING CONSERVATION REQUESTS FROM NATIVE COMMUNITIES

LAUREN CHANG AND SUSAN HEALD

ABSTRACT—The Conservation Department at the National Museum of the American Indian in Washington, DC has been developing a collaboration process with representatives from Native communities to help formulate collections care and treatment options for their items in the museum's collection. The collaboration has informed how treatments are approached and documented and how some objects are stored and displayed. Information gathered from conservation consultations is recorded by several means. Pertinent information on a particular object is also incorporated into its conservation documentation. Two case studies are explored in this paper: a Lakota beaded hide dress and a Kwakwaka'wakw hamsamł mask.

TÍTULO—DOCUMENTACIÓN E IMPLEMENTACIÓN DE TRATAMIENTO Y CUIDADO DE COLECCIONES DESDE LAS COMUNIDADES ABORIGENES. **RESUMEN**—El Departamento de Conservación del Museo Nacional del Indio Americano ha desarrollado un proceso de colaboración con los representantes de las comunidades indígenas con el fin de ayudar en la formulación de opciones de cuidado y tratamiento de sus objetos en la colección del Museo. Esta colaboración ha señalado cómo estos tratamientos han sido abordados y documentados, y cómo algunos objetos han sido almacenados y exhibidos. La información reunida en este proceso ha sido registrada por diferentes medios. La información pertinente a un objeto particular, también ha sido incorporada en su documento de conservación. Dos estudios de caso se explorarán: un vestido interior Lakota decorado con mostacillas y una máscara Kwakwaka'wakw hamsamł.

1. INTRODUCTION

The mission of the National Museum of the American Indian (NMAI), Washington, DC emphasizes consultation, collaboration, and cooperation with Native people. Whenever possible, conservation consultations with Native communities are held to establish each community's expectations and desires for the exhibition of their material culture. This emphasis on collaboration drives nearly all of the activities at the museum and is discussed in this paper, presented in Minneapolis, Minnesota in June 2005. From June 2001 to June 2005, the Conservation Department collaborated with 30 communities in preparation for the inaugural exhibitions at the NMAI Mall Museum, which opened in 2004, and for a North Pacific Coast exhibit that will open in February 2006. Each Native community's expectations must be well documented to ensure thorough transfer of knowledge to appropriate museum staff, conservators in particular. The archived documentation chronicles the exhibition process and plays a central role in conservation's collaborative projects.

2. DOCUMENTING A CONSERVATION CONSULTATION

Conservation consultations are documented with audiotapes, digital images, and handwritten notes. Information from these three sources is then compiled into a notebook and saved to a CD that is used by conservation staff, interns, curators and exhibitions staff throughout the exhibition process. Pertinent information is copied directly into the conservation database.

DOCUMENTING AND IMPLEMENTING CONSERVATION REQUESTS FROM NATIVE COMMUNITIES

In addition to the consultation notes, each notebook contains the following information:

- object list for the exhibit
- background information on the Native community and the exhibit
- maps identifying the geographic location of the community
- references
- consultation notes
- glossary of terms in the respective Native language
- images from the consultation
- audiotape log linking the audio to written documentation

In addition, the introduction to the consultation notes provides the following information:

- identification of the consultants and NMAI participants
- description of the consultation setting including location and activities
- summary of general conservation information, which may include handling restrictions (gender, menstrual cycle); level of intervention; conservation materials requests (synthetic vs. natural materials)

Notes on each object are then summarized next to a thumbnail image of the object. The object is identified by catalogue number, and cross-referenced with the audiotapes. Often the summarized information includes specific handling instructions or storage requests, how the piece was used and manufactured, and display requests made by the community. The information may also include

requests for cleaning, stabilization or refurbishment along with specifics of materials and treatment techniques.

Although this level of documentation may appear time-consuming, it has proven essential. Thorough transfer of knowledge is crucial to prepare the objects according to community requests. Sometimes the conservators in the consultations are not the conservators performing the treatments. Additionally, the consultation may be the only opportunity to focus on conservation issues with the community representatives and objects in the same place.

3. INCORPORATING CONSULTATION INFORMATION INTO STANDARD CONSERVATION REPORTS

3.1 TREATMENT PROPOSAL

Information from the notebooks is incorporated into treatment proposals to explain to the supervisory conservator and curator why certain treatment processes are being proposed. An example might be, "Compensation for lost buttons on this blanket was requested during the consultation. Buttons will be provided by the consultant." Without this information the proposals may appear unusual if the reasoning is not fully explained.

3.2 RATIONALE SECTION

The rationale field follows the treatment field and is used for two purposes. One is to explain why a particular material was used over another based on its working or aging properties. The other is to

explain how the treating conservator arrived at treatment decisions, taking into account the requests of the community and the responsibility of the conservator to follow professional ethics. For example, the rationale might be that a community consultant specified that natural materials be used instead of synthetic, even though the synthetic material might be the conservator's preferred choice.

In some instances, consultants specifically ask that pieces not be treated even though they are covered with grimy "museum" dirt or have unstable damage. Some consultants have explained that they do not differentiate between museum dirt and dirt from traditional use, and that it should be left as is. Other community consultants have expressed that non-Native conservators do not possess the cultural knowledge to clean and stabilize the piece correctly. In cases where a dirty or unstable object is not treated for exhibition, the rationale section might read, "Though covered with grimy disfiguring surface soiling, this piece was not cleaned at the request of the community consultants."

3.3 CONSULTATION SECTION

The Consultation section is used to provide a synopsis similar to the introductory section of the consultation notes described. For instance, a paragraph written for the Tlingit conservation consultation is copied and pasted into the consultation field of the report for each Tlingit object treated for the exhibition. Any additional specific information on an object can also be pasted from the electronic version of the consultation notebook.

Follow-up correspondence would also be included in this section.

Not every item treated in the Conservation Department receives this level of documentation. If there was any Native input on the care and treatment of the object however, or if the treatment was a collaborative project, the rationale and consultation sections become essential to the overall conservation treatment documentation.

4. CASE STUDY ONE: A LAKOTA HIDE DRESS

4.1 INITIAL CONSULTATION

Lakota community curators selected a beautifully beaded hide dress (fig. 1) typical of the reservation period (circa 1890) as one of the objects representing their community in "Our Universes," one of NMAI's Mall Museum inaugural exhibitions.

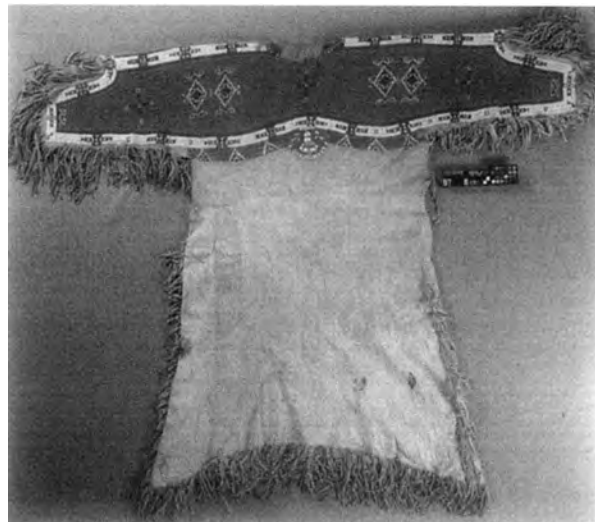


Figure 1. Lakota hide dress before treatment.

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The dress was in stable condition but had several holes with associated staining. The Lakota conservation consultation in June 2001 included Cecilia Fire Thunder, a Lakota community curator; Fedelia Cross and Matilda Montileaux, Lakota experts in traditional materials and techniques; Emil Her Many Horses (Lakota), NMAI Curator for the exhibition; two conservators and a conservation Mellon Fellow. During the three-day consultation each Lakota object selected for exhibition was examined and discussed. When the condition of the hide dress was discussed, Fedelia Cross suggested that the wearer might have been shot, noting the holes and associated staining. Based on this possibility, the dress was deselected out of respect. It would be inappropriate to have a reservation period dress on display with damage that could be interpreted as gunshot wounds within the context of this exhibition.



Figure 2. Cecilia Fire Thunder, Matilda Montileaux, and Fedelia Cross.

4.2 TESTING AND RESELECTING

Following the June 2001 consultation, several stained areas on the dress were tested for blood using the benzidine test (Odegaard et al. 2000). Some of the stains did indeed test positive for blood though it was not possible to distinguish human from animal blood with this test. In addition, the bloodstaining was from the outside, not the inside, and therefore was not likely from a gunshot wound. In December 2001, The Lakota consultants (fig. 2) returned to work with the conservators on collaborative treatments for three other objects selected for the exhibition (Johnson et al. In press). During this visit, they also searched for a Lakota dress to replace the blood-stained one, however, none of the other dresses seemed suitable for the exhibition. The consultants, curator, and conservators discussed the blood test results, the animal versus human origin of the blood, and the fact that the staining had come from the exterior. As a result, the original dress was re-selected with the condition that the staining not be visible on display.

4.3 HIDING THE STAINS

Several options were discussed. The least invasive option was to adjust the drape to hide the stains, but this proved unsuccessful due to their prominent location. Cecilia Fire Thunder suggested that stains be cut away and patches of brain-tanned hide inserted; this was considered a last resort traditional repair method. While conservators rarely remove original material, all options were considered during the consultation. An alternative suggestion, proposed jointly by conservation and

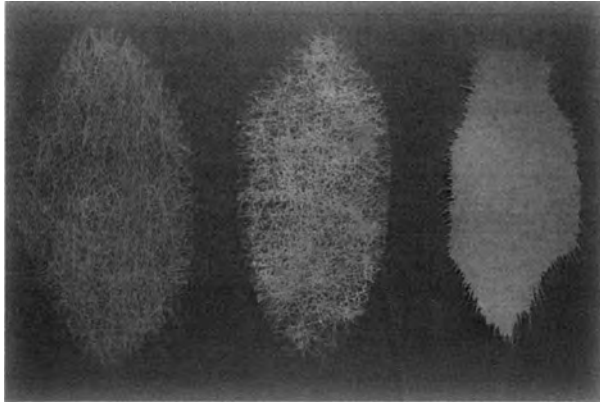


Figure 3. Toned Cerex overlay and Japanese tissue fill.

curatorial staff, was to camouflage the stains by placing a reversible patch over the stained areas, thus disguising them without removing original material. This met with the approval of the Lakota consultants who agreed on the use of either synthetic or natural materials for the overlay.

Layers of acrylic-toned Cerex were stitched together using a fine needle and a thread pulled from Stabiltex to form an overlay on the stains. The holes were compensated for with an acrylic-toned Japanese tissue fill lightly adhered to the back of the Cerex overlay (fig. 3). The overlay was stitched into place over the stain using a fine needle and Stabiltex thread. The overlays are easily removed by simply clipping the stitches. The layers mimic the depth and structure of the fibrous hide surface, successfully obscuring the stains (fig. 4). Fedelia Cross expressed satisfaction with the treatment outcome when she attended the Mall Museum's opening.

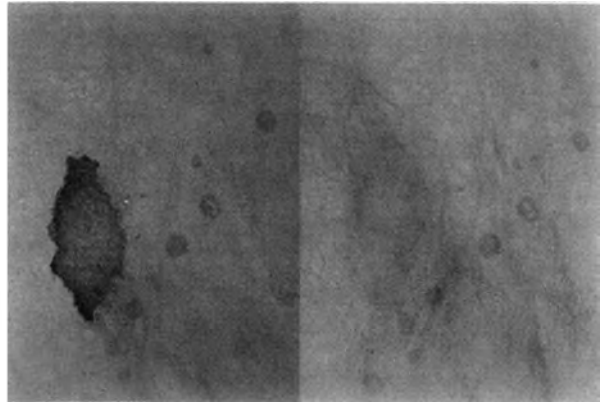


Figure 4. Detail of hole before and after treatment.

5. CASE STUDY TWO: A KWAKWAKA' WAKW HAMSAMŁ MASK

5.1 BACKGROUND AND INTRODUCTION

Barb Cranmer, the Kwakwaka'wakw (1) community curator for a North Pacific Coast exhibit, selected a hamsamŁ raven mask for her community's exhibition.

The hamsamŁ raven mask would have been used in a Hamat'sa dance. In this dance the Hamat'sa initiate, who has come under the influence of Baxwbakwalanuksiwe', the Great-Cannibal-Spirit-at-the-End-of-the-World, is tamed. At one point three avian attendants of Baxwbakwalanuksiwe' enter the dance—Huxkhwk, Crooked Beak, and Cannibal Raven. The masks of the avian attendants have elongated beaks that are built to shudder and produce a thunderous snap while the body and head of the dancer are hidden by a cedar bark skirt (Jonaitis 1991; MacNair et al. 1998).

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Figure 5. Side, detail and back views of the Kwakwaka'wakw hamsam mask.

The hamsam raven mask chosen for this exhibition has fabric edgings, a yarn topper, and a fabric skirt that would have concealed the wearer's head (fig. 5). The use of fabric, while not unique to this mask, is a departure from cedar bark edgings used in both historic and contemporary masks. The yarns and fabric form the basis of this case study.

When Barb Cranmer and William Wasden, a Kwakwaka'wakw artist and singer, first saw the hamsam mask (fig. 6), they recognized the mask as being made by Mungo Martin (2), a revered Kwakwaka'wakw artist. They were concerned that a non-Kwakwaka'wakw hand made the fabric and yarn additions, and they requested that those elements be replaced with cedar bark. They also pre-



Figure 6. Barb Cranmer and William Wasden during the Kwakwaka'wakw consultation.

ferred that the insect-infested eagle feathers be replaced with new feathers. Before proceeding with a treatment, they asked that the mask be examined for evidence of multiple artists and alterations.

5.2 EXAMINING THE HAMSAM MASK

Upon initial examination it appeared that the materials and construction techniques were consistent with a single hand. Though the fabric outlining the edges of the mask may have been replaced and the mask repainted, this could have been part of standard Kwakwaka'wakw practice. It was noted that the yarn topper was a discrete element secured on its own framework, and that the fabric skirt was constructed and attached in the same manner as a cedar bark skirt. These elements could also have easily been replaced during the life of the mask.

The mask was also examined by Peter MacNair, Curator Emeritus in Anthropology at the Royal

British Columbia Museum and an authority on Kwakwaka'wakw culture, who felt that the construction was in keeping with either Mungo Martin or Charlie James, Martin's stepfather and mentor, due to the metal hinges at the base of the mask, the metal rod in the beak for the rigging, and the general sense of haste in the construction and painting. The alternating red and white yarns used to mimic dyed and undyed cedar bark and the fabric skirt were thought to have been done by someone well versed in Kwakwaka'wakw mask-making traditions. Although the mask has not been formally attributed to Martin, the possibility that he created the mask adds another layer of complexity to the project because many contemporary Kwakwaka'wakw artists trace their training back to him.

5.3 OPTIONS FOR TREATMENT

Information gathered from examinations and conversations with experts in Kwakwaka'wakw culture were relayed to the NMAI curatorial team. After several discussions, three options were proposed to Barb Cranmer:

- The mask could be left alone as a work most likely by Martin.
- The existing fabric edging and skirt could be hidden in situ behind a new cedar bark braid and cedar skirt. The insect-eaten feathers could be replaced with new feathers, and the yarns at the top of the mask could be cleaned.
- All of the fabric, yarn, and feather elements could be removed and replaced.

Barb Cranmer consulted with her community and responded that the only acceptable option was the

complete replacement of all of the fabric, yarn, and feather elements. She said that no mask would be danced in the hamsaml mask's current condition. She explained that in the Kwakwaka'wakw tradition each piece would be brought to its best appearance before it would be danced. Masks would be repainted, and cedar bark and feathers would be renewed as needed. For this mask Barb Cranmer's sister, Donna Cranmer, made the cedar bark elements and Kevin Cranmer, a Kwakwaka'wakw artist, traveled to the Cultural Resources Center to collaborate with conservators in renewing the mask.

5.4 MASK RENEWAL

In preparation for working with Kevin Cranmer, the extant materials and construction were documented in the conservation database and digital and 35mm photographs were taken. During the collaboration with the artist, numerous digital images and written notes were taken and added to the consultation notebook. All of the extant yarns, fabric, and feathers were labeled and retained. The consultations and rationale before and during the project were recorded fully in the conservation database.

6. CONCLUSIONS

Recommendations from Native communities vary. For some communities it is unacceptable to represent their culture without the objects appearing complete. For others the perception of damage and possible misinterpretations (i.e. bloodstains) may render an object unusable in the exhibition context. Still others request no conservation intervention,

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including cleaning and stabilization. Documentation is crucial to record the decision-making process whether or not treatment is performed. Consultations have enriched our professional experience and have had a profound effect on the way conservators at NMAI think about and perform their work.

NOTES

1. Formerly known as Kwakiutl.
2. Mungo Martin (c. 1881-1962) was a renowned Kwakwaka'wakw artist who also gained a reputation as a teacher. He worked at the Royal British Columbia Museum's Thunderbird Park, where he restored totem poles and taught other carvers. Many contemporary Kwakwaka'wakw artists can trace their training back to Martin

ACKNOWLEDGEMENTS

Thanks to all of our conservation consultants who graciously and patiently shared their expertise with us, notably Cecelia Fire Thunder, Fedelia Cross, Matilda Montileaux, and Barb Cranmer. To Jenifer Bosworth who performed the testing and treatment on the Lakota dress and produced fantastic documentation, to Peter MacNair who provided guidance throughout the North Pacific Coast exhibit, and to the NMAI Conservation staff, thanks for support and input for these projects and this paper.

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Odegaard, N., S. Carroll, and W.S. Zimmt. 2000. *Material characterization tests for objects of art and archaeology*. London: Archetype Publications.

SOURCES OF MATERIALS

Cerex® (spunbonded nylon)
Conservator's Emporium
100 Standing Rock Circle
Reno, NV 89511
Tel: (702) 852-0404

Golden Artist Colors, Inc.
188 Bell Road
New Berlin, NY 13411-9527
Tel: (800) 959-6543
Fax: (607) 847-6767
goldenart@goldenpaints.com
www.goldenpaints.com

Stabiltex® (sheer plain weave polyester)
Talas

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THE ROLE OF HISTORIC DOCUMENTATION IN A CONTEMPORARY TEXTILE PROJECT

ROBIN M. HANSON

ABSTRACT—Conservation documentation can take many forms. This paper discusses the role that historic documentation, namely turn-of-the-century black-and-white photographs, can play in a contemporary textile project. In the summer of 1995 The White House purchased at an estate sale a silk crazy quilt and pillow sham constructed of fabrics that supposedly were used in White House upholstery projects during the last decade of the 19th century. The quilt and sham had been made by A. E. Kennedy, a Washington, DC merchant who provided a variety of services for The White House, including upholstery, during the years 1893-1904. The quilt and sham had been purchase from a descendent of Mr. Kennedy, therefore the provenance was good. The goal of this project was to relate specific textiles used in the quilt and sham to upholstered furniture documented in historic photographs of The White House, thereby corroborating the provenance. Research focused on the formal rooms of state, particularly the East Room, Green Room, Blue Room, and Red Room. These interiors were photographed frequently, therefore increasing the likelihood that photographs including upholstered furniture might exist. Enlargements of black-and-white photographs of the quilt were used to establish repeats in various fabrics and then compared with historic photographs. Ultimately, four matches were made and are described here.

TITULO—EL ROL DE LA DOCUMENTACION HISTORICA EN UN PROYECTO TEXTIL CONTEMPORANEO. **RESUMEN**—La documentación en la conservación puede tener diferentes formas. En esta ponencia se discute el rol que puede jugar en un proyecto de textiles

contemporáneos la documentación histórica, en este caso fotografías en blanco y negro de fines del siglo XIX y comienzos del XX. En el verano de 1995, la Casa Blanca compró en una subasta estatal un “loco” edredón de seda y una funda de almohada fabricados de telas, que supuestamente fueron usadas en el proyecto de tapizado de la Casa Blanca, durante la última década del siglo XIX. El edredón y la funda fueron hechos por A.E. Kennedy, un comerciante de Washington DC que proveía de una variedad de servicios a la Casa Blanca, incluyendo tapicerías, durante los años 1893 a 1904. El edredón y la funda habían sido comprados a un descendiente del señor Kennedy, por lo tanto, la proveniencia era segura. El objetivo de este proyecto fue relacionar textiles específicos usados en el edredón y la funda para tapizar el amoblado, documentados en fotografías históricas de la Casa Blanca, y de esta manera, corroborar su proveniencia. La investigación se concentró en las antiguas habitaciones de la Casa, la Sala Este, la Sala Verde, la Sala Azul y la Sala Roja. Como estos interiores fueron fotografiados con frecuencia, se incrementa la probabilidad de que puedan existir fotografías que incluyan amoblados tapizados de este tipo. Se usaron ampliaciones de fotografías en blanco y negro del edredón para establecer las repeticiones en varios géneros y compararlas con las fotografías históricas. Al final, cuatro coincidencias fueron registradas y son descritas aquí.

1. INTRODUCTION

This paper, presented in Minneapolis, Minnesota in June 2005, describes a project involving two textiles in the collection of The White House. White

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Figure 1. Silk crazy quilt in the collection of The White House, object number 995.1747.1

House object number 995.1747.1 is a silk crazy quilt, a quilt style popular in America during the late 19th and early 20th centuries (fig. 1). The quilt is constructed of upholstery fabrics, at least some of which were used in White House upholstery projects during the last decade of the 19th century. As such, the object provides an invaluable record of late 19th century furnishing textiles, the taste of the day, and textile manufacturing technology. The textiles used throughout the quilt are, by any standard, sumptuous fabrics.

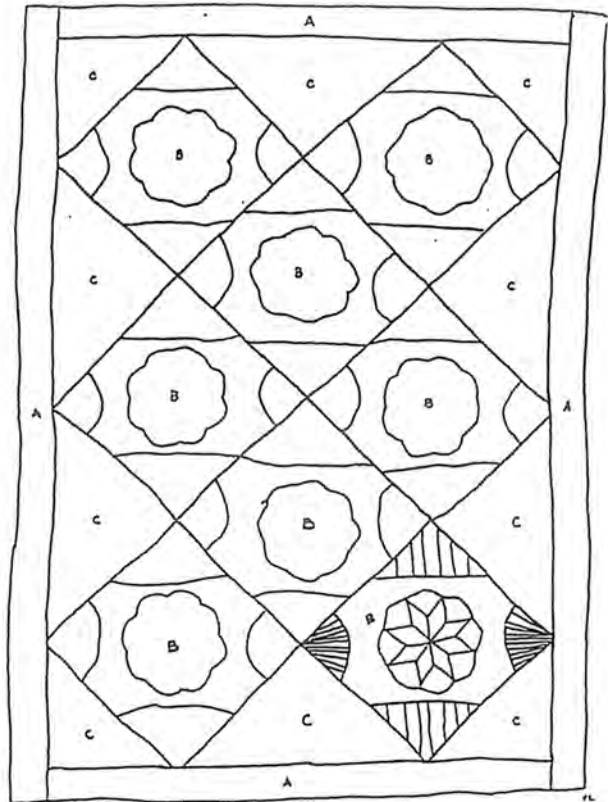


Figure 2. Line drawing of silk crazy quilt, showing pattern.

The quilt was made by A.E. Kennedy, a Washington, DC merchant who provided a variety of services for The White House, including upholstery, during the years 1893-1904 (1). In 1897, Mr. Kennedy had a shop at 1704 G Street, N.W. and by mid-1900 had relocated to 1016 Connecticut Avenue, N.W. During the years that he worked for The White House, four presidential administrations came and went, beginning with Benjamin Harrison, in office from 1889 to 1893. Grover Cleveland was in office from 1893-1897, William McKinley from 1897 to the time he was assassi-

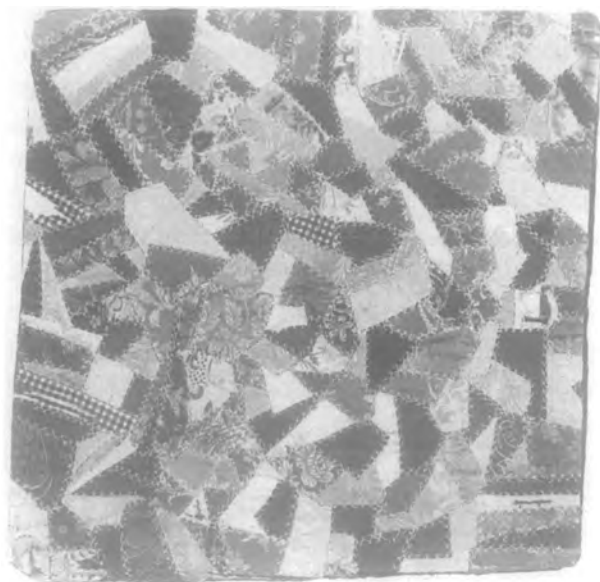


Figure 3. Front face of silk pillow sham in the collection of The White House, object number 995.1747.2.

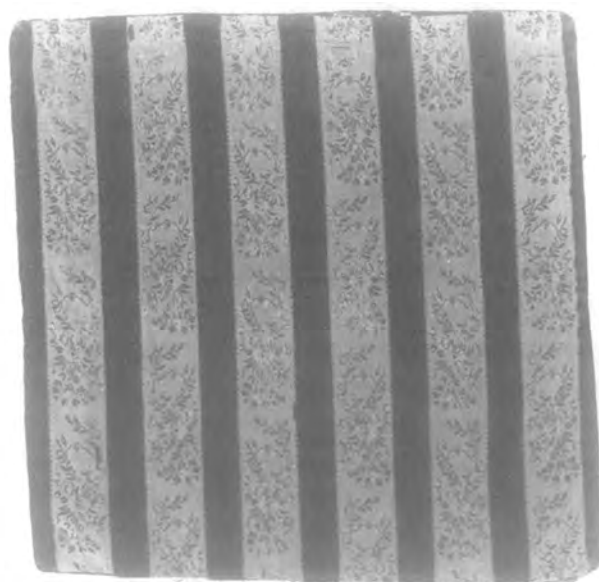


Figure 4. Back face of silk pillow sham in the collection of The White House, object number 995.1747.2.

nated in 1901 at the beginning of his second term, and Theodore Roosevelt from 1901-1909.

There is a regular pattern to the central section of the quilt that consists of eight complete diamond shapes, each containing fan motifs in the east and west corners, an eight-pointed star (the Purple Cross motif) in the center (labeled B on figure 2), and triangles in the north and south corners. The remaining partial diamonds that complete the central section (labeled C on figure 2) appear to be random in design. Each of the patches is outlined with a feather stitch (Moss 1984). Several of the large patches have been bisected by an additional line of this same decorative stitching. Stitching used to outline individual patches usually has no structural function in a crazy quilt, but rather is

decorative. In this object it is a structural element in some places and a decorative element in others. The quilt is comprised of 907 pieces. Between 80 and 90 different textiles have been used, including velvets in green, brown, royal blue, gold, burgundy, wine, purple, and champagne, among other colors, as well as brocades, brocatelles, lampas, satins, and damasks. The object is 229.2cm (90-1/4") long and 166cm (65-3/8") wide.

Accompanying the quilt is a pillow sham, White House object number 995.1748.1, that measures 48.3 x 49.5cm (19 x 19-1/2") (figs. 3, 4). Both were purchased in the summer of 1995 in Frederick, Maryland at an estate sale of a descendent of A.E. Kennedy. Neither were signed or dated.

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2. HISTORICAL CONTEXT

Crazy patchwork originated in America about 1880. Crazy quilts became a fad during the 1880s and the 1890s; their creation was a fashionable, not a rural, tradition. Brackman (1989) contends that crazy quilts can be dated in part by their color schemes—early silk quilts were lighter in color than later silk quilts; black was a popular color in the late 19th century. The White House's quilt seems to fit within this time frame. It includes many of the noted characteristic features and reflects Victorian sensibilities in its use of a variety of rich textiles as well as "the Victorian penchant for covering any unadorned straight line" (Brackman 1989, p. 109).

The late 19th century was a time of great change in the United States. The 1880s heralded the arrival of the Gilded Age. By the gay nineties, the time period in which this quilt was created, America was at the height of the Gilded Age. The preference for French furnishings was firmly established among the wealthy in America, and "Americans ordered furnishing silks in a manner once characteristic only of princes" (Schoeser and Dejardin 1991, p.139).

At the same time, major events in American political history occurred that helped shape textile manufacturing. While a tariff imposed in 1882 added 60 percent to the cost of imported silks, affluent Americans remained faithful in their preference for French silks (Schoeser and Dejardin 1991). Protective tariffs on foreign goods, conceived to protect business and labor from foreign imports, were again imposed by the McKinley Act of 1890

(2) during the early years of the Harrison administration. An increase in inflation during the later years of the Harrison administration turned public sentiment against these protective tariffs and resulted in Cleveland being reelected to a second term in 1893. During his campaign Cleveland specifically ran on an anti-tariff platform. Higher tariffs, enacted by McKinley in 1897, resulted in America looking to produce materials at home rather than continuing to rely on European imports. As a result, the manufacture of opulent textiles in America burgeoned.

In 1874, the value of textiles imported from France to America was \$50 million. By 1880, the Germans and Swiss had captured 25 percent of the American import market, France 50 percent, and the British the remaining 25 percent. Manchester, England was the hub of European textile exports (Schoeser and Dejardin 1991, p.141). After the Franco-Prussian war, popular textiles were similar to those of the Second Empire (3) and included velvet, plush, moquette (cut velvet carpeting having a warp pile that is printed with a pattern before being woven) (Androsko 1990), tapestry, and damask.

Major players in the supply of decorative furnishing fabrics to America's wealthy in the late 19th century included Cheney Brothers, Brunswick and Fils, and F. Schumacher & Co. (4). Cheney Brothers Silk Manufacturers was the first textile weaver established in the United States, in 1837, with factories in South Manchester, Connecticut and a sales office on Fourth Avenue at 18th Street in New York (Manchester 1916). Cheney Brothers epitomized the silk industry in America, from ser-

iculture to manufacture. They rapidly became the foremost silk velvet weavers in America, remaining in business until 1955 at which time they were bought by J.P. Stevens (Voorsanger 1986).

While it was not until 1926 that Brunschwig transferred its business to New York, Schumacher opened an American mill in Paterson, New Jersey in 1895, and began manufacturing sumptuous textiles in the United States, in addition to importing French cloth. Schumacher was founded in New York City in 1889, at Broadway and 22nd Street, as an import house of fine European textiles. The McKinley Act of 1890 and the panic of 1893 caused the company to look to America for resources, hence the opening of a mill on American soil. While the products from this mill were but a minor part of the company's total line, Schumacher soon was able to produce fabrics indistinguishable from their imports, including lampas, brocatelles, and damasks.

Between 1860 and 1880, Paterson, New Jersey doubled in size and became known as the "Lyon of America" or "Silk City." The city was home to a large population of French immigrant weavers, many from Lyon, France, who brought with them their craft (Slavin 1992). Along with Manchester, Connecticut, Paterson, New Jersey was the most important center of the silk weaving industry in America.

3. THE WHITE HOUSE

With the types of fabrics manufactured at this time understood, the investigation turned towards relating the specific textiles in the quilt to fabrics in The

White House. Research focused on the formal rooms of state on the first floor of The White House, particularly the East Room, Green Room, Blue Room, and Red Room. The interiors of the formal rooms of state were photographed frequently, thereby increasing the likelihood that photographs including upholstered furniture might exist.

Through the use of enlargements of black-and-white negatives, it was possible to establish repeats by cutting similar patches from photographs and piecing them together like puzzle pieces (a manual version of Adobe Photoshop). This step provided information for the research phase of the project, when historic photographs were examined.

3.1 THE EAST ROOM

Although envisioned by the architect as a levee room, the East Room—the largest of the formal rooms of state and occupying the entire east end of The White House—instead functioned as a grand salon. According to an inscription on a historic photograph, in 1873 the ceiling of the East Room was divided by girders into three panels and the room decorated in white and gold. Based on visual evidence, the general structure of the room remained constant until the turn of the century. Photographs from 1890, during the Harrison administration, show a room with furniture upholstered in a dark pile textile, presumably velvet. The furniture was very Victorian, with elaborate fringe or passementerie.

Although it was not possible to positively match the velvet textiles in these photographs to those that appear frequently in the quilt, clearly velvet

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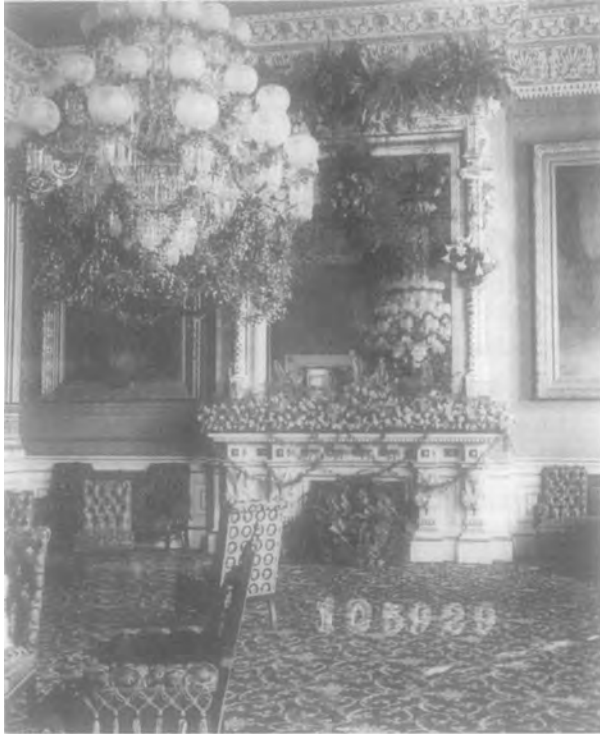


Figure 5. East Room, The White House, 1902.

was commonly used for upholstery fabric. Period photographs reveal a large round ottoman in the center of the room and side chairs along the walls; all are upholstered in the same dark velvet. Elaborate ornamentation in the form of long fringe is in evidence around the bottoms of some of the side chairs as well as the ottoman.

By 1902, during the Roosevelt administration, the room has an exotic feel. Large potted palms and ferns, interspersed with seating furniture, line the walls. Only a small section of this enormous room is revealed in figure 5. In the foreground is an upholstered armchair, in profile, with elaborate

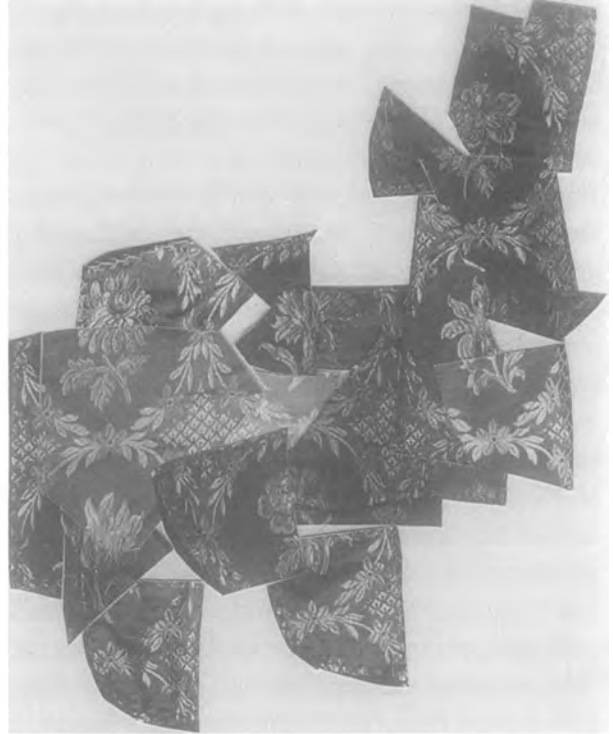


Figure 6. Repeat established of textile used in quilt and seen in East Room upholstered chairs.

fringe. From the armrest it is possible to identify this textile as one used in the quilt, a compound weave with a 4/1 satin ground in gold and with wefts in pale yellow and white. The design comprises exotic flowers (5) appearing as “medallions” surrounded by interlocking circular garlands of small flowers such as forget-me-nots (6) and diamonds. Because historic documentation indicated the room was decorated in gold and white, it is not illogical that the textiles used in the room were gold. The repeat was established by cutting similar patches from detail photographs of the quilt and pasting them together (fig. 6).



Figure 7. Green Room, The White House, 1893.

3.2 THE GREEN ROOM

The Green Room is a small room located along the south side of the building, between the East Room and the Blue Room. Used as a music room during the Cleveland administration, the Green Room was described at the time as being “furnished tastefully in pale green plush” (Johnston 1893). A pair of large vases flank the fireplace, a textile covers the mantel, a portrait of Martin Van Buren hangs on the wall, and an elaborate lighting device is suspended from the ceiling. Photographs from the 1870s, during the Garfield Administration, show a room decorated with patterned wallpaper, patterned carpet, and chairs upholstered in a light colored textile like that created by a cut and voided velvet. A table in the center of the room is draped with a paisley cloth. Fringe is in evidence everywhere.

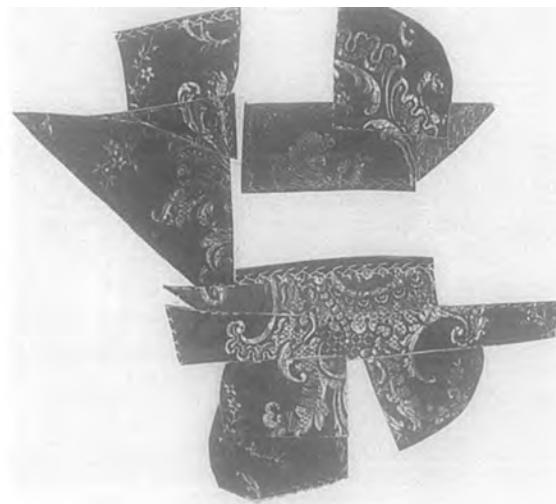


Figure 8. Repeat established of textile used in quilt and seen in East Room upholstered seating furniture.

In a photograph dated 1893, at the end of the Harrison administration, the vases and chandelier are still present and a large piece of upholstered seating furniture in the center of the room is covered in a lavish textile (fig. 7). Known as an *indiscret* (a Second Empire period couch with three separate seating places all fixed on a central axis), this furniture was described as being “typical of conversational seating fashionable during the Second Empire” (Schoeser 1991, p.130). While the color of the textile in which the *indiscret* is upholstered cannot be determined from the black-and-white photograph, it is not unreasonable to presume that it was green. It is possible to identify this textile as another one used in the quilt, a compound weave with a satin ground in green and with wefts in white and gold. This repeat was established in the same manner as the previous one; results can be seen in figure 8.

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Figure 9. Red Room, The White House, 1893.



Figure 10. Detail of chair seen in Red Room photograph dated 1893.

3.3 THE RED ROOM

Adjacent to the State Dining Room, the Red Room (fig. 9) traditionally was used by first ladies as a reception room. Photographs taken in the summer of 1893, during the second Cleveland administration, reveal a very Victorian era room. Large vases flank the fireplace, pictures hang salon style, and the massive wood chairs are sumptuously upholstered and finished with elaborate passementerie. The chairs (fig. 10) are upholstered in yet another textile found in the quilt, a compound weave with a 4/1 satin ground in red and with wefts in red and white (fig. 11).

Of particular interest is a contemporary description of the upholstery fabric. It was characterized as a “silk-like fabric with palmette-like medallions interspersed with small diamonds.” The small diamonds have been used as a design element in the

quilt; several of the Purple Cross motifs in the center section contain alternating pieces of this red textile with its small white diamond and a velvet.



Figure 11. Repeat established of textile used in quilt and seen in Red Room upholstered chairs.



Figure 12. Undated photograph of Mrs. McKinley from Esther Singleton's 1907 book on The White House.

In addition, since this research was completed, a fourth match was made using a photograph in Esther Singleton's 1907 book on The White House. In this undated photograph, Mrs. McKinley is seated in an upholstered chair, the textile used is seen on the back of the sham (figs. 12, 4).

4. CONCLUSIONS

Invaluable information about this quilt was obtained from the object itself. This project con-

tributed to the understanding of the quilt's history and of late 19th century furnishing fabrics. Turn-of-the-century black-and-white photographs were key to the project's success.

Several factors contributed to a positive identification in only three cases. Because color photography did not enjoy widespread use until the mid-20th century, historic photographs are black-and-white. In the late 19th century, photography was still in its infancy. Lighting was primitive. Photographs from inside a room facing towards the window could not be taken, therefore no draperies appear which would provide a large expanse of textile to aid in identification. By necessity, photographers had to have their backs to windows and shoot into a room. While many of these photographs are high quality and the images sharp, some are slightly out of focus, making identification problematic since the textile areas are small to begin with.

Patterned textiles were necessary to match small pieces of textiles in the quilt to specific textiles used on White House furnishings, since no color clues were available. Finally, the objective of the turn-of-the-century photographers documenting these interiors spaces was not to visually document the textile, knowing that in the late 20th century a researcher would come along wanting to identify them. Their goal was to provide America with a vision of the grand house.

NOTES

1. In the 1940s, a National Park Service employee went through records at the National Archives and

THE ROLE OF HISTORIC DOCUMENTATION IN A CONTEMPORARY TEXTILE PROJECT

copied transactions, including invoices, between local merchants and The White House. From these records, A.E. Kennedy can be linked to specific White House projects between the years 1893 and 1904.

2. McKinley was a congressman during the Harrison administration and chief architect of the tariff.

3. The Second Empire of Napoleon III, the years 1852-1870, was followed by the Franco-Prussian war of 1870-1871.

4. Scalamandré has only been in existence since 1929, having celebrated their 60th anniversary in 1989.

5. During the Victorian era, people were familiar with the language of flowers. The species depicted in this textile were, by any definition, exotic and foreign. They were not wild but rather cultivated, primarily from bulbs not originally found in the West but imported from Japan and Egypt. Included are parrot tulips, double or triple carnations, chrysanthemums, and lilies, among others.

6. Forget-me-nots commonly were regarded as an emblem of constancy and friendship. In the Victorian era, the symbolism attached to specific flowers would have been widely understood.

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CONSERVATION TRAINING ON THREE CONTINENTS: ONE STUDENT'S EXPOSURE TO DIFFERENT TREATMENT AND DOCUMENTATION PRACTICES

YADIN LAROCLETTE

ABSTRACT—In 2003-2004, the author held internships at four institutions: one in Scotland at the National Museums of Scotland in Edinburgh; two in Santiago, Chile, at the Fashion and Textile Museum and the National Museum of History; and one in the United States at the Los Angeles County Museum of Art in California. The internships fulfilled the third year curriculum in the Winterthur/University of Delaware Program in Art Conservation.

This paper presents an international perspective of four different approaches to treatment and documentation of costume and textile collections, and covers the global trend towards digital collections management systems.

TITULO—ENTRENAMIENTO EN CONSERVACIÓN EN TRES CONTINENTES: LA EXPOSICIÓN A DIFERENTES APROXIMACIONES DOCUMENTALES. **RESUMEN**—Durante los años 2003 y 2004, la autora estuvo realizando becas de pasantías en Europa, en Norte y Sudamérica: en el National Museums of Scotland, en Edimburgo, en el Los Angeles County Museum of Art, en California, EEUU, en el Museo de la Moda y Textil y Museo Histórico Nacional, ambos en Santiago, Chile. Las pasantías completaban el tercer año del currículo del Programa de Conservación en Arte de la Winterthur University of Delaware. Esta ponencia presenta una perspectiva internacional acerca de cuatro aproximaciones distintas de tratamiento y conservación de colecciones textiles y de vestuario. Cubre, además, las tendencias globales acerca de los sistemas digitales de manejo de colecciones.

1. INTRODUCTION

Most conservation training programs require or strongly advise students to conduct internships outside of their educational institution. The Winterthur/University of Delaware Program in Art Conservation requires two summer internships and one 10-month internship during the third and final year of studies. The first summer internship is intended as an introduction to working with institutions and aids the student to determine their specialty. By the second summer and third year internship the student is expected to take on more challenging conservation projects. Therefore, an advisory committee made up of Winterthur faculty and staff helps the student plan this internship year and facilitates the application process.

Traditionally, students spend 8 to 12 weeks in one institution for their summer internships and then move on to spend 10 to 11 months at one venue for their third year. Program director Debbie Hess Norris has worked tirelessly to make additional funds available to students for travel and research, and many have chosen to apply these funds towards interning abroad for the summer portions of their internships. Until recently, very few students have had placements in more than two institutions for their third year. I spent that year, between 2003 and 2004, at four sites on three different continents. This paper, presented in Minneapolis, Minnesota in June 2005, discusses what we as students seek in internships and the benefits gained from them. It then describes each of the four places I interned and how they helped me attain the desired goals. It is important to note that I am not unique in traveling to various intern-

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ship sites in order to fulfill my internship objectives as defined in the Winterthur Program Curriculum goals.

2. PURPOSE OF INTERNSHIPS

According to the goals set in the Winterthur curriculum, the purpose of the internship is to gain practical experience. The aims include: broadening the student's exposure to specialty object problems and treatments, refining hand skills, building confidence in object assessment and decision making, improving report-writing skills, and developing responsible professionalism.

Keeping Winterthur's goals in mind, I began defining my own objectives. Some of these were straightforward, such as refining my hand skills and improving my ability to write reports. Other goals were more nebulous; developing responsible professionalism covers a broad range of issues. Examples included learning to evaluate and solve complex problems and working and communicating with diverse personalities in a variety of disciplines. The underlying emphasis was that we want to make ourselves as marketable as possible. It used to be that one would often grow into a position where they initially interned. Today, full-time positions are becoming harder and harder to come by, and museums are contracting conservators for specific projects. Getting to know as many people as possible in the field can greatly enhance one's potential to find work upon graduation.

3. THE FOUR INTERNSHIP SITES

Rather than divide the year into one summer and one 10-month internship, I broke my third year

program up into four parts. I spent four months in Edinburgh at the National Museums of Scotland and two months in Santiago, Chile at two different venues, the privately funded Textile and Fashion Museum, which is due to open next year, and the Chilean government's Museum of National History. I then returned to California to spend the last six months at the Los Angeles County Museum of Art.

Working with conservators trained in different traditions and cultures allowed me to gain a broad perspective of the textile conservation field. I had the opportunity to be exposed to various treatment methodologies and documentation practices and databases.

3.1 NATIONAL MUSEUMS OF SCOTLAND

The National Museums of Scotland (NMS) consists of six different museums, four in Edinburgh and two in rural areas, all with very diverse collections. The textile conservation lab, where I conducted most of my work, is within the Museum of Scotland and Royal Museum complex a few blocks from Edinburgh Castle. Of the 3 million objects in the NMS collection, approximately 17,000 are textiles and/or costumes. The textile conservation lab is headed by Lynn McClean and currently staffed with two part-time conservators. The conservation staff is responsible for the conservation of the textiles at all six museums. The lab was a very stimulating environment to work in, with the sharing of multi-disciplinary ideas and treatment strategies.

I worked on a number of textiles during my internship, including 18th and 19th century Native

American costume for an exhibit on the Scots' influence on Canada's First Peoples. One of the things that struck me in Scotland was how relative "age" is. Treatment of 15th and 16th century textiles is relatively routine, while in the U.S. treating anything more than 200 years old is quite rare. This age differential and associated level of deterioration can often affect treatment protocol. For example adhesives, although always considered a last resort, are often incorporated into treatment strategies. The lab has also developed large pressure mounts for banners, some of which include wells for tassels and other three dimensional elements. I learned a lot about what a textile can withstand during wet-cleaning as well; pieces that I thought would disintegrate when submerged in water survived splendidly.

The level of documentation at NMS is dependent on the level of the treatment. The lab produces hard copy reports for in-depth treatments such as on banners and other large projects. Short or minor treatments are entered into a database called Q&A. Digital documentation at NMS is going through a transition. The Q&A program is so old that it is no longer supported by the museum's information technology network and only one personal computer in the entire museum is running it. The museum has a separate database for collections management called AdLib. Several members of the conservation department have been working with the AdLib programmers over the last few years to develop a conservation module. Jane Clark, an objects conservator at the museum, presented a paper on this development at the 2002 ICOM meeting in Rio de Janeiro (Clark 2002).

3.2 MUSEO DE LA MODA Y TEXTIL

After spending four months on the Scottish moors in the northern hemisphere, I traveled to the foot of the Andes in the southern hemisphere, to Chile's capital city of Santiago. The first of my two internships in Santiago was at the Museo de la Moda y Textil (Fashion and Textile Museum). Development of this museum began in 1999 and the museum is due to open in September 2006. The museum was founded by Jorge Yarur Bascuñan, whose family is well established in Santiago. His Palestinian grandfather founded the Manufactura Machasa textile mill in 1937 and Mr. Yarur's goal for the museum is to maintain his family's legacy in the textile industry and form an educational center for the study and research of Western fashion. The museum's aims are to illustrate the history of Western fashion, be a foundation of specialized knowledge, and have a state-of-the-art textile conservation center.

There were approximately 600 objects in the collection when the museum project began. Mr. Yarur has been collecting actively in the last six years and today there are approximately 7,000 artifacts, ranging from early sportswear and equipment to Madonna bodices. The conservation facility is headed by Nathalie Hatala, who had trained in Paris at the Institute for the Formation of Restorers of Works of Art (IFROA). There are four other employees within the conservation department, which include a restorer/conservator, a preventive conservator, and two technicians.

My assignment during this one-month internship was split in two parts. The first was to determine

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how much fabric was missing from an 18th century European dress. Prior to acquisition, the dress had been altered to be part of a 19th century ensemble. In addition, the skirt had been taken apart prior to being acquired. The second involved replicating the fabric design with silk-screening. Helen Kapodistrias discussed a treatment employing a silk screening technique at last year's Textile Specialty Group meeting (Kapodistrias 2004).

After doing extensive historical research and carefully examining the cuts of the extant fabric, the previous stitching lines, and the creases from previous folds, I concluded that more than half the skirt fabric was missing. Restoring the dress utilizing more reproduction fabric than original fabric would not provide an accurate representation or the type of aesthetic value the museum was seeking. I advised the museum's founder, Mr. Yarur, that restoring the costume would not be appropriate, and he agreed. Mr. Yarur works directly with the restorers and conservators on site, and is involved in each phase of treatment.

All of the research I did for this dress was stored in hard copy, as is all the conservation documentation at the museum. In terms of collections management, the registration department uses the SUR database (Sistema Unificado de Registro or Unified Registrar Systems). This system was first implemented by Chile's national Direction of Libraries, Archives and Museums (DIBAM).

3.3 THE MUSEO HISTORICO NACIONAL

My second internship in Santiago was in the heart of the city, at the National Museum of History. The

museum is run by the DIBAM, which runs 27 other museums throughout Chile. The textile lab at the National Museum of History was the first conservation lab to be set up, in 1980, and has remained at its original location. All of DIBAM's other conservation labs are located at a separate site.

The textile collection at the National Museum of History includes a variety of cultural material related to the history of Chile as a nation. The museum staff is small in comparison to the rigorous exhibition schedule, and textile conservators Fanny Espinoza and Isabel Alvarado also often act as textile curators and registrars. They are both extremely motivated, working with a shoe-string budget. While working tirelessly on their own museum's collections, they are also very active within Chile's conservation community.

My assignment during this internship involved a challenging conservation problem: the red silk fabric on an important flag was disintegrating. The flag had witnessed the signing of Chile's independence in 1817 and was stolen while on display at the museum in 1980 by the "extreme leftist" political group MIR (Movimiento de Izquierda Revolucionario). The flag was returned to the museum a few weeks prior to my arrival, in December of 2003. The return of the flag was heavily publicized and was very charged politically. One of the group's stipulations upon returning the flag was that it be exhibited in the near future. Though the flag had been well cared for during the interim 23 years, it was in need of conservation to be safely exhibited. My assignment was to thoroughly examine the flag, determine its condition

and develop a treatment plan. The lab is currently seeking funding for treatment.

In terms of documentation, Isabel and Fanny have developed their own card catalog system, which they are currently updating. The collections management database that is used by the registrars is SUR. Although a registrar is actively inputting data into the SUR database, conservation is not currently integrated into the system.

3.4 THE LOS ANGELES COUNTY MUSEUM OF ART

The Los Angeles County Museum of Art (LACMA) was my fourth and last internship. LACMA's Conservation Center was established in 1967 and is one of the oldest conservation centers in the western United States. Including interns, the Conservation Center staff numbers approximately 20 people in paintings, paper, objects, textiles, and analytical research.

LACMA's textile department is responsible for approximately 25,000 textiles, an encyclopedic collection ranging from ancient to historic decorative fabrics, tapestries, costumes, and contemporary fiber arts from all over the world. The textile conservation lab is largely exhibition driven, with the pace being set by temporary exhibits in the museum's textile gallery and light-sensitive rotations in the four main buildings housing the permanent collections. The textile conservation lab consists of two full-time conservators. Catherine McLean is the head and Susan Schmalz is the associate conservator.

The lab's philosophy is to be the least interventive as possible when developing treatment protocols. Textiles are very rarely wet-cleaned, and pinning is the first option considered when determining a mounting system. I worked on a textile that due to its fragility and importance merited its own permanent mount. This 17th to 18th century Italian voided velvet, which contains seven different colors, is an extremely rare example for both its age and color variety. It was scheduled to go on display in an exhibit titled *Luxury Textiles East and West: Opulent Interiors*. The velvet had suffered water damage in the past, was very brittle in some areas, and had tears and losses in the satin foundation. I chose to support the weakest areas exhibiting tears and losses with a cotton plain-weave lining stitched on the reverse, while leaving as much of the back exposed as possible for future study. Friable areas were stabilized with laid and couched stitches. The treatment took four months.

One of the benefits of working with a large staff such as LACMA's is the sharing of ideas and brain-storming with other disciplines and departments. An example of this collaboration was working with the art prep and installation team to fabricate a permanent mount for the velvet. A custom passive over-mat was designed to hide the frayed edges of the velvet without crushing the pile, allowing for the safe exhibition and handling of the textile.

In terms of documentation, the textile conservation lab currently generates a hard copy report for every treatment that goes through the lab, and basic treatment information is later entered into a collections

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management database system called MultiMIMSY 2000, designed by Willoughby.

4. CONCLUSIONS

Working on Native American costume in Scotland, European fashion in South America, and European decorative arts in Los Angeles made me realize just how interconnected we are in this field. Time and space merged in many ways for me during that very busy year. I found that each place I worked in grappled with some of the same issues, such as merging documentation into the digital world.

I was able to learn from British, French, and North and South American trained conservators on a wide variety of textiles from different cultures and periods in history. I was exposed to different materials and different ways of thinking about treatments and I have gained a cultural and professional awareness that has made me a better conservator. I feel better prepared for future projects, may they be here in the U.S. or abroad.

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THE SEMINAR WORKSHOP AS AN EDUCATIONAL MODEL: TEACHING TEXTILE CONSERVATION AT THE ESCUELA NACIONAL DE CONSERVACIÓN, RESTAURACIÓN Y MUSEOGRAFÍA

ROSA LORENA ROMÁN TORRES AND ABNER GUTIÉRREZ RAMOS

ABSTRACT—Since 1993, the National School of Conservation, Restoration and Museography (ENCRyM) in Mexico City has offered an optional seminar workshop in textile restoration. The seminar, offered during the last semester of studies, is part of the curriculum for achieving a bachelor's degree in Restoration of Cultural Heritage. The objective of the seminar workshop is to train professionals to understand and value textile cultural patrimony. Training also includes developing skills to propose, design, and execute ethical, critical, and creative conservation and restoration treatments based on scientific research. The seminar workshop model has proven to be a successful educational experience and the textile restoration seminar workshop is now a required component of the Restoration of Cultural Heritage curricula. The workshop is now offered in the second year.

The objective of this paper is to share with the international community the history of the textile restoration seminar workshop and the teaching and learning strategies of the seminar's instructors.

TÍTULO—EL SEMINARIO-TALLER COMO MODELO EDUCACIONAL PARA LA ENSEÑANZA DE LA CONSERVACIÓN Y RESTAURACIÓN TEXTIL: ESCUELA NACIONAL DE CONSERVACIÓN, RESTAURACIÓN Y MUSEOGRAFÍA “MANUEL DEL CASTILLO NEGRETE.” **RESUMEN**—Desde 1993, la Escuela Nacional de Conservación, Restauración y Museografía de la ciudad de México, ofrece un seminario-taller optativo en restauración textil. El Taller compartido durante el último semestre de estudios, forma parte del currículo para obtener el grado de Licenciado en Restauración del

Patrimonio Cultural. El objetivo de este Taller es entrenar profesionales en la comprensión y valorización del patrimonio cultural textil. El programa incluye también el desarrollo de aptitudes para proponer, diseñar y ejecutar tratamientos creativos de conservación y restauración basados en la investigación científica. El modelo de este seminario-taller ha probado ser muy exitoso como experiencia educacional. Hoy en día el taller de restauración textil es un requerimiento del currículo de Restauración de Patrimonio Cultural, ofrecido durante el segundo año de estudio de la carrera.

El objetivo de esta ponencia es compartir con la comunidad internacional la historia de trabajo de este seminario de Restauración Textil y compartir las estrategias de enseñanza y aprendizaje de los instructores del Seminario.

1. INTRODUCTION

Restoration is a professional discipline that requires one to conceptualize, identify, preserve, conserve, and recover the testimonial, artistic, and functional qualities of tangible cultural assets through practical and theoretical interventions. These actions are based on recognition, rescue, value, and safekeeping of material evidence, giving stability, restituting unity, and reestablishing cultural context. The discipline of restoration can be defined as the professional intervention devoted to rescue the material and maintain its asset as cultural heritage.

The main challenge of the conservator is to carry out the necessary actions to delay the time induced

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deterioration of material culture. It is we, conservators and restorers, who bear responsibility for interventions on unique and irreplaceable textiles. That is our challenge, our privilege (fig. 1).

In training conservators, the interrelation between rescuing, placing within historical context, and maintaining original intention represents a fundamental part of an educational process that aims to protect and conserve any manifestation produced by a social group represented in a specific cultural moment.

From the above, we understand that the assets addressed as cultural heritage of a nation are in the end teaching objects, because it is through interdisciplinary research that we learn from these objects and recover them as testimony augmenting a collective memory. In this way, restoration becomes a fundamental tool for historic tasks. The bachelor's degree offered at the Escuela Nacional de Conservación, Restauración y Museografía (ENCRyM) serves to meet these challenges through a comprehensive interdisciplinary



Figure 1. As conservators, it is our challenge and privilege to intervene on behalf of unique and irreplaceable textiles.

approach to its curriculum, discussed in this paper, and presented in Minneapolis, Minnesota in June 2005. This is similar to programs at Winterthur/University of Delaware, Buffalo State College, and New York University in the United States.

The bachelor's degree is divided in four axis: fundamental theoretical methodology, scientific experimental methods, anthropological and historical aesthetics and techniques, and established academic principles. The students are obligated to complete seven workshops: ceramics, metals, textiles, paper, sculpture, paintings, and mural painting. In addition, the students choose one more workshop in either musical instruments, photography, plastics, or modern art. They also must take courses on subjects like restoration theory, applied science, anthropology and history, photography, reintegration techniques, polymers and solvents, inorganic and organic materials, collection conservation, adhesives, and archeological materials.

A need for conservation methodology as it applies to textiles was established. In previous years, students have had the option of taking the textile seminar workshop during their final term along with other required courses: examination and evaluation methods (laboratory), history of cultural objects, storage methods, weaving and dyeing.

2. SEMINAR WORKSHOP

2.1 HISTORY OF THE SEMINAR WORKSHOP AT ENCRyM

At the beginning of the 1990s, the seminar workshop became the educational model in the

ENCryM. The seminar workshop was born out of the need to teach conservation methodology as it applies to specific media. Every seminar workshop in the school was structured by a group of professionals who, in an interdisciplinary way, led the students in historic research, study of physical, chemical and biological materials, as well as the physical material (painting, sculpture, graphic documents, pottery, textile, etc.). The study of material deterioration mechanisms and restoration methodologies led the students toward resolving conservation and restoration problems with a scientific and interdisciplinary approach.

2.2 THE TEXTILE SEMINAR WORKSHOP

The textile seminar workshop's goal is to establish a clear understanding of the principles of conservation as they relate to textiles. Emphasis on the roles textiles play in the cultural heritage of a society is always considered to better inform the course of treatment. Attention is paid to issues such as deterioration, treatment reversibility, and the use of archival materials. By the end of the course, the goal is for the student to understand and recognize textiles as cultural heritage, and to propose, design, and execute conservation and restoration with an integral scientific character (fig. 2).

During the textile seminar workshop, the student is assigned one textile for purposes of study during the course. The textile the student will use is chosen for the student based on the academic program. We emphasize that we work with original objects throughout the entire educational process. Students are taught to respect each object and



Figure 2. As part of the seminar workshop, students learn to treat textiles ranging from archaeological (as shown here) to modern.

accept the responsibility that working with irreplaceable and unique materials implies (fig. 3).

3. THE TEXTILE SEMINAR WORKSHOP CURRICULUM

3.1 DOCUMENTATION

A graphic record of all work is kept, which guarantees documentation before, during, and after intervention. The textile is situated in its historical context, original and current environments, and its function and cultural meaning are defined through historical research. It is at this moment that the textile becomes a cultural reference.

3.2 STRUCTURAL ANALYSIS

From a technological point of view, manual and cognitive abilities are developed, such as identification and execution of textile manufacture techniques, for a better understanding of the textile's makeup and to justify intervention (fig. 4).

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Figure 3. A student treating a textile.

3.2 TECHNICAL ANALYSIS

From a chemical point of view, the constituent materials of the textile are studied and identified. Their physical and chemical characteristics and the causes of deterioration are analyzed in order to justify a proposal for intervention.

The raw materials, fibers and natural dyes are characterized using spot-tests based on chemical reactions. We study the reaction and determine the degree of alteration through observation under an optical microscope with different techniques to evaluate and justify intervention.

During the teaching-learning process, the teacher and student restorers, observe, examine and ana-

lyze the textile as a study object and identify specific problems, using scientific methodology and analytical equipment such as microscopes, accelerated mass spectrometry (AMS) and particle induced x-ray emission (PIXE). In this way we can understand the present deterioration mechanisms and propose, design, and execute intervention that will reunite and stabilize the integrity of the textile in its historical context.

3.3 SEMINAR DISCUSSIONS AND STUDENT EVALUATION

As part of the teaching-learning strategies, each teacher gives and directs the topics of their area. The teaching of restoration relies on direct research on the textile using the laboratory manual which includes physical-chemical testing, case studies from previous school terms and from other institutions, and practices in dyeing, weaving, featherwork, sewing and rehousing.

All of the teachers hold regular meetings of directed discussion where students are expected to show



Figure 4. Students learn weaving techniques in order to gain knowledge of weaving structures.

their progress in research and restoration processes on the textile they are treating.

In the workshop, students are expected to apply what they have learned in the classroom and in the seminar discussions. The purpose of this work is to put into practice the students' experiences and knowledge that will allow them the ability to restore a broad range of types of textiles from archeological to those made in the 21st century, while consistently applying an integral and scientific methodology.

The program subjects are enriched with guest speakers who are specialists, such as textile analysts, museologists, museographers, archaeologists, ethnographers and other professionals.

The inter-relationship within the teaching-learning process, making use of all possible resources, gathering credible references, discussing intervention criteria, and exchanging experiences prevents restoration work conducted during the seminar from being improvised. Each activity is discussed, consented, justified and documented.

4. ACHIEVEMENTS AND CHALLENGES

The seminar workshop has worked with other institutions such as the ICOM Mexico textile group, the National Anthropology Museum, the Instituto Quintanarroense de Cultura, the National History Museum, the Luis Márquez Romy Museum, El Museo del Obispado de Monterrey, and the Museo Regional de Chiapas, among others, as well as the North America Textile Conservation Conference which includes Canada and the United States.

The seminar generates permanent research avenues in archaeological textiles, ethnographic textiles, flags, feather art restoration, and conservation materials research. These have led to several bachelor's theses, such as a comparative study of different types of adhesives for conservation of linen fabrics, conservation and restoration of fabrics with feathers, a case study entitled "Huipil thought to have belonged to La Malinche, an integral study," restoration and conservation of textiles from the 20th century including the Colima Salt Workers Cooperative Society Banner from 1925, and a technical analysis entitled "Characterization and Evaluation of a Synthetic Fabric: A Flag Study." These generated knowledge in different areas of textile conservation.

Another achievement for the textile seminar workshop was the organization of the 5th North American Textile Conservation Conference (NATCC), on behalf of the ENCRyM. This conference took place from November 9-11, 2005 at the facilities of the National Anthropology Museum and at the ENCRyM.

Due to the growing awareness of conservation and work completed in the last 10 years, revisions have been made to the Bachelor's in Restoration curriculum (2002-2004). The textile seminar workshop is no longer an optional subject but compulsory in the fourth semester within the theoretical-methodological axis of the program. Among other changes in this new phase, the seminar is developing stronger outreach by spreading experiences and results of the research conducted, and establishing guidelines and principles of textile restoration within Mexico as a way to safeguard its textile

THE SEMINAR WORKSHOP AS AN EDUCATIONAL MODEL: TEACHING TEXTILE CONSERVATION AT THE ESCUELA NACIONAL DE CONSERVACIÓN, RESTAURACIÓN Y MUSEOGRAFÍA

cultural heritage. Seventy two students have graduated, of whom 30 have majored in textile conservation, and 100 textiles with diverse characteristics have been restored.

5. CONCLUSIONS

At the Escuela Nacional de Conservación, Restauración y Museografía, the textile seminar workshop model has produced an excellent level of education and work in the last 10 years. Having transformed the textile seminar workshop from an optional final semester subject into a core subject in the fourth semester emphasizes its importance and makes us face new challenges.

Now we can participate in the initial training of new restorers with all the responsibility that this implies, not only regarding the basic knowledge of textile restoration specifically, but also with criteria and attitudes towards restoration in general.

This is why we are convinced that rescue, conservation, research, diffusion and defense of textile heritage must be a responsibility assumed by all: ethnographers, archaeologists, historians, museographers, chemists, and biologists. This is why the school has adopted a disciplinary approach towards conservation teaching.

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SECOND TIME'S THE CURSE: THE SHATTERED SILKS OF SCHIAPARELLI

SARA REITER, HOWARD SUTCLIFFE,
KEN SUTHERLAND AND BETH A. PRICE

ABSTRACT—The costume exhibition *Shocking! The Art and Fashion of Elsa Schiaparelli* opened at the Philadelphia Museum of Art (PMA) in fall 2003 and traveled to the Musée de la Mode et du Textile, Paris, in spring 2004. Prior to the exhibition, the PMA conservation staff completed over 40 treatments; several involved the stabilization of shattered silk with adhesive. The majority of the treatments worked well for the Philadelphia exhibition; however, by the end of the second venue the adhesive supports had begun to release from the shattered silk. The treatment methods, handling and other stresses placed on the objects during the traveling exhibition are discussed in this paper along with a technical study to determine possible causes of the failure. The investigation raises questions about the role of sodium silicate, a weighting agent, in the degradation of the silk fabric.

TITULO—MALDICION POR SEGUNDA VEZ: LAS DESTROZADAS SEDAS DE SCHIAPARELLI. **RESUMEN**—La exhibición de vestuario “Escándalo! El Arte y la Moda de Elsa Schiaparelli,” fue inaugurada en el Museo de Arte de Philadelphia en otoño de 2003 y luego viajó al Museo de la Moda y del Textil de París durante la primavera de 2004, donde estuvo expuesta por seis meses. Antes de su exhibición, el personal de conservación del Museo de Arte de Philadelphia (PMA) concluyó más de 40 tratamientos en esta colección. Muchos de estos tratamientos fueron de carácter extensivo e involucró la estabilización con adhesivo de la seda destrozada. La mayoría de estos tratamientos funcionaron bien para la exhibición de Philadelphia, sin embargo, hacia el final de la segunda temporada de exhibición, el

adhesivo de los soportes comenzó a soltarse de la seda. Los métodos de tratamientos, la manipulación y otros efectos de estrés que afectaron los objetos durante el traslado de la exhibición, son discutidos en esta ponencia, junto a los resultados de un examen analítico llevado a cabo para determinar las posibles causas de estas fallas. La investigación arroja preguntas acerca del rol que ocupa el silicato de sodio usado en el proceso de pesado de la seda, en la degradación de la tela de seda.

1. INTRODUCTION

In September 2003, the exhibition of 20th century dress *Shocking! The Art and Fashion of Elsa Schiaparelli* opened at the Philadelphia Museum of Art (PMA) lasting three months. The show was shipped in February 2004 to the Musée de la Mode et du Textile (MDLMT), Union Centrale des Arts Decoratifs, Paris, where it was exhibited for six additional months. The two-year conservation component preceding the installation in Philadelphia included over 40 treatments of coats, sweaters, evening gowns, hats, and jewelry. Almost half of these treatments involved the support and consolidation of shattered silk using adhesive.

After the objects were returned from Paris, it became evident that the adhesive treatments had not performed well. In order to understand the causes of the failure, the adhesive selection and treatment methods and the stresses placed on the traveling objects were reviewed. These are presented in this paper which was given in Minneapolis, Minnesota in June 2005. The adhe-

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sive and silks were investigated using scanning electron microscopy with energy dispersive spectroscopy (SEM-EDS) and Fourier transform-infrared microspectroscopy (MFT-IR).

2. TREATMENT

2.1 ADHESIVE SELECTION

While many of the PMA's objects required minimal intervention for display, others posed significant problems with shattered silk. The most severe shattering was found in the silk that lined Schiaparelli's outerwear garments from the 1930s—silk characterized by a plain weave with the crepe running only in the warp direction. In total, PMA conservators treated 17 garments having shattered silk for the exhibition.

The first major treatment was executed on a full-length, patchwork design, felted wool evening coat (PMA 1969-232-3) from the spring 1939 *Commedia dell'arte* inspired collection. Its full silk crepe lining was damaged extensively at the pressure points of the neck, armseyes, cuffs, and hemline thus necessitating an adhesive treatment that would provide strength and even support while retaining flexibility for mannequin dressing.

The treatment adhesives tested—Lascaux 360Hv and 498Hv thermoplastic resins (methyl methacrylate and n-butyl acrylate dispersions)—were selected for their high bonding strength, matte appearance, low toxicity, and short- and long-term reversibility. Test batches were prepared in varying concentrations using de-ionized water, then applied with a flat, wide-headed brush in one layer

to small, undyed silk crepeline squares stretched onto a Teflon coated fiberglass sheet. Next, the cast films were dried and peeled from the casting bed, applied to medium weight silk crepe samples, and reactivated with a heated 70°C (158°F) spatula. A 1:1 mixture of Lascaux 360Hv/498Hv in a 10% w/v aqueous solution best met the requirements for bond strength and appearance and was used to treat the “patchwork” evening coat and all other garments.

2.2 TREATMENT METHOD

Examination of the coats and jackets with shattered silk revealed that their lining construction of pleats and darting was consistent with the “patchwork” evening coat, which served as a treatment model. To preserve as much of the original construction as possible, the damaged areas were released where necessary along the edges to enable treatment in situ. Once accessible, the lining fabric was re-aligned and humidified using Gore-Tex with dampened blotting paper. Adhesive crepeline patches were applied to the reverse as underlays, along the hemline as an overlay, and on both sides at the neckline and perimeter of the armseyes. Lines of laid and couching stitches drawn from Stabiltex threads secured any broken threads on the surface. Once the Lascaux adhesive supports were placed, the lining was refolded, pinned into position, and resecured using dark blue Skala polyester thread.

3. DRESSING

Dressing inevitably placed stress on the garments, especially those with linings, so fittings were min-

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Figure 1. Detail of lifting adhesive coated crepeline patch from the lining of the tweed trouser suit jacket (BMA 55.26.38a).

imized. A conservator and curator working together installed each garment to ensure careful handling. In Philadelphia, new fiberglass mannequins were purchased for the exhibition. They were sized small enough to customize and thus minimize garment manipulation. By working with a single type of mannequin, the staff quickly developed efficient and safe dressing methods during the six week installation in Philadelphia. At MDLMT, however, installation time was limited to two weeks using a variety of mannequins.

4. MORTALITY AND MORBIDITY REPORT

Condition reports, completed at the close of the Philadelphia venue, showed that the shattered silk treatments performed satisfactorily with limited lifting at the edges of the adhesive patches and additional slits in some untreated areas. Where needed, stitches were added and patches set down using the heated spatula. Upon return of the gar-

ments from Paris, it was noted that all of the adhesive patches exhibited delamination ranging from minor lifting to near complete detachment (fig. 1). The most dramatic failure occurred in the silk lining of a 1939 tweed trouser suit jacket (Brooklyn Museum of Art (BMA) 55.26.38a). The silk had shattered in untreated areas, undoubtedly exacerbated by repeated handling during dressing, undressing, packing, unpacking, and condition reporting.

5. ANALYSIS

The possible causes for the adhesive failure were investigated by analyzing samples of the trouser suit jacket (BMA 55.26.38a) silk lining and delaminated crepeline support fabric, as well as unused crepeline support fabric with cast adhesive. Their chemical composition and structural characteristics were determined by MFT-IR using a Thermo Nicolet Continuum microscope (MCT-A detector) attached to a Nexus 670 spectrometer in the transmission mode with a diamond sample support (4 cm^{-1} resolution, 200 scans/spectrum, $4000\text{--}600\text{ cm}^{-1}$, Happ-Genzel apodization), and a JEOL 6460LV SEM with Oxford INCA X-sight EDS detector (20 kV accelerating voltage, carbon tape on aluminum stub sample mount with gold/palladium coating).

5.1 MFT-IR

Microscopic examination revealed two distinct materials in the jacket silk lining sample: brown silk fibers and a slightly opaque, whitish residue. The crepeline support fabric showed the same whitish residue with unevenly distributed frag-

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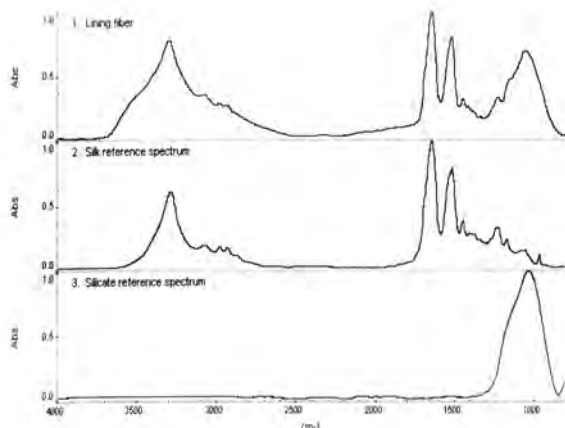


Figure 2. FT-IR spectra of tweed trouser suit jacket lining, silk fiber (IRUG 2000, IPR0032), and silicate (PMA11878) standards.

ments of brown fiber on its surface. The MFT-IR data obtained from these samples showed the whitish residue to be Lascaux adhesive, and the brown fibers from the silk lining and crepline support surface to be similar and consistent with a proteinaceous material such as silk. A silicate component (Si-O stretch, 1055 cm^{-1}) (fig. 2) found in the jacket lining was not present in the crepline support or reference samples of silk habutae. This finding prompted a literature search for possible silicate sources from the processing or dyeing of silk, which are discussed in section 6.

5.2 SEM-EDS

The breakage pattern visible in the secondary electron image of the uppermost surfaces of the jacket's silk lining fabric (fig. 3) and the presence of corresponding fibers on the surface of the delaminated crepline support (fig. 4) indicates that at least some of the failure occurred within the silk

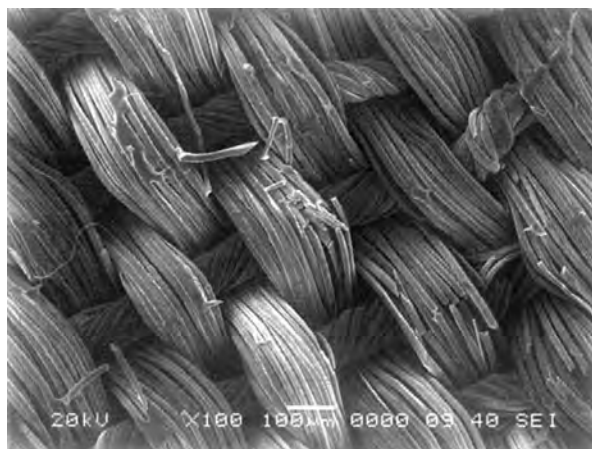


Figure 3. 100x Secondary electron image of silk lining from the tweed trouser suit jacket showing broken fibers and adhesive residue.

fibers themselves. Also visible in figure 3 is adhesive residue on the surface of the lining fabric, which may have transferred during reactivation of the adhesive coated crepline support or may be an artifact from a failure of the adhesive/support fabric bond. Examination of the unused, adhesive coated silk crepline showed even and complete coverage of the adhesive suggesting that the preparation procedure for the support likely did not contribute to the failure.

Silk lining fabric and fibers from six additional Schiaparelli pieces whose adhesive treatments had failed also were examined. The damage to the fibers was consistent with that seen in the suit jacket samples. Silicon (Si) was detected by EDS, further supporting the observation of silicate in the silk lining fabrics (fig. 5). Tin (Sn) also was found with smaller amounts of sodium (Na) and phosphorus (P). The combination of tin, silicon and phosphorous in the silk linings strongly suggests

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Figure 4. 100x Secondary electron image of adhesive coated silk crepeline patch released from jacket after exhibition. The short fibers are pieces of broken silk from the jacket lining. The longer fibers appear to be from batting and tissue used during installation and packing.

that the Schiaparelli fabrics were weighted (loaded) by the tin-silicophosphate process, a method used to improve the finished hand of the fabric. In contrast, these elements were not found in six reference samples of undamaged silk—undyed and dyed crepeline, dupion, habutae, modern cocoon, and a lining from a man's waistcoat c. 1790 (PMA #1882-1477).

6. THE WEIGHTING PROCESS

The tin-silicophosphate process was a common, cost-saving method used by commercial manufacturers for the weighting of silk in the 1930s, the period during which the linings for the Schiaparelli garments were fabricated. This weighting process increased the volume and weight of the degummed silk (up to 300%) (Mauersberger 1947, p. 725) by immersion in a

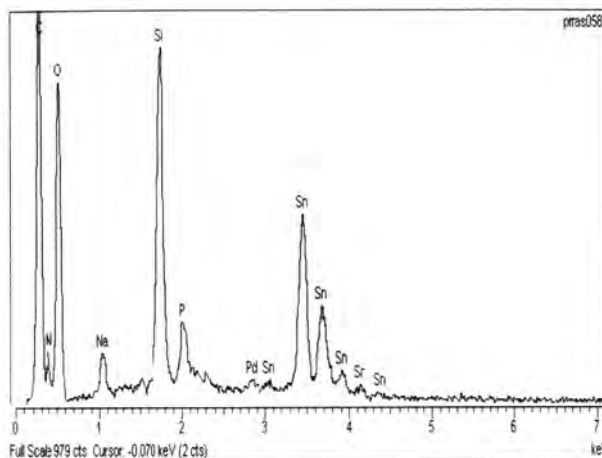


Figure 5. EDS spectrum of silk lining from tweed trouser suit jacket (BMA 55.26.38a). (Palladium (Pd) visible in the spectrum represents the coating material used in sample preparation for SEM examination.)

series of three baths: tin chloride [SnCl_4], sodium phosphate [$\text{Na}_2\text{HPO}_4 \cdot 12\text{H}_2\text{O}$], and sodium silicate (water glass) [$\text{nNa}_2\text{O} \cdot \text{nSiO}_2$ mixture] (Carboni 1952, p. 190). The resulting silk had improved luster, texture, and draping properties. If the mineral weighting was excessive the treated fabric weakened over time (Mauersberger 1947, p. 726) due to increased light absorption of the mineralized material and stresses caused by the added mass of the material (Carboni 1952, p. 199). These factors likely explain in part the fiber breakage and chemical deterioration that was observed in the Schiaparelli silk linings.

7. TREATMENT CONCLUSIONS

The most successful treatments were those with Lascaux adhesive supports on both sides of the damaged areas. Although most of the adhesive

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supports delaminated, the treatments as a whole helped the objects to survive two lengthy exhibitions and associated handling with minimal additional losses. Without stabilization, the objects certainly would have sustained greater damage.

The majority of the garments were returned to storage without further treatment and to date, the adhesive supports do not appear to have caused further damage to the garments. The supports, however, must be addressed before the objects can be displayed again. One garment, the Ottoman Dress (Drexel #55.33.5a) was retreated immediately after the close of exhibition. The failure of its adhesive supports was extreme and visually disturbing as they were located on the exterior of the light pink flounce extending up the back of the dress. The supports were removed easily with a micro-spatula and tweezers, and the entire damaged area of the flounce was covered with a more concentrated and tackier variation of the original adhesive coated crepeline: a 15% w/v solution of 2:1 Lascaux 360Hv/498Hv. This treatment, undertaken because the dress' faille fabric was too brittle to withstand a stitched support, yielded a slightly stiffer fabric but does not interfere with the visual integrity of the Schiaparelli design.

8. FUTURE RESEARCH

Understanding the deterioration processes of weighted silk fabrics and the properties of the adhesives used to stabilize them will facilitate better treatment choices. Toward this goal, the authors are continuing their research into the role of silica and other weighting minerals in the deterioration of silk, and plan to investigate more compatible

adhesives for the treatment of weighted silk fabrics in the near future.

ACKNOWLEDGEMENTS

The authors are grateful to everyone who worked so diligently to make the Schiaparelli exhibition a success. A special acknowledgement is given also to the Brooklyn Museum of Art and the Drexel University Historic Costume Collection for permission to share the information learned from their objects.

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SOURCES OF MATERIALS

Teflon coated fiberglass sheet, Chemgals Premium
10 mil
CHEMFAB, Inc.
PO Box 3200
466 Polymoore Drive
Corunna, Ontario, Canada N0N 1G0
Tel: (519) 862-1433
Fax: (519) 862-3513
www.cii-chemfab.com

Silk dupion, Silk crepe
Silk Connection by Rupert, Gibbon & Spider, Inc.
PO Box 425
Healdsburg, CA 95448
Tel: (800) 442-0455
www.silkconnection.com

Lascaux 360Hv, 498Hv, Silk crepeline, Skala
polyester thread
Talas
20 West 20th Street
New York, NY 10011
Tel: (212) 219-0770
www.talas-nyc.com

Silk habutae
Test Fabrics
PO Box 26
West Pittston, PA 18643
Tel: (570) 603-0433
www.testfabrics.com

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SLINGS AND ARROWS: SAFE COSTUME TRANSPORT

MARY C. BAUGHMAN

ABSTRACT—A transport or storage system for costumes is described. This system features a cloth or Tyvek sling with cover flaps that secure the costume in place. The sling is attached to a lightweight support box. Costumes remain suspended in the slings during transport. The costumes can be packed and unpacked quickly. The sling system is designed for use inside a durable packing crate.

The shapes of 19th century women's garments inspired the sling design, but this system can be modified to suit other types of garments and objects. Although it was designed for temporary use and made with inexpensive materials, the sling design is appropriate for long-term storage if archival materials are used. This paper, presented in Minneapolis, Minnesota in June 2005, outlines construction techniques for the sling system and the boxes that were created to ship reproduction costumes. This system replaced packing tissue in the shipping boxes.

Full text and images from this paper are accessible at Conservation OnLine (<http://palimpsest.stanford.edu/byauth/baughman/>).

TITULO—TRANSPORTE (Y ALMACENAMIENTO) SEGURO DE ROPA. **RESUMEN**—Se describe un sistema de transporte y almacenamiento de ropa. Este sistema consta de una cuneta de tela o Tyvek con aletas que cubren y aseguran la ropa en su sitio. La cuneta se apoya dentro de una caja ligera. La ropa se mantiene suspendida en la cuneta durante el transporte. Los vestidos pueden ser empaquetados y desempaquetados rápidamente. El sistema de cuneta está diseñado para ser colocado dentro de un cajón de embalaje.

Este trabajo esboza las técnicas de construcción de un sistema de cunetas y cajas que fue diseñado para el envío de copias de vestidos originales. El sistema de cuneta reemplazó el uso del papel en el embalaje de cajas. Las formas de los vestidos femeninos el siglo XIX inspiraron el diseño de cuneta pero este sistema puede modificarse y adaptarse a otro tipo de ropa y objetos. Aunque fue diseñado para uso temporal y realizado con material barato, el diseño de cuneta es apropiado para un largo almacenamiento si se utilizan materiales de archivo.

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IMPROVING ACCESSIBILITY OF A TEXTILE AND FASHION ARTS COLLECTION AT THE MUSEUM OF FINE ARTS, BOSTON

MEREDITH MONTAGUE

ABSTRACT—To meet the demands of an ever-widening internet audience, the Textile and Fashion Arts Department of the Museum of Fine Arts, Boston has increased virtual access to its collection through digital photography. Concurrently, physical access to the collection has been improved with the construction of custom object storage mounts. With these efforts, greater access for curators, scholars and the general public was achieved while limiting direct handling of the collection. These objectives were enabled by three separate grants. The first grant, from the National Endowment for the Arts (NEA), partially funded the photography of textiles from the American collection. Two subsequent grants, one from the Institute of Museum and Library Services (IMLS) and a second from the NEA, provided additional support for the design and construction of object mounts and photo documentation of costume accessories. The three grant-funded projects are outlined in this paper and the details of their implementation described.

TITULO—MEJORANDO LA ACCESIBILIDAD A UNA COLECCIÓN TEXTIL Y DE ARTES DE LA MODA, USANDO LA FOTOGRAFIA DIGITAL Y EL MONTAJE DE OBJETOS.

RESUMEN—Para resolver las demandas de un público de Internet cada vez más amplio, el Departamento de Textiles y Artes de la Moda del Museum of Fine Arts, de Boston, ha incrementado el acceso virtual a sus colecciones a través de la fotografía digital. Actualmente, el acceso físico a esta colección se ha mejorado fabricándoles a los objetos un montaje a medida para depósito. Mediante estos esfuerzos, se logró aumentar el acceso a los curadores, a los estudiantes y al

público general, a la vez que se limitó la manipulación directa de la colección. Se logró conseguir estos objetivos a través de tres distintas fuentes de financiamiento. Con la primera fuente, proveniente del National Endowment for the Arts (NEA), se financió parcialmente el registro fotográfico de los textiles de la colección americana. Dos fuentes posteriores, una del Institute of Museum and Library Services y una segunda del NEA, permitieron financiar el diseño y construcción del montaje de objetos y la documentación fotográfica de los accesorios de vestuario. Los tres proyectos financiados se describen a grandes rasgos y se detalla su implementación.

1. INTRODUCTION

In the preservation of historic textiles, one of the most damaging agents of deterioration is human intervention. Handling can be detrimental for even the hardest historic textiles, given their inherent flexibility and increased fragility with age. At the Museum of Fine Arts, Boston (MFA) overcrowded storage conditions and insufficient photo documentation unnecessarily increased handling of the collection for day-to-day activities. Staff addressed these concerns in a series of projects designed to increase the physical and virtual accessibility of the collections through digital documentation and custom storage mounts (figs. 1, 2); these projects are presented in this paper, given in Minneapolis, Minnesota in June 2005.

Three projects, each partially funded by federal agencies, are outlined (Table 1). Three factors provided the impetus for these projects: the move

IMPROVING ACCESSIBILITY OF A TEXTILE AND FASHION ARTS COLLECTION AT THE MUSEUM OF FINE ARTS, BOSTON



Figure 1. Typical shoe storage before rehousing.

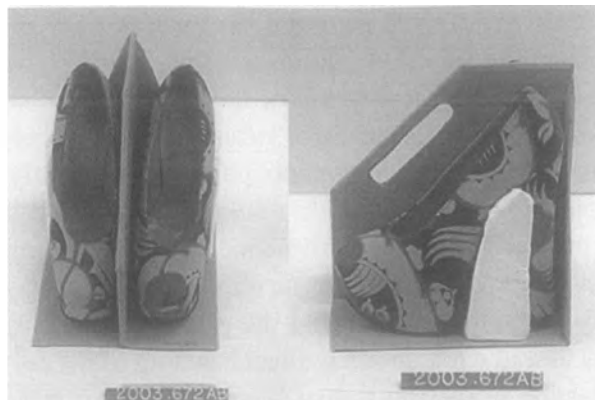


Figure 2. Vivienne Westwood shoes c. 1991 with new mount.

toward a centralized database for MFA collections, relocation of the Textile and Fashion Arts Department (TFA) collection to make way for an expansion of the Museum's east wing, and the inherent fragility and light sensitivity of the textile collection, making it a good test case for virtual accessibility via the internet.

1.1 A NEW DATABASE FOR THE MFA

In the mid-1990s, the MFA began the long process of transferring its collection records from card cat-

alogues and over 20 freestanding departmental databases to a central database. As part of this conversion, the small black-and-white photos previously adhered to the accession card were upgraded to color digital images attached to the database record for each object. Digital photography made it possible to upgrade the primary object image while simultaneously creating a suitable image for access online. Software allowed any part of the image to be seen in greater detail, allowing much greater visual accessibility than was achieved previously with film.

Project	Principal Personnel	Duration	Achievement
NEA grant - American textile photo-documentation project	one full-time and one part-time collections care position one part-time photographer	3 years	digital images of 7,000 objects added to collections database
IMLS grant - costume accessories prototype storage mount project	one part-time collections care position	2 years	design and construction of prototype storage mounts for costume accessories
NEA grant - photo-documentation and storage mounts for costume accessories	one full-time collections care position one part-time photographer	18 months	2,500 digital images added to database; 800 custom storage mounts fabricated

Table 1. Overview of MFA grant projects, 1999-2005.

MEREDITH MONTAGUE

Gallery System's product "The Museum System" was selected and named Artemis, in honor of the Greek goddess of the hunt. Since the mid-1990s Artemis has grown not only to include the MFA's collection records, but conservation information, exhibition and registration data, a history of sites and events within the museum, and all museum related digital photography.

1.2 RELOCATION OF THE TEXTILE AND FASHION ARTS DEPARTMENT

The upcoming construction of a new wing for American Art prompted the move of the Textile and Fashion Arts Collection from its old home adjacent to construction to a new storage area. This move made it possible to initiate a long overdue storage upgrade for the collection including new cabinetry and object mounts. In preparation for the move, the more vulnerable three-dimensional, multi-media costume accessories were targeted for rehousing.

1.3 INCREASED ACCESSIBILITY

With 30,000 light sensitive textiles in the Museum's care and a display policy that allows for short term, rotating exhibitions, only a relatively small number of objects are available for viewing at any one time. This fact, coupled with the inherent fragility of the material, made the TFA collection a logical choice for the Museum's first major digital documentation project.

2. NEA FUNDED PHOTO-DOCUMENTATION PROJECT 1999-2002

The first project, partially funded by the NEA, involved the photography of 7,000 objects. It was

decided that the American textile collection would be targeted for this effort, as these objects would be needed for research and development of new galleries as a result of the Museum's expansion project.

2.1 ORGANIZATION AND SET UP

In estimating staff needs for photography, objects were grouped into three categories. Small flat textiles and costume accessories such as shoes, collars, cuffs, and gloves required little or no set-up and could be photographed quickly, averaging 50-70 objects a day; medium and large sized flat textiles and three-dimensional objects such as hats and jewelry required some preparatory mounting and handling as well as more complicated lighting set-ups, averaging 10-20 photographs per day; and costumes, which required a day for dressing and an additional day for photography, averaging 4 or 5 costumes over 2 days.



Figure 3. Nevamar is clamped to a tabletop and vertical poles to create a seamless backdrop for photography.

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Figure 4. A low table constructed of 2.5 cm (1") corrugated cardboard was used to photograph large textiles.

In determining the order in which objects would be photographed, the collection was further categorized by the type of photo set-up required:

- Small textiles and those with little dimension, such as fans, stomachers, and purses, were shot on a low table measuring .75 x 1.2m (2-1/2 x 4') with a camera mounted above.
- A tabletop scoop set-up was used for three-dimensional artifacts such as hats, shoes, and jewelry (fig. 3). This curved tabletop was constructed from a flexible sheet of Nevamar clamped to a piece of plywood and upright poles to create a seamless backdrop.
- Medium-sized flat textiles were shot on a slanted pinning board that required little effort to attach the textiles and gave overall support to the object.
- Less structured costume articles such as undergarments and children's wear were shot on padded hangers hung from a hook attached to the slant board.

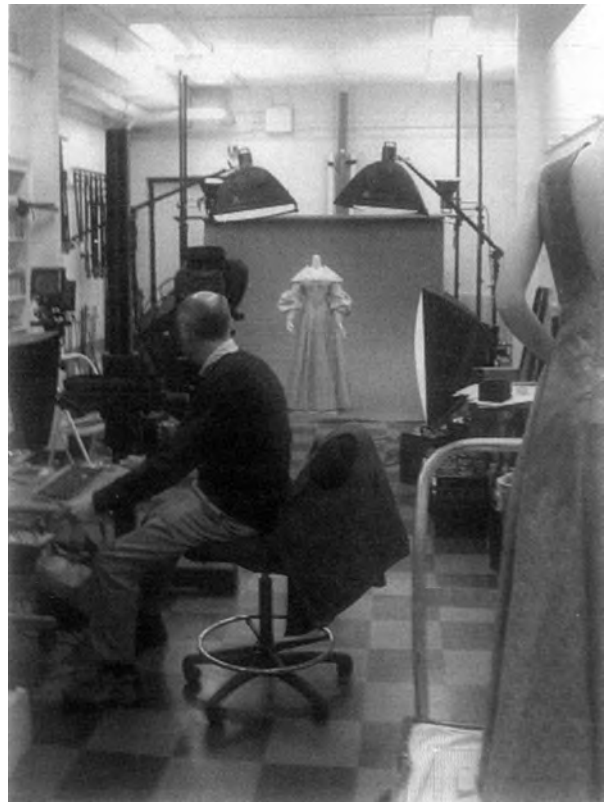


Figure 5. Costume photography in the MFA's photo studio.

- Large flat objects such as quilts and coverlets were shot flat on low platforms constructed very simply from 2.5cm (1") corrugated cardboard raised 46cm (18") off the ground. The camera for this set-up was mounted on an inverted tripod attached to the ceiling; the shutter could be controlled by remote control or by a long shutter release cable snaked back to the photographer (fig. 4).
- Costumes dressed on mannequins.

With the exception of costumes which were shot in the photo studio due to specialized lighting

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requirements, all photography was performed in existing storage and work areas. While spaces were chosen to have the least impact on day-to-day activities, the lack of dedicated photography space was less than ideal.

2.2 PHOTOGRAPHY

Photography was carried out by professional photographers from the Museum's Visual Services Department, using a Leaf Volare Scanning Digital camera (fig. 5). The camera captured an eight bit, 300 DPI, 18 megabyte file. Photos were initially stored on CD's and transferred to the server before they were attached to the database. As technology advanced over the course of the project, a RAID (redundant array of independent disks) system was set up to allow the photographer to move the image file directly onto the server for archiving. Master copies of the photos were stored on DVD. A Macintosh computer ran the accompanying camera software and Adobe Photoshop was used to correct the image color just after photography.

Digital photography proved to be a collaborative process. Objects were retrieved and set up for the photographers by two collection care staff members, who ensured that the photographs had the proper accession numbers and orientation. Collections care staff created and maintained a separate Microsoft Access database to keep track of which objects had been photographed on what day. Conservation staff provided general oversight and determined mounting methods and appropriate set-ups for the various object categories. Curatorial staff provided guidance on the preferred angle of the photo and the appropriate orientation of the

object. Photography took place two days a week for 15 months, and was then increased to three days a week for the remaining 21 months. A minimum of one additional day a week was needed to retrieve and return objects, proof images and update the database.

2.3 COLLECTION SURVEYS

While objects were being processed, collections care staff collected information about condition, treatment priority, ideal storage size and configuration for each object. A survey form was created with checklist, radio button, and drop-down lists, and was linked to the object record in the database using plug-in software. In addition, a curatorial ranking scale was incorporated into the form so that each object could be assigned a quality ranking by the curators. The information from the survey has been used to determine space needs for the collection as it is rehoused in new cabinetry, and will be used in the future to prioritize long-term conservation needs of the collection.

3. IMLS FUNDED PROTOTYPE MOUNT PROJECT 2001-2003

3.1 IMPROVING PHYSICAL ACCESSIBILITY

In 2001 work began on the first of two projects focusing on improving the physical accessibility of the collection. With grant funding from the Institute of Museum and Library Services (IMLS), prototype mounts for the costume accessory collection were designed and constructed and space needs information required for rehousing the collection was gathered.

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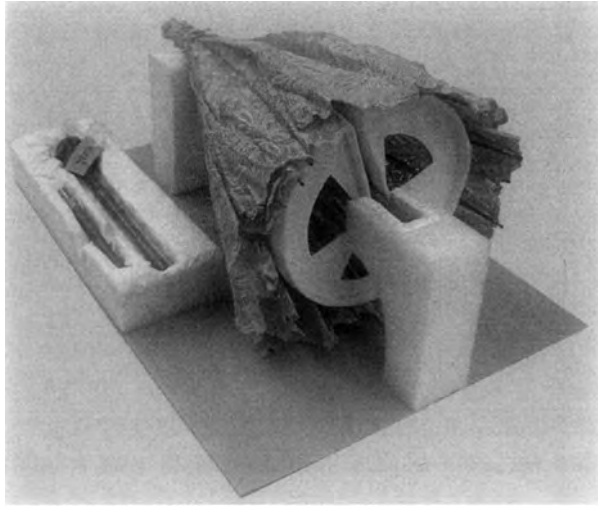


Figure 6. Parasols presented a great challenge due to their fragile textile elements and adjustable structural components.

Costume accessories were targeted because of their fragile nature, three-dimensional form and multi-media components that placed them at higher risk of damage from handling (fig. 6). The grant had three phases: object assessment and research on mount-making materials and methods; design and construction of mounts; and a space needs assessment for the objects on their new mounts. Seventy prototype mounts were constructed, including for hats, fans, combs, handbags, gloves, shoes, parasols and corsets to serve as models for storage mounts for the entire collection. By designing this grant project to focus largely on the prototype mounts, it gave us an opportunity to consider the risks and benefits before moving forward with rehousing particular categories of objects.

3.2 OBJECT ASSESSMENT AND RESEARCH

Grant principle Karen Gausch visited a number of institutions with similar collections to learn differ-

ent mounting solutions, and conducted a review of the literature. She surveyed individual objects within each category of costume accessory, and grouped objects based on like construction and support requirements (fig. 7). Prototype mounts were designed to address these requirements. For example, mounts for shoes were grouped in the following way:

- A handling board designed with a layer of Volara contoured for the shape of the shoe footprint was sufficient for low profile footwear that needed minimal support in storage.
- A second category required the same handling board, but with custom inserts for shoes that needed internal support to prevent or reverse distortion.
- A third category of shoes with medium to high profile required a tray with sides and Ethafoam heel stops to provide greater stabilization in storage and handling.
- High profile footwear like boots, footwear with detached elements, or those with highly decorated surfaces comprised a fourth category. Trays with lids were assigned to these objects



Figure 7. Karen Gausch and Liz Hill discuss support needs for individual costume accessories.

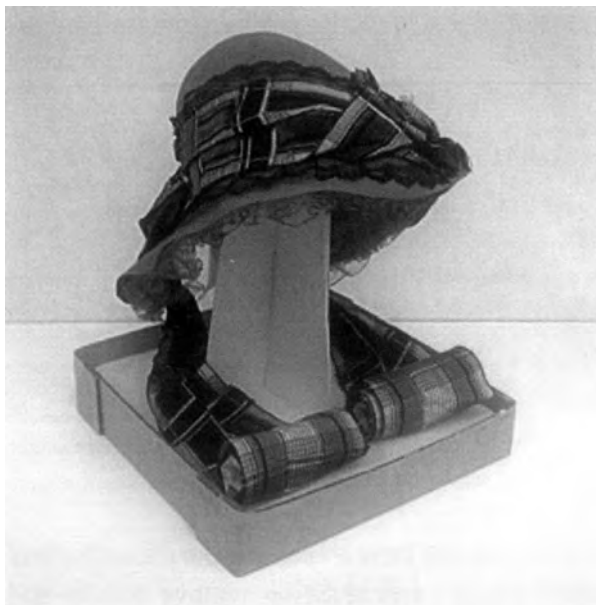


Figure 8. Prototype mount for a 19th century bonnet with long ties.

for greatest ease in storage and handling and to contain loose elements.

3.3 DESIGN AND CONSTRUCTION

Goals in the design phase of the project included providing appropriate support for the object, a handling device that would reduce direct contact with the object, and an enclosure that could catch loose parts and contain ties and tassels. As one example, the mount shown in figure 8 consists of an Ethafoam lined tray which supports the cross-shaped vertical pieces of mat board that culminate in a carved Ethafoam crown; the crown is covered in silk knit.

From a preservation perspective, the mounts are vital because many of these objects will never be

fully conserved and stabilized, yet remain important and rare examples of their respective crafts. The mounts offer support and reduction in handling, greatly increasing the long-term preservation of the objects while allowing for visibility and safe access. However, the increase in space and resources needed for rehousing also needed to be considered. Individual mounts will not be detailed in this paper; however, a MFA web publication is planned in late 2006 that will detail all the prototype mounts constructed for this project.

3.4 SPACE NEEDS ASSESSMENT

An allotment of time was built into the grant to estimate the space required to house objects once they were mounted. One of several variables considered was the need to make the most efficient use of storage space. On average, the mounted objects took 25–50% more space than the object alone. Smaller increases in space requirements were seen with the gloves and shoes, while the larger increases in space requirements were realized with the corsets, hats and parasols. These latter categories were formerly stored in a much condensed state that distorted the natural shape of the object. The prototype mounts incorporated internal supports to help preserve the shape of the object, and as a result required more space when mounted. These estimates were used to calculate how much cabinetry would be needed to house the collection in its new storage area.

4. NEA FUNDED PROJECT 2003-2005

The final phase of this project was completed in March 2005 when an additional 2,500 costume

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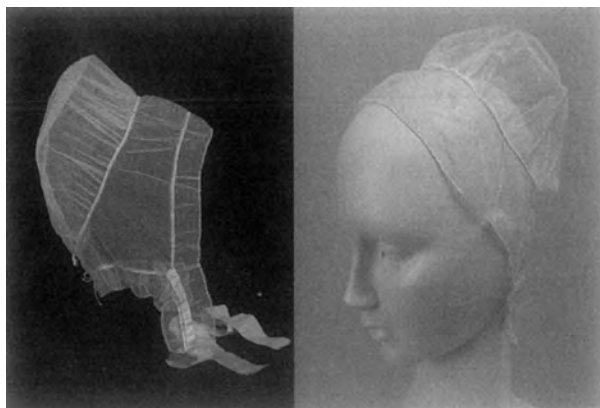


Figure 9. Nineteenth century ladies' cap shown at left with an internal mount and at right on a mannequin.

accessories were photographed and approximately 800 mounts were constructed, based on the prototypes created during the IMLS funded project.

Photography of headwear presented the greatest challenge because of the wide variety of shapes encountered. At the curator's request, some hats were photographed on mannequins to show the way in which the object would be positioned. Although the use of readily available mannequins reduced our set-up time significantly, it did not always produce an accurate picture due to the lack of hair and hairstyles often needed to give the object the right look. The use of mannequins for photography rather than mounts can also have the disadvantage of prematurely dating a photograph (fig. 9).

When possible, simple mounting solutions were sought that were unobtrusive and demonstrated the most detail regarding cut and construction of the object. In some instances, mounts made for previ-

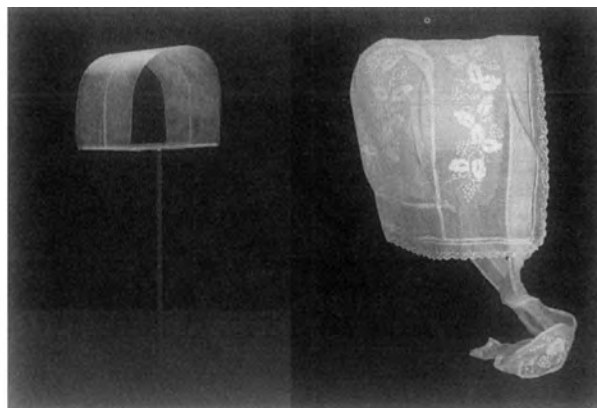


Figure 10. Mount constructed for photography of lightweight, sheer, 19th century ladies caps.

ous exhibitions were reused and the photographers used digital techniques to remove stands and posts. Often an invisible mounting method creates a more timeless photo, as seen in figure 10. This mount was constructed for photography of lightweight, sheer 19th century ladies caps. A Plexiglas base was fitted with a curved wire armature and single narrow gauge metal post. Lightly sanded Mylar was placed over the armature and attached with double sided tape to the Plexiglas stand. The Mylar was cut to varying sizes depending on the size of the object to be photographed. The post was secured in Ethafoam for photography.

Once photographed, storage mounts were constructed for the accessories, using the prototypes previously developed. Having already researched, grouped, and designed prototype mounts, the construction phase for hundreds of storage mounts was streamlined and efficient. Economy of time and materials was realized as mounting proceeded by grouping. However, the prototype mounts con-

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Figure 11. Allison Hewey with new mounts for contemporary handbags and 19th century headdresses with bouquets.

tinued to evolve over the course of this project as a result of the volume of mounts being made. Grant principle Allison Hewey developed construction short-cuts along the way and improved on prototype designs as individual object differences became apparent. Shown in figure 11 are new designs Allison developed for contemporary handbags and 19th century women's headdresses with matching bouquets.

5. CONCLUSIONS

The MFA has already seen the impact of these projects through increased image availability of the Textile and Fashion Arts collection in Artemis. The images, storage mounts, condition, and space needs information collected have been useful in preparing the collection for a move into new storage facilities and the project has served as a model for the Museum's ongoing efforts to digitally document its collections. Very recently, all of the object records with images have been uploaded to

the MFA's web site where browsers can access images and basic documentary information. For fragile objects on limited display, this resource provides an important new level of accessibility. The mounts have improved preventive care of the collection, providing a safe means of handling during the active programming of the TFA Department. They have also aided in the quick identification, transport, and sorting of objects as they move from old to new storage cabinetry.

ACKNOWLEDGEMENTS

The author would like to acknowledge the generous funding from the NEA and IMLS that made these projects possible. For the IMLS grant project in particular, several individuals gave generously of their time and expertise in sharing with project staff, including Chris Paulocik of the Costume Institute, Metropolitan Museum of Art; Nobuko Kajitani; Lucy Commoner of the Cooper Hewitt National Museum of Design; Glenn Peterson of the Fashion Institute of Technology; and Susan Heald of the National Museum of the American Indian. Many aspects of the prototype mount designs are not unique to the MFA but build on the inventive work of others; the author extends appreciation and recognition to these people. The author also thanks Arthur Beale, former Chairman of the Department of Conservation and Collections Management for his guidance, encouragement, and support of these efforts. Finally, tremendous thanks are due to the many staff members who brought these projects to successful completion.

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PRELIMINARY STUDY OF A MICRO EXTRACTION METHOD FOR MEASURING THE pH OF TEXTILES

JAN VUORI AND SEASON TSE

ABSTRACT—A modified version of a standard extraction technique was used to measure the pH of naturally aged samples of cotton, silk and jute. For this study, the sample size was reduced considerably (to 0.5g, 0.01g and 0.001g or 1mg). The aim of the study was to determine if reduced sample sizes could produce results similar to those obtained from much larger samples. These results are presented in this paper.

The extracted pH of the 0.5g samples was measured using an Orion EA 940 Ion Analyzer with ROSS flat surface electrode (Orion/ROSS). These measurements were taken as a benchmark against which the extracted pH from the smaller samples, measured using an IQ240 portable pH meter with micro probe and ColorpHast pH strips, were compared. The results indicate that the IQ240 portable pH meter with micro probe produces pH readings that are very similar to those obtained using the Orion/ROSS for acidic textiles and that these results remain much the same even when the sample size is reduced to 1mg. The pH strips produced consistent results that were quite close, but slightly lower, than those produced by the Orion/ROSS. These results did not change when the sample size was reduced to 1mg.

TITULO—ESTUDIO PRELIMINAR DE UN METODO DE MICROEXTRACCION PARA MEDIR EL PH EN TEXTILES. **RESUMEN**—En este trabajo se usa una versión modificada de una técnica estándar de extracción para medir el pH en muestras de algodón, seda y yute envejecidas naturalmente. La principal modificación fue reducir considerablemente el tamaño de la muestra (p.e. 0,5g, 0,01g y 0,001g o 1mg). El objetivo de

este estudio era determinar si las muestras de tamaño reducido podían producir resultados similares a los obtenidos con muestras mucho más grandes. El pH extraído de muestras de 0,5g fue medido usando un Analizador de Iones Orion EA 940 con un electrodo plano ROSS (Orion/ROSS). Las medidas fueron tomadas como estándar o punto de partida, las que se compararon con el pH extraído de las muestras pequeñas. Estas fueron analizadas con un medidor de pH portátil para micro pruebas y tiras de pH ColorpHast. Los resultados indicaron que el medidor portátil de pH IQ240 para micro pruebas genera lecturas de pH muy similares a aquellas obtenidas usando el Orion/ROSS para textiles ácidos y que estos resultados se mantienen más o menos iguales, aun cuando las muestras se reduzcan a 1 mg. Las tiras de pH dieron resultados consistentes y muy cercanos, aunque un poco más bajos, a los producidos con el Orion/ROSS. Se puede concluir que los resultados no cambian cuando el tamaño de la muestra se reduce a 1mg.

1. INTRODUCTION

The pH of a textile provides valuable information about its condition and can have a significant bearing on decisions related to its preservation. As textiles age they can become increasingly acidic. Thus pH measurements can be used in the initial assessment of a textile's condition to get an estimate of its degree of acidity. Since aqueous immersion or wet cleaning can remove some water-soluble acidic degradation products, a measure of a textile's acidity will have direct bearing on treatment decisions. pH measurements can also be used to monitor the effectiveness or progress of a treat-

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ment. For example, pH measurements of the initial soak bath and the final rinse bath will indicate how effective a wet cleaning treatment has been in removing soluble acidic degradation products from a textile. pH measurements can also be used to determine if an alkaline reagent such as sodium borohydride has been sufficiently removed following a stain removal treatment. Finally, pH measurements can be used to determine if storage and display materials are acid-free or not.

pH strips and pH meters with flat surface electrodes can be used to take readings directly from the surface of the textile artifact, however there are a few drawbacks. Because the area must be wetted out, there is a risk of creating a tideline or change in color on the textile. If there are any finishes present on the textile, these can interfere with extraction of soluble acids from the bulk of the textile and therefore produce erroneous pH results.

The most accurate method for measuring the pH of textiles is by extraction, i.e. soaking a sample of the textile in water and measuring the pH of the extract. In order to produce meaningful and repeatable results, it is best to follow a standard method for performing the extraction. Examples of standard methods include the American Society for Testing and Materials (ASTM) D2165-90, *pH of aqueous extracts of wool and similar animal fibers*, and Canadian General Standards Board (CAN/CGSB) 4.2 No. 74-M91/ISO 3071:1980, *Textile test methods, textiles—determination of pH of the aqueous extract*.

These standards require removing a significant amount of material from the textile, 10g and 2g

respectively. Clearly, this is not an option for conservation since even a 0.1g sample of a typical light weight silk fabric can measure approximately 4 x 3.5 cm (1-1/2 x 1-3/8").

Although standard test methods cannot be applied directly to artifacts, they do provide very good guidelines for sample preparation and handling, sample to water ratio, water quality, and extraction time, among other things. Modifications can be made to the guidelines as long as these modifications are carefully followed and documented.

Therefore, the Textile Lab of the Canadian Conservation Institute (CCI) carried out a series of tests to determine if a micro extraction technique using samples as small as 1mg could be used to measure the pH of textiles using a procedure based on the standards established by ASTM and CAN/CGSB. The micro extraction technique used in this study and presented in Minneapolis, Minnesota in June 2005 is suitable for both condition assessment and developing treatment strategies; it is not intended to be used for monitoring conservation treatments or material testing.

2. EXPERIMENTAL PROCEDURES

For this study, the sample material consisted of naturally aged samples of cotton, jute and silk. Three sample weights were used: 0.5000g, 0.0100g, and 1mg. The 0.5000g samples were used to provide a benchmark against which the other much smaller samples were compared. The 1mg sample was considered to be a realistic size that a conservator may be able to take from some textile artifacts (fig. 1). Samples weighing 0.0100g were

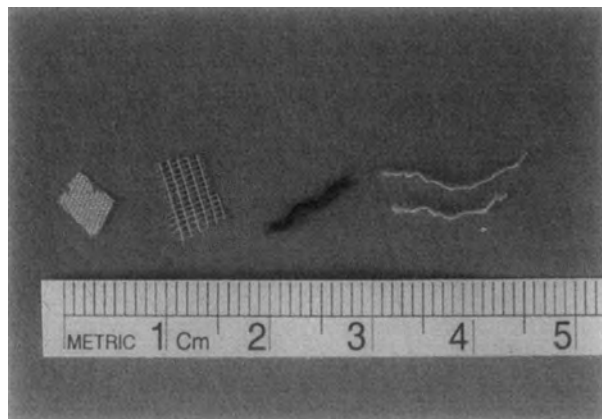


Figure 1. Fibre samples each weighing 1mg.

included because we were also interested to see how samples in between the two extremes would compare. All samples were weighed using a Mettler AE electronic balance (reproducibility $\pm 0.05\text{mg}$). The 0.0100g and 1mg samples were weighed into 1.5ml plastic snap-cap micro centrifuge tubes held upright in a foam jig (fig. 2). The 0.5000g samples were placed into 100ml borosilicate glass beakers and were cut up into pieces approximately 5mm square. The 0.0100g and 1mg samples were cut up into smaller fragments using tweezer scissors within the micro centrifuge tubes. All extracts were prepared in triplicate.

All samples were extracted using a sample to water ratio of 1:50 (0.5000g extracted in 25ml, 0.0100g extracted in 0.5ml, and 1mg extracted in 0.05ml (or 50 μl)). A micropipette (1) was used to measure out the 0.05ml volumes. Alternatively a graduated 1ml disposable syringe can be used.

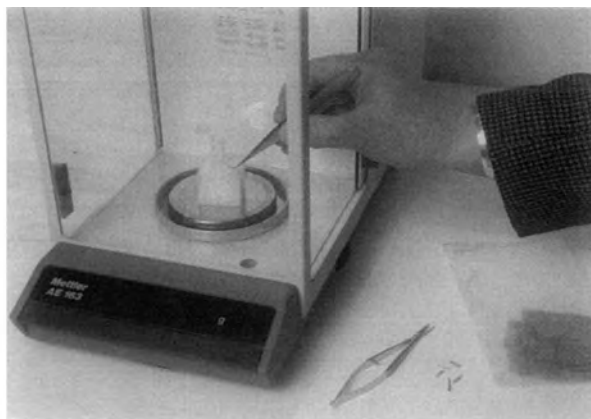


Figure 2. Weighing a 1mg fiber sample. By taring the balance and placing the fiber on the foam jig, weighing samples to 1mg is quick and easy. All fiber is then transferred into the snap-cap micro centrifuge tube.

These are quite accurate when used with the needle in place. Water purified by reverse osmosis (RO) with subsequent polishing by deionization (DI), organic removal and submicron filtration (RO/DI; 18.2 megaohms-cm) was used for extraction. Readings were taken after 1, 2, and 24 hours, with some deviations. The pH of the RO/DI water was measured using an Orion EA 940 IonAnalyzer with analytical electrode (ROSS flat surface combination pH electrode) (Orion/ROSS). In order to measure the pH of the RO/DI water, an ionic strength adjuster (Orion pHISA) was added. This increases the ionic strength of the water for more accurate measurement. The pH of the RO/DI was found to be 5.9.

The Orion/ROSS was also used to measure the pH of the 0.5g samples. This pH meter could not be used to measure the pH from the two smaller sample sizes because the volume of extract was not sufficient to cover the pH-sensing surface.

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Figure 3. The IQ240 portable pH meter with micro probe. The cap has been removed from the tip of the micro probe.

A portable pH meter, the Model IQ240 from Scientific Instruments, Inc., equipped with a micro probe (accuracy ± 0.01 pH units) was used to measure the extracted pH of the two smaller sample sizes. The IQ240 is a new type of pH meter that uses a silicon chip sensor, technically an Ion Sensitive Field Effect Transistor (ISFET), instead of a glass electrode to measure pH (fig. 3). The tiny silicon chip sensor is located on the slanted tip of a stainless steel rod that is only 3.5mm in diameter (fig. 4). This narrow rod can be inserted into a micro centrifuge tube, the slanted bottom of which enables the small volume of extract to cover the sensor. The main benefits of the ISFET sensor is that the probe can be stored dry, thus no storage solutions are required, and there is no glass to risk breaking. The probe also contains a reference electrode and temperature sensor so that pH readings are automatically temperature compensated. The IQ240 portable pH meter with micro probe is not inexpensive; as of May 2005, the system cost \$839 US. If the cost precludes purchase of the unit, it is

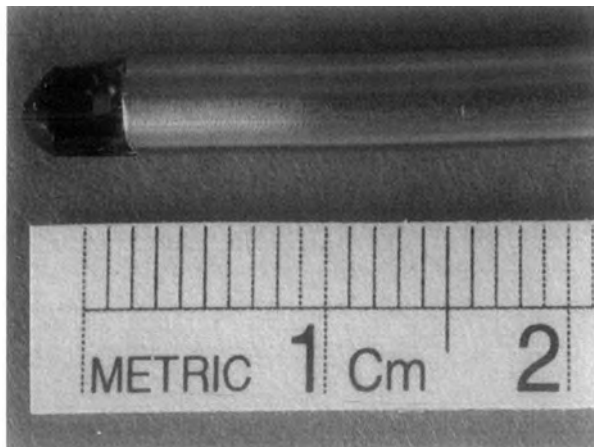


Figure 4. The silicon chip sensor is located on the tip of the micro probe.

certainly worth enquiring if a local scientific laboratory has one and is willing to do the measurement for you. One idiosyncrasy discovered is that when the AC adaptor is being used, it should be plugged directly into the power mains (outlet) and not into an extension cord as this causes the readings to fluctuate.

This study also included the use of a readily available and low cost alternative method for measuring pH, namely ColorpHast pH strips manufactured by Merck. In this study, three ColorpHast strips were used: range 2.5 to 4.5, 2 to 9, and 4.0 to 7.0. Each strip was cut into 3 narrower strips, both to economize and to avoid absorbing too much of the extract available for measurement (fig. 5). The 50 μ l extracts from the 1 mg samples could only be read once with a pH strip. The 0.5ml extracts from the 0.01g samples could be read using all three range of pH strip. For each of the 25ml and 0.5ml extracts, the 2.5 to 4.5-range pH strip was used first, followed by the 2 to 9 and

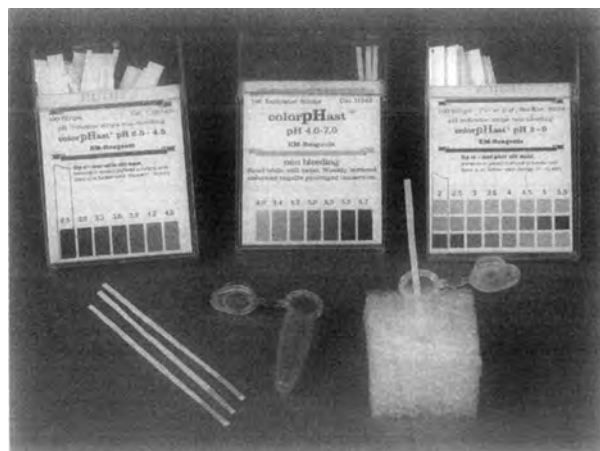


Figure 5. ColorpHast pH strips cut into thirds to measure pH of extract contained in snap cap micro centrifuge tube.

finally the 4 to 7-range strip. This sequence of measurements was repeated with two more replicates using fresh strips each time. With the 2.5 to 4.5 range strips, if the color indicated that the pH was higher than 4.5, this was indicated with a plus sign. With the 4 to 9 range strips, if the color indicated that the pH was below 4, this was indicated with a minus sign.

In order to improve extraction, soluble salts such as sodium chloride (NaCl), potassium chloride (KCl) or potassium nitrate (KNO_3) may be added to the water (Scallan 1990). To confirm the usefulness of this approach, a second set of identical tests was carried out using a 0.1M NaCl solution for extraction.

3. RESULTS

The pH measurements made with the various methods are summarized in Tables 1 to 6.

4. CONCLUSIONS

The fairly consistent results demonstrate the usefulness of following a modified standard procedure for carrying out the extraction and measuring the pH of textile fibers. Samples should be extracted for a minimum of one hour to produce reliable results. Longer extraction times did not appear to affect the results.

Results from this preliminary study show that, for acidic textiles, the IQ240 portable pH meter with ISFET micro probe produces pH readings that are very similar to those obtained using the Orion/ROSS. Secondly, these results remain much the same even when the sample size is reduced to 1mg. In a similar study using 5.7mg samples of acidic paper and barkcloth, combination flat-surface electrode and pH strips, and following the TAPPI cold extraction method, Thompson and Norton (1999) also found that the micro-extraction technique gives results consistent with a standard sample size of 1g.

For acidic textiles, the pH strips produced consistent results that were quite close to those produced by the Orion/ROSS. Care must be taken in selecting the particular range used and it is best to use more than one. Again, sample size of 1 mg did not appear to affect the readings that could be obtained. The addition of a soluble salt, in this case NaCl, improved the accuracy of the readings made with the pH strips. However, it must be emphasized that the pH values determined with and without adding salt are *different* since the rate and quantity of water extractable hydrogen ions are different. Because of this, the pH values obtained

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Extraction Time	Orion EA 940 IonAnalyzer with Ross flat surface elec- trode			IQ240 portable pH meter with IFSET micro-probe			ColorpHast strip 2.5 - 4.5			ColorpHast strip 2 - 9			ColorpHast strip 4.0 - 7.0		
sample weight / extract volume: 0.5g / 25ml															
Sample #	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
1 hour	5.01	4.99	4.89				4.5+	4.5+	4.5+	4.5	4-4.5	4-4.5	4-4.4	4-4.4	4-4.4
2 hours	4.94	4.82	4.98												
24 or 48 hours															
sample weight / extract volume: 0.1g / 0.5ml															
Sample #	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
1 hour				4.66	4.71	4.69	4.5+				4-4.5				4.4
2 hours				4.74	4.62	4.67	4.5+				4-4.5				4.4-4.7
24 or 48 hours				4.67	4.62	4.70	4.5+				4-4.5				4-4.4
sample weight / extract volume: 0.001g / 0.05ml (1mg / 50µl)															
Sample #				10	11	12	1	4	7	2	5	8	3	6	9
1 hour				4.89	4.75	4.75	4.5	4.5	4.5	4-4.5	4-4.5	4.5	4.5+	4-	4-4.4
2 hours				4.87	4.78	4.75	4.5	4.5	4.5	4-4.5	4.5	4-4.5	4.0	4-	4-4.4
24 or 48 hours				4.90	4.78	4.75	4.5	4.5	4.5	4.5	4.5	4-4.5	4.4	4-	4-4.4

Table 1. pH measurements - cotton extracted in RO/DI water.

Extraction Time	Orion EA 940 IonAnalyzer with Ross flat surface elec- trode			IQ240 portable pH meter with IFSET micro-probe			ColorpHast strip 2.5 - 4.5			ColorpHast strip 2 - 9			ColorpHast strip 4.0 - 7.0		
sample weight / extract volume: 0.5g / 25ml															
Sample #	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
1 hour	4.68	4.64	4.89												
2 or 5* hours	4.60	4.60	4.98				4.5+*	4.5+*	4.5+*	4.5*	4-4.5*	4-4.5*	4.5-4.7*	4.7*	4.7*
24 or 48 hours	4.66	4.70	4.67				4.5+	4.5+	4.5+	4.5	4.5	4.5	4.5-4.7	4.4-4.7	4.4-4.7
sample weight / extract volume: 0.1g / 0.5ml															
Sample #	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
1 hour				4.31	4.39	4.22	4.5+				4-4.5				4.4-4.7
2 hours				4.23	4.20	4.15	4.5+				4-4.5				4.4-4.7
24 or 72^ hours				4.28^	4.31^	4.25^	4.5+				4.5				4.4-4.7
sample weight / extract volume: 0.001g / 0.05ml (1mg / 50µl)															
Sample #				10	11	12	1	4	7	2	5	8	3	6	9
1 hour				4.56	4.57	5.35	4.5+	4.5+	4.5+	4.5-5	4.5-5	4.5-5	4.7	4.7	4.7
2 hours				4.54	4.55	5.22	4.5+	4.5+	4.5+	4.5-5	5	4.5-5	4.7	4.7	4.7
24 or 72^ hours				4.61^	4.59^	5.02^	4.5+	4.5+	4.5+	4.5-5	5	5	4.7	4.7	4.7

Table 2. pH measurements - cotton extracted in 0.1M NaCl.

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Extraction Time	Orion EA 940 IonAnalyzer with Ross flat surface elec- trode			IQ240 portable pH meter with IFSET micro-probe			ColorpHast strip 2.5 - 4.5			ColorpHast strip 2 - 9			ColorpHast strip 4.0 - 7.0		
sample weight / extract volume: 0.5g / 25ml															
Sample #	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
1 hour	4.23	4.14	4.25				3.9	3.9	3.9	4	3.5-4	3.5-4	4-	4-	4-
2 hours	4.15	4.18	4.11												
24 or 48 hours															
sample weight / extract volume: 0.1g / 0.5ml															
Sample #	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
1 hour				4.10	4.08	4.25	3.9-4.2				3.5-4				4-
2 hours				4.00	4.01	4.32	3.9-4.2				3.5-4				4-
24 or 48 hours				4.00	3.93	4.30	3.9-4.2				3.5-4				4-
sample weight / extract volume: 0.001g / 0.05ml (1mg / 50µl)															
Sample #				10	11	12	1	4	7	2	5	8	3	6	9
1 hour				4.55	4.56	4.01	4.2	3.9-4.2	3.9-4.2	4	4	3.5-4	4-	4-	4-
2 hours				4.55	4.57	4.04	3.9-4.2	3.9-4.2	3.9	4	4	3.5-4	4-	4-	4-
24 or 48 hours				4.51	4.53	4.00	3.9-4.2	3.9	3.9	4	4	3.5-4	4-	4-	4

Table 3. pH measurements - jute extracted in RO/DI water.

Extraction Time	Orion EA 940 IonAnalyzer with Ross flat surface elec- trode			IQ240 portable pH meter with IFSET micro-probe			ColorpHast strip 2.5 - 4.5			ColorpHast strip 2 - 9			ColorpHast strip 4.0 - 7.0		
sample weight / extract volume: 0.5g / 25ml															
Sample #	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
1 hour	3.77	3.78	3.78												
2 or 5* hours	3.77	3.78	3.78				4.2*	3.9-4.2*	4.2*	4*	4*	4*	4*	4*	4*
24 or 48 hours	3.84	3.83	3.82				3.9-4.2	3.9-4.2	4.2	4	4	4	4-	4-	4-
sample weight / extract volume: 0.1g / 0.5ml															
Sample #	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
1 hour				4.04	4.09	4.25	4.2				4				4-
2 hours				4.06	4.07	4.18	4.2				4				4-
24 or 72^ hours				4.12^	4.17^	4.24^	3.9-4.2				4				4-
sample weight / extract volume: 0.001g / 0.05ml (1mg / 50µl)															
Sample #				10	11	12	1	4	7	2	5	8	3	6	9
1 hour				4.24	3.99	3.84	3.9-4.2	4.2	3.9-4.2	3.5-4	3.5-4	4	4-	4-	4-
2 hours				4.20	3.98	3.80	3.9-4.2	3.9-4.2	4.2	3.5-4	3.5-4	4	4-	4-	4-
24 or 72^ hours				4.27^	4.09^	3.86^	3.9-4.2	3.9-4.2	4.2	3.5-4	3.5-4	4	4-	4-	4-

Table 4. pH measurements - jute extracted in 0.1M NaCl.

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Extraction Time	Orion EA 940 IonAnalyzer with Ross flat surface elec- trode			IQ240 portable pH meter with IFSET micro-probe			ColorpHast strip 2.5 - 4.5			ColorpHast strip 2 - 9			ColorpHast strip 4.0 - 7.0		
sample weight / extract volume: 0.5g / 25ml															
Sample #	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
1 hour	5.47	5.56	5.55				4.5+	4.5+	4.5+	4-4.5	4.5	4.5	4.4-4.7	4.4-4.7	4.4-4.7
2 hours	5.70	5.81	5.69												
24 or 48 hours															
sample weight / extract volume: 0.01g / 0.5ml															
Sample #	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
1 hour				5.07	5.31	5.01	4.5+				4.5				4.4-4.7
2 hours				5.12	5.17	4.98	4.5+				4.5				4.4-4.7
24 or 48 hours				5.14	5.28	5.19	4.5+				4.5				4.4-4.7
sample weight / extract volume: 0.001g / 0.05ml (1mg / 50µl)															
Sample #				10	11	12	1	4	7	2	5	8	3	6	9
1 hour				5.22	5.65	5.71	4.5+	4.5+	4.5+	4.5-5	4.5-5	4.5-5	4.4-4.7	4.4	4.4-4.7
2 hours				5.05	5.15	5.38	4.5+	4.5+	4.5+	4.5-5	4.5-5	4.5	4.4-4.7	4.4	4.4-4.7
24 or 48 hours				4.73	4.72	5.15	4.5+	4.5+	4.5+	4.5	4.5	4.5-5	4.4	4-4.4	4.4-4.7

Table 5. pH measurements - silk extracted in RO/DI water.

Extraction Time	Orion EA 940 IonAnalyzer with Ross flat surface elec- trode			IQ240 portable pH meter with IFSET micro-probe			ColorpHast strip 2.5 - 4.5			ColorpHast strip 2 - 9			ColorpHast strip 4.0 - 7.0		
sample weight / extract volume: 0.5g / 25ml															
Sample #	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
1 hour	4.40	4.40	4.43												
2 or 5* hours	4.38	4.38	4.36				4.5*	4.5*	4.5*	4-4.5*	4.5*	4.5*	4-4.4*	4-4.4*	4-4.4*
24 or 48 hours	4.46	4.41	4.36				4.5	4.5	4.5	4.5	4.5	4.5	4.4	4-4.4*	4-4.4*
sample weight / extract volume: 0.01g / 0.5ml															
Sample #	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
1 hour				4.32	4.32	4.32	4.5+				4-4.5				4.4-4.7
2 hours				4.30	4.27	4.30	4.5				4.5				4.4
24 or 72^ hours				4.30^	4.28^	4.30^	4.5+				4-4.5				4.4
sample weight / extract volume: 0.001g / 0.05ml (1mg / 50µl)															
Sample #				10	11	12	1	4	7	2	5	8	3	6	9
1 hour				4.62	4.34	4.34	4.5+	4.5+	4.5+	5	5	4.5-5	4.4	4.4	4.4
2 hours				4.36	4.32	4.36	4.5+	4.5+	4.5+	4.5-5	4.5-5	4.5-5	4.4	4.4	4.4
24 or 72^ hours				4.38^	4.35^	4.37^	4.5+	4.5+	4.5+	4.5-5	4.5-5	4.5	4-4.4	4.4	4.4

Table 6. pH measurements - silk extracted in 0.1M NaCl.

by the two different extraction methods *cannot* and *must not* be compared. pH values can only be compared if they are obtained by the same method.

It should be noted that the pH strips, and perhaps to a lesser extent the IQ240 portable pH meter, give more accurate results when the pH lies outside the range 5 to 8. Within the neutral range, especially if the ionic strength of the extract is low (i.e., very little extractable material), the strips can give ambiguous or inaccurate results. Nevertheless, pH strips are extremely useful and sometimes may be the only way a pH estimate can be obtained. The accuracy of the IQ240 portable pH meter with micro probe for measuring low ionic strength solutions has not been tested and the product literature indicates that in very low ionic strength solutions a stable reading may not be possible.

With any kind of local sampling it is important not to assume that the results represent the whole object. At best, pH is an estimate and it is important that this limitation is recognized when the results are interpreted. In order to have a better estimate of the pH of a textile, the pH of small samples taken from several areas of the textile should be determined. The micro extraction technique described here allows this to be done without removing significant amounts of sample material.

Finally, when recording the pH of a textile for documentation purposes it is important to note how the sampling was done, the sample to water ratio, duration of extraction, quality and pH of the water, method of measurement, and type of instrument

used. Although some of the tools used in this study are not standard equipment in most textile conservation labs, they are likely to be found in a scientific lab where these techniques may be carried out.

NOTES

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1. Eppendorf adjustable volume automatic pipettes 20-25-50 μ l.

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Tse, S., and J. Vuori. Forthcoming. *Guidelines for pH measurement in conservation.* Ottawa: Canadian Conservation Institute.

www.pHmeters.com (accessed July 11, 2005).

SOURCES OF MATERIALS

Eppendorf adjustable volume automatic pipettes (20, 25, 50µl); IQ240 Benchtop/Portable pH Meter with 3.5mm stainless steel ISFET Micro Probe
Canadawide Scientific Ltd
2300 Walkley Road
Ottawa, ON K1G 6B1
Canada
<http://canadawide.ca/>

IQ240 Benchtop/Portable pH Meter with 3.5mm stainless steel ISFET Micro Probe
IQ Scientific Instruments, Inc.
2075-E Corte del Nogal
Carlsbad, CA 92011
Tel: (800) 276-0723
www.pHmeters.com

ColorpHast pH strips; pH buffers; polypropylene snap-cap micro centrifuge tubes; Orion EA 940 Ion Analyzer with analytical electrode (ROSS flat surface combination pH electrode); and Orion pHISA (Ionic Strength Adjustor Solution for pH measurement of water)
Fisher Scientific
Tel: (800) 234-7437
www.fisher1.com

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PHOTOYELLOWING AND PHOTOBLEACHING OF SILK AND WOOL FABRICS UNDER MONOCHROMATIC AND MULTICHROMATIC LIGHT RADIATION

ERIKA TAKAMURA, KUNIO YOSHIZUMI AND PATRICIA COX CREWS

ABSTRACT—The yellowing of silk and wool fibers upon exposure to light is a concern whenever museum textiles are exhibited. It is well known that light irradiation causes photoyellowing and photobleaching of protein fibers. This poster presents research that examined the effect of monochromatic light at 16nm intervals between 220 and 550nm in an effort to determine which regions of the electromagnetic spectrum are most damaging to protein fibers. Response spectra of photoyellowing and photobleaching effects on silk and wool fabrics were compiled. For silk, two strong yellowing peaks were observed at 246 and 294nm in the UV range. For wool, a yellowing peak and a shoulder were also observed at 246 and 294nm. A bleaching effect was observed at 451nm for both silk and wool.

TITULO—FOTO-AMARILLAMIENTO Y FOTO-BLANQUEAMIENTO DE TELAS DE SEDA Y LANA SOMETIDAS A RADIACION LUMINICA MONO CROMÁTICA Y POLICROMÁTICA. **RESUMEN**—El amarillamiento de las fibras de seda y lana expuestas a la luz, es una preocupación siempre que los textiles de museo son exhibidos. Se sabe muy bien que la radiación lumínica causa foto-amarillamiento y foto-blanqueamiento en las fibras proteicas. Esta investigación examina los efectos de la luz monocromática de 16nm de longitud de onda a intervalos de entre 220 y 550nm, en un esfuerzo por determinar qué región del espectro electromagnético es el más dañino para las fibras proteicas. Se registraron los efectos del espectro de acción del foto-amarillamiento y foto-blanqueamiento en la telas de seda y lana. En la lana, el pico y cima de amarillamiento se observó a 246 y

294nm. En la seda, se observaron dos fuertes picos de amarillamiento, a 246 y 294nm, en el rango de UV. Se observó un efecto de blanqueamiento a los 451nm, tanto en la seda como en la lana.

1. INTRODUCTION

Numerous studies exist in the fields of biology and material science on photodegradation of fibers and other materials based on monochromatic irradiation (1). It has been well documented that monochromatic irradiation causes the photoyellowing and photobleaching of fibers. However, research regarding the effects of monochromatic light at specific wavelengths on the yellowing and/or bleaching of protein fibers is limited.

The photochemical behavior of silk has been examined extensively using a multichromatic light source, but to date, there is no published research regarding the effects of monochromatic light on silk to determine wavelength dependence of photodegradation (2). Previous research regarding the photodeterioration of wool showed the wavelength dependency for photoyellowing and photobleaching under ultraviolet (UV) and blue light irradiation, respectively. The response spectra were also reported by some researchers (3) although characteristic peaks in the UV region of the electromagnetic spectrum have not been published to date. Other researchers have shown that the photodegradation of wool depends on the wavelength of light exposure (4). This research, presented in Minneapolis, Minnesota in June 2005, added to the literature by examining the yellowing and/or bleaching effects of specific wavelengths of monochromatic irradiation on both silk and wool.

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2. EXPERIMENTAL

2.1 MATERIALS

Undyed silk and wool fabrics were selected from standard test fabrics used for colorfastness to staining tests in Japan Industrial Standard L 0803 (5). The silk fabric had a thread count of 52.8 warp yarns (2.3 tex) by 38 weft yarns (2.3 tex) per cm with a fabric weight of 60 g/m². The wool fabric had a thread count per cm of 28 warp yarns (19 tex) by 27 weft yarns (15 tex) with a fabric weight of 102 g/m². The undyed and unexposed wool was slightly more yellow in color than the silk.

2.2 EXPOSURE TO LIGHT SOURCES

Samples were irradiated with monochromatic light using a spectroirradiator (6). The spectroirradiator was equipped with a xenon arc lamp with an ellipse half sphere mirror to collect light emission. Irradiation from this source was converted into monochromatic light using a diffraction lattice grating with 1200 lines/mm. Wavelength dispersion was 2 nm/mm. The effect of secondary diffraction into the monochromatic light was eliminated by the use of appropriate filters.

By placing the specimens at an appropriate position in a sample holder, each specimen was exposed to monochromatic irradiation at 16nm wavelength intervals between 220 and 550nm. Since a source cannot emit irradiances of equal intensity at every wavelength, the length of exposure was varied so that a constant irradiance was maintained for all wavelengths. Light intensity at each wavelength was measured periodically using

a thermopile detector (7). Exposures were carried out at room temperature ranging from 20-25°C (68-77°F). Silk and wool specimens also were exposed to multichromatic light using an Atlas CI35 xenon-arc Fade-Ometer. Radiant energy of 0.75 W/m²/nm at 420nm was maintained.

A response spectrum for each fiber was obtained by exposing a specimen to a narrow band of irradiation isolated from the dispersed spectrum of multichromatic light emitted from a light source. Periodically the reflectance spectrum was measured using a Minolta Model CM-3700d color analyzer to determine Yellowness Index (YI) (8).

3. RESULTS AND DISCUSSION

3.1 YELLOWING OF WOOL UNDER MONOCHROMATIC IRRADIATION

Following exposure to an accumulated radiant energy of 500kJ/m²/nm at 246nm of monochromatic light, the wool specimen yellowed significantly as shown by the decreased reflectance between 400 and 500nm (fig. 1). By contrast, the irradiation of wool with monochromatic light to an accumulated radiant energy of 500kJ/m²/nm at 451nm in the visible region caused bleaching of the wool specimen (fig. 2). That is, the reflectance increased in the blue region of the spectrum. No differences were observed in the spectra of the exposed and unexposed wool specimens between 500 and 700nm.

The yellowing observed every 16nm between 200 and 550nm was compiled into a spectrum using YI values (fig. 3). A yellowing peak and a shoulder

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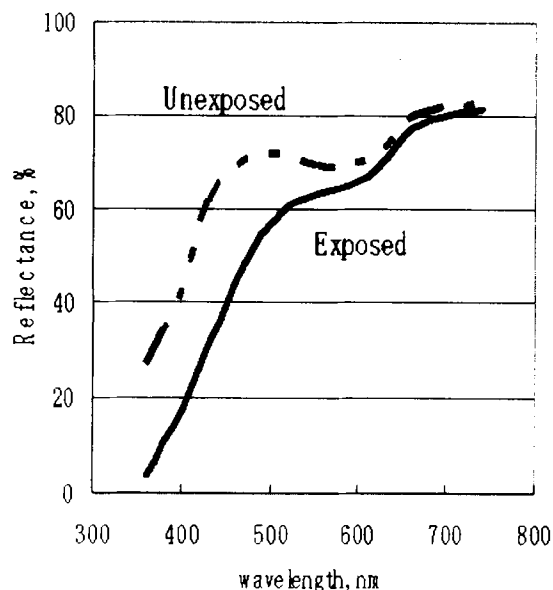


Figure 1. Reflectance of unexposed and exposed wool fabric after exposure to 500 kJ/m²/nm radiant energy at 246nm of monochromatic irradiation.

were observed at 246 and 294nm in the UV region, whereas a broad bleaching valley was observed at 451nm in the visible region. These results also indicate that selected wavelengths contribute more to yellowing than others. These peaks were not identified by previous researchers (Lennox and King 1968; King 1971; Lennox et al. 1971; and Collins and Davidson 1993), instead they reported that yellowing increased steadily as wavelength decreased. It is generally understood that shorter wavelength irradiation is more damaging to molecules due to the increase in radiant energy per photon.

Presumably, the yellowing of wool is the result of the destruction of proteins such as tryptophan,

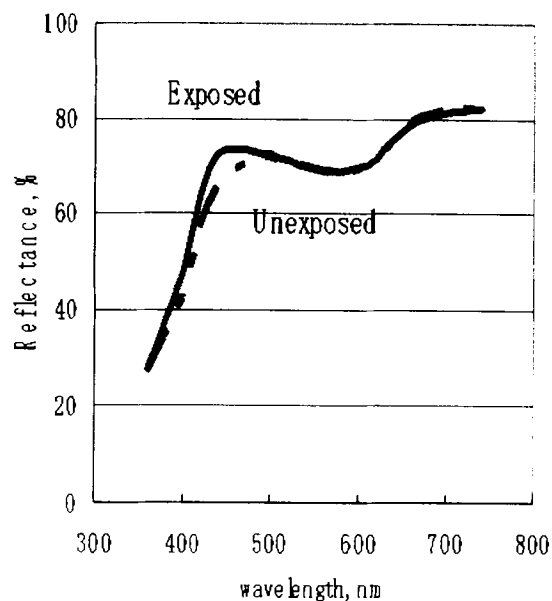


Figure 2. Reflectance of unexposed and exposed wool fabric after exposure to 500 kJ/m²/nm radiant energy at 451nm of monochromatic irradiation.

tyrosine, phenylalanine, histidine, and cystine. However, it must be acknowledged that although the mechanism of photoyellowing of wool has been widely studied (Gochel and Knott 1992; Collins and Davidson 1993; Church and Millington 1996; and Millington and Church 1997), the specific chemical reactions are not well understood, but the generally accepted explanation for yellowing is the destruction of proteins mentioned above.

Although the phenomena of photobleaching of wool has previously been reported, especially by irradiation with wavelengths greater than about 380nm (Collins and Davidson 1993; Church and Millington 1996), the bleaching mechanism has

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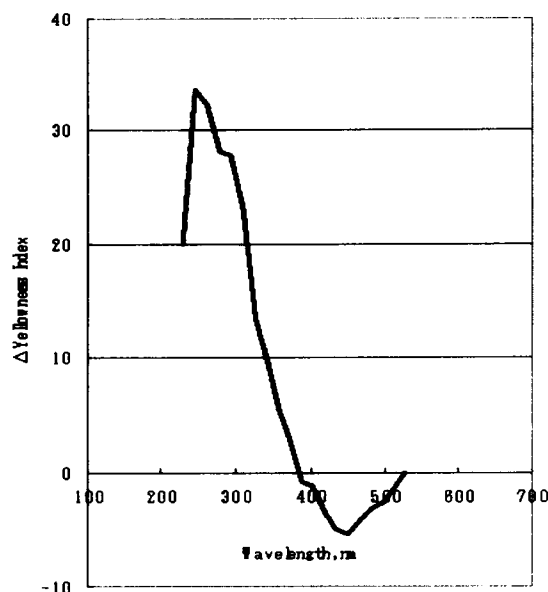


Figure 3. Action spectrum for yellowing of wool fabric exposed to 500 kJ/m²/nm radiant energy under monochromatic irradiation.

not been well documented or understood. Some scientists (Shaefer 1991; Collins and Davidson 1993) suggest that blue fluorescent light is responsible for photobleaching of wool. The results of this study suggest that visible light causes the observed bleaching effect, but further research is required to elucidate the precise bleaching mechanism.

3.2 YELLOWING OF SILK UNDER MONOCHROMATIC IRRADIATION

Reflectance spectra of unexposed and exposed silk are shown in figure 4. The reflectance spectrum of the unexposed silk was almost flat between 400 and 700nm. However, the silk reflectance spec-

trum was changed greatly after exposure to an accumulated radiant energy of 500kJ/m²/nm at 246nm of monochromatic light (fig. 4). The silk specimen yellowed as shown by the decreased reflectance between 400 and 500nm. At 451nm, a bleaching effect was observed on silk as it was for wool, although the effect was slighter (fig. 5).

The response spectrum for the yellowing of silk was compiled using YI values (fig. 6). Like wool, two strong yellowing peaks were observed at 246 and 294nm in the UV region. Moreover, a broad valley at 451nm was observed, which shows that light irradiation in the visible region again caused a bleaching effect.

The mechanism of photoyellowing of silk has been considered to be similar to wool. With similar protein components, the photochemical reactions would be expected to be similar and presumed to result from changes in amino acids (Baltova et al. 1998; Baltova and Vasseleva 1998; and Vasseleva et al. 1998).

3.3 YELLOWING OF WOOL AND SILK UNDER MULTICHROMATIC IRRADIATION

The yellowing of wool and silk under multichromatic light irradiation by exposure to light in a Fade-Ometer is shown in figure 7. The silk yellowed more, i.e. it exhibited higher YI values than wool during 200 hours of light exposure. Conversely, wool appears to be more sensitive to light irradiation than silk as indicated by the magnitude of the peaks and valleys shown on its response spectra (figs. 3, 6).

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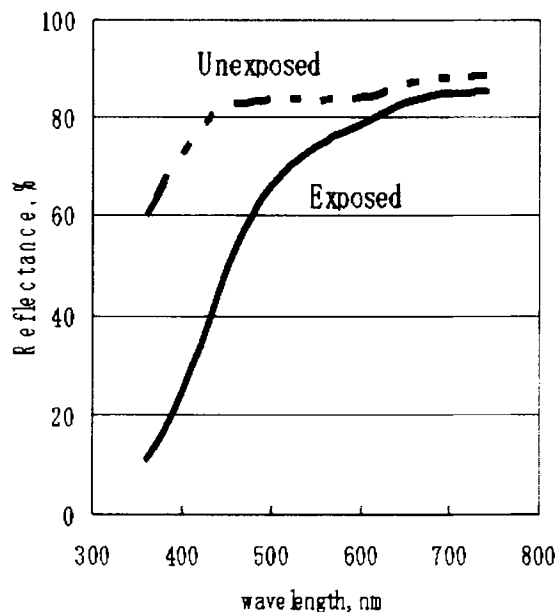


Figure 4. Reflectance of unexposed and exposed silk fabric after exposure to 500 kJ/m²/nm radiant energy at 246nm of monochromatic irradiation.

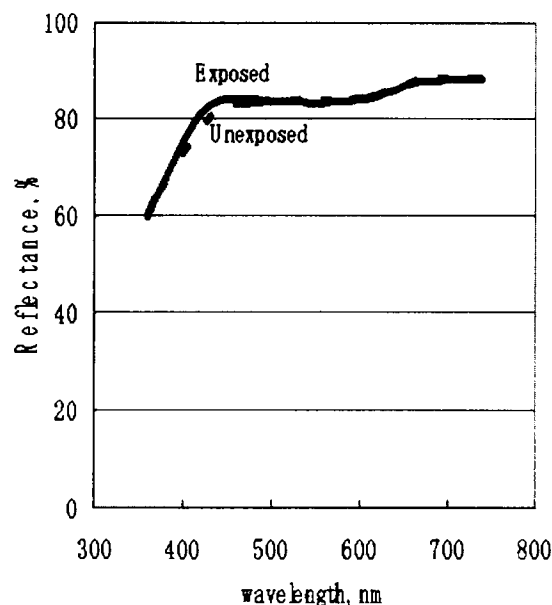


Figure 5. Reflectance of unexposed and exposed silk fabric after exposure to 500 kJ/m²/nm radiant energy at 451nm of monochromatic irradiation.

4. CONCLUSIONS

This study examined the yellowing and bleaching effects on silk and wool under monochromatic light at specific wavelengths under identical irradiances. It also examined the photoyellowing effects of multichromatic light on silk and wool for comparison. Following 200 hours of multichromatic light exposure in a Fade-Ometer, silk yellowed more than wool.

Following exposure to monochromatic light irradiation, silk exhibited a yellowing peak and shoulder at 246 and 294nm in the UV region. Similarly, wool exhibited two strong yellowing peaks at 246 and 294nm in the UV region. A broad bleaching

effect at 451nm was observed in both silk and wool, which shows that the bleaching effect of light irradiation can arise in the visible region of the electromagnetic spectrum. When the response spectra were compiled for both silk and wool, it is apparent that wool exhibits significantly more yellowing and bleaching than silk at selected wavelengths, yet silk yellows more than wool when exposed to multichromatic light. This seemingly contradictory observation may be explained by the bleaching effect compensating for and overriding the yellowing in wool, so that overall wool exhibits less yellowing than silk under multichromatic light.

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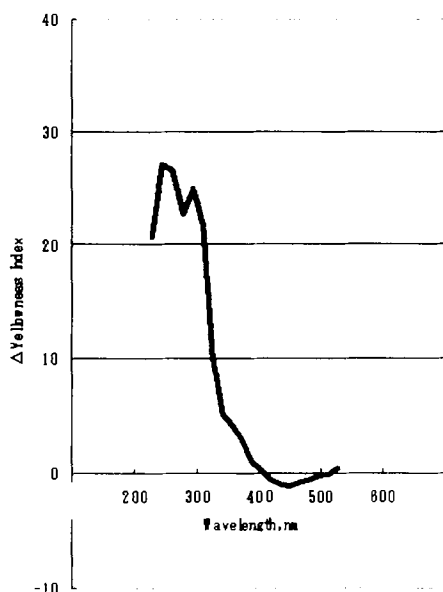


Figure 6. Action spectrum for yellowing of silk fabric exposed to 500 kJ/m²/nm radiant energy under monochromatic irradiation.

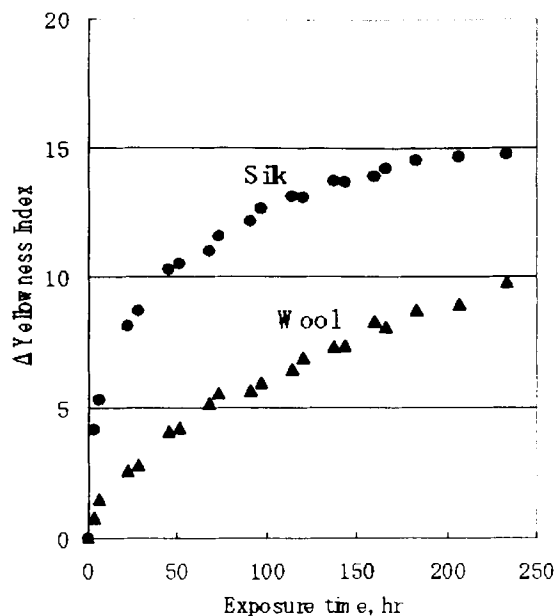


Figure 7. Yellowing of wool and silk fabric after exposure to multichromatic irradiation.

NOTES

1. CIE 1987; Gochel et al. 1992; Banrud et al. 1993; Andradý et al. 1996; and Katsuda et al. 1996.
2. Baltova and Vassileva 1998; Baltova et al. 1998; and Vassileva et al. 1998.
3. Lennox and King 1968; King 1971; Lennox et al. 1971; and Collins and Davidson 1993.
4. Inglis and Lennox 1965; Church and Millington 1996; and Millington and Church 1997.
5. Japanese Industrial Standards (JIS) specifies the standards used for industrial activities in Japan. The standardization process is coordinated by

Japanese Industrial Standards Committee and published through Japanese Standards Association. JIS L 0803 is a colorfastness test method published under the JIS Textile Engineering Division. The JIS standard test fabrics are similar to some of the test fabrics used by American Association of Textile Chemists and Colorists (AATCC) test methods for evaluating colorfastness to staining.

6. Spectroirradiator model CRM-FD made by JASCO Co., Ltd.
7. Thermopile detector made by JASCO Co., Ltd.
8. Yellowness Index (YI) = $(1.316X - 1.164Z)/Y \times 100$ where X, Y and Z are the CIE tristimulus val-

**ERIKA TAKAMURA, KUNIO YOSHIZUMI
AND PATRICIA COX CREWS**

ues.

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PHOTOYELLOWING AND PHOTOBLEACHING OF SILK AND WOOL FABRICS UNDER MONOCHROMATIC AND MULTICHROMATIC LIGHT RADIATION

Polymer Degradation and Stability 60:367-373.

SOURCES OF MATERIALS

Wool and silk fabrics, standard adjacent fabrics in
Japan Industrial Standard L 0803
Japanese Standards Association
4-1-24 Akasaka
Minato-ku
Tokyo 107-8440
Japan
Tel: 81-3-3583-8087

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SPLITTING HAIRS: A SAMPLING TECHNIQUE FOR FIBERS

ANNE MURRAY

The June 2005 Textile Specialty Group meeting in Minneapolis, Minnesota included a "tips" session, held mid-day before the lunch break. The following was presented at that session.

1. INTRODUCTION

The following is a sampling technique for identifying fibers. The equipment is fairly basic and readily available. Dan Naedel, a forensic microscopist at the Smithsonian Center for Material Research and Education, shared this technique with the author.

2. MATERIALS

- small piece of CR-39 plastic sheet (allyl diglycol carbonate monomer)
- 1.2 x 5 x 10cm (1/2 x 2 x 4") glass block
- Polaroid film coater (plastic holder and cotton applicator with a solution of 5-15% isopropyl alcohol, 2-5% zinc acetate dehydrate, and 3-7% glacial acetic acid)
- Personna brand, stainless steel, Teflon coated, double edge razor blade, .004 thick

3. SAMPLING TECHNIQUE

1. Tape the small piece of CR-39 plastic sheet to the glass block. The glass block is used to raise the sample off the table in order to have working room for your hands. The plastic is used to prevent dulling of the razor blade. CR-39 is a good choice for the plastic sheet. It is used for optical lenses, is very durable, is not scratched by the razor blade, and is resistant to most solvents (fig 1).

2. Tape both ends of the fiber to the plastic sheet (fig. 2).

3. Coat the fiber with a thin layer of Polaroid film coater and allow it to dry anywhere from an hour to over a week.

4. Under magnification, one can, with practice, cut longitudinal sections and cross sections from the coated fiber using a double edge razor blade.

4. ADVANTAGES

One advantage of having coated the fiber is that if you happen to slice all the way through the fiber when cutting longitudinal sections, the coating holds it in place, preventing the fiber from curling back on itself and requiring the end to be taped down again (fig. 3).

Another advantage of this technique is that three types of samples can be taken from a single embedded fiber. Cross sections and longitudinal sections can be taken and transferred to a SEM stub using a tungsten needle. Longitudinal samples then can be taken from the fiber remaining in the coating as well as from the portion cut away. A third type of sample, a scale cast, also can be taken. When wet, the coating oozes under the fiber. After taking cross sections and longitudinal sections, the remaining fiber can be gently pulled up, revealing a scale impression (figs. 4, 5, and 6).

Figures 7 and 8 are SEM photomicrographs of dog and mountain goat guard hairs sectioned using this technique. They show the variation in the medulla structures.

SPLITTING HAIRS: A SAMPLING TECHNIQUE FOR FIBERS

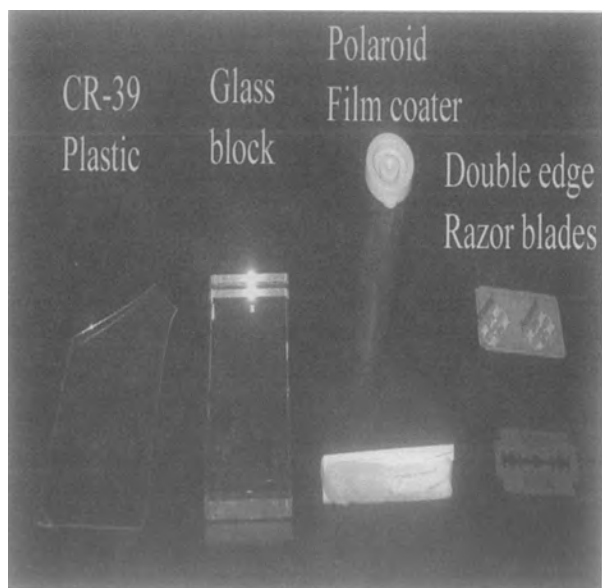


Figure 1. Sectioning supplies. From left, piece of CR-39 sheet plastic, glass block, Polaroid film coater, and double edge razor blades.

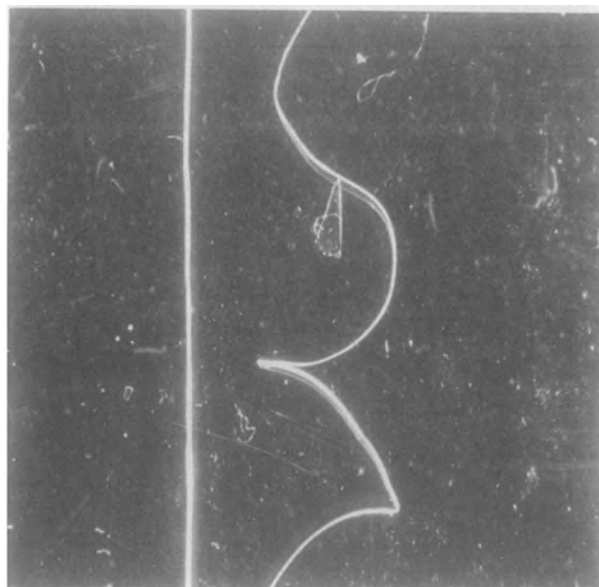


Figure 2. Unrestrained fibers from a mountain goat, *Oreamos americanus*. Left, guard hair; right, wool underhair.

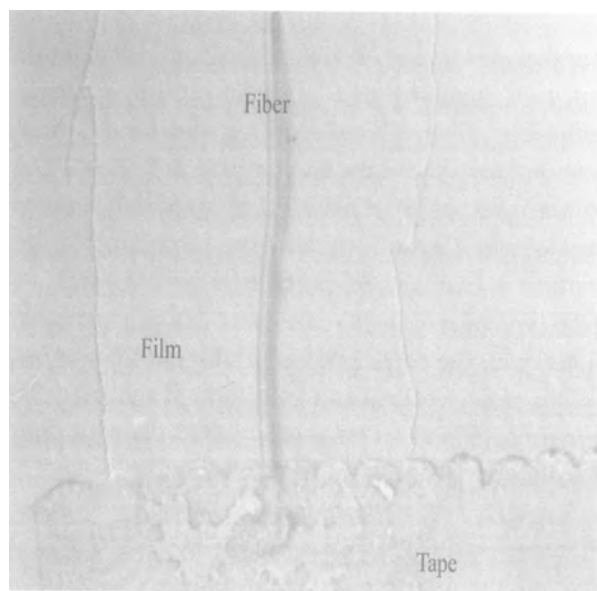


Figure 3. Wool fiber coated with Polaroid film coater.

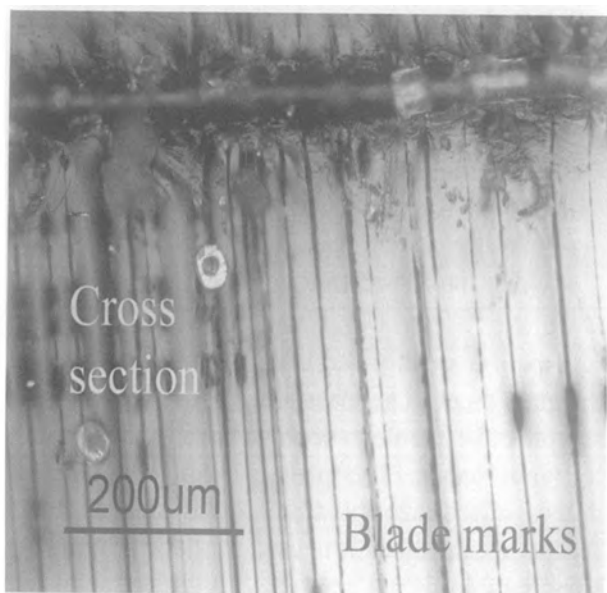


Figure 4. Cross section of a guard hair from a mountain goat, *Oreamos americanus*.

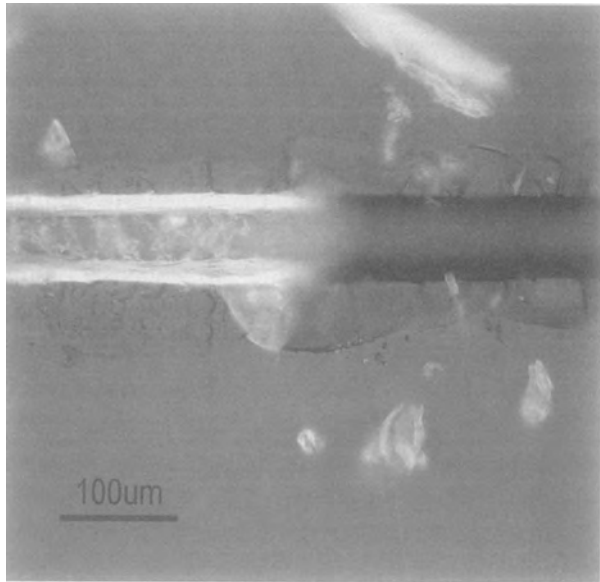


Figure 5. Longitudinal section of fiber in figure 4.

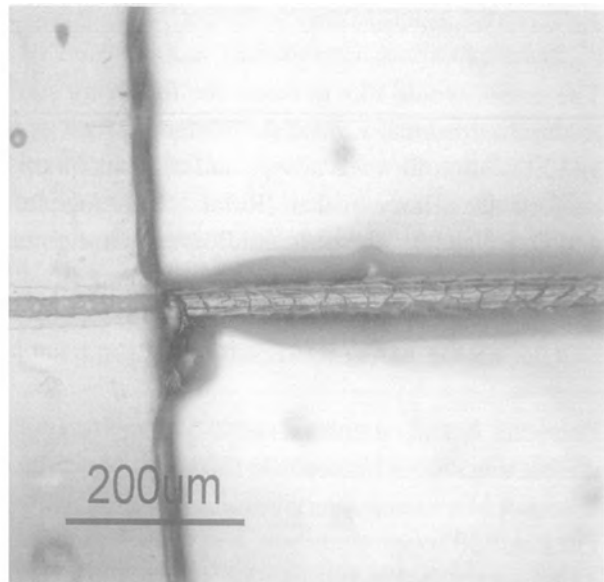


Figure 6. Scale cast of fiber in figures 4 and 5.

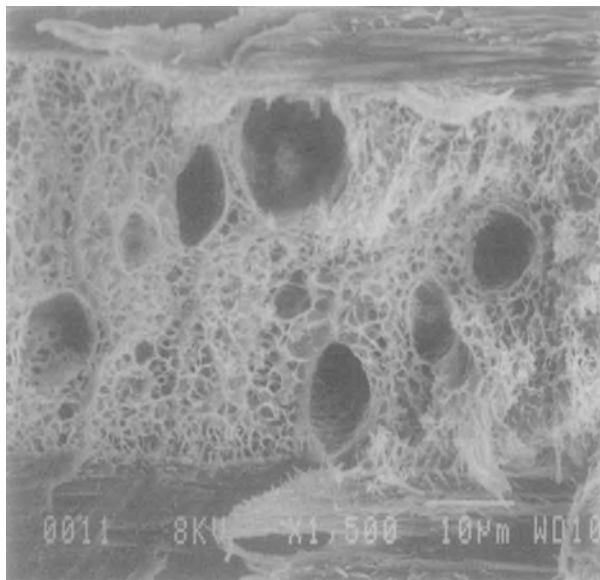


Figure 7. Longitudinal section of a guard hair from a dog, *Canis familiaris*.

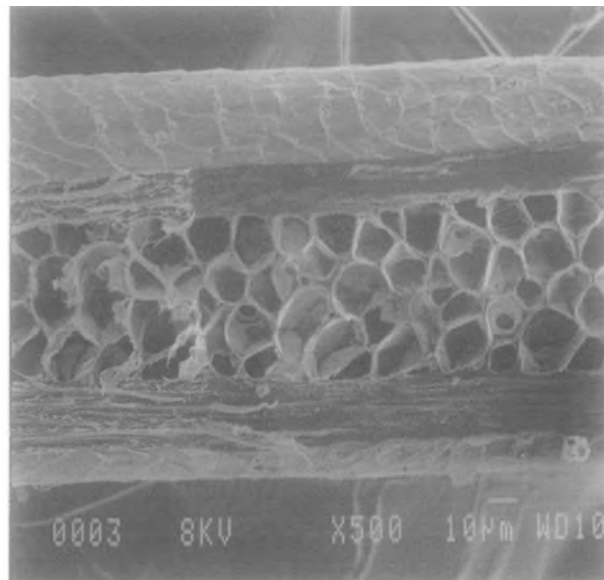


Figure 8. Longitudinal section of a guard hair from a mountain goat, *Oreamnos americanus*.

SPLITTING HAIRS: A SAMPLING TECHNIQUE FOR FIBERS

ACKNOWLEDGEMENTS

The author would like to thank the following staff at the Smithsonian Center for Materials Research and Education for their advice and analysis on this project: Dr. Harry Alden, Roland Cunningham, and Dan Naedel. The photomicrographs in figures 7 and 8 were taken by Roland Cunningham.

SOURCES OF MATERIALS

Personna brand stainless steel, Teflon® coated,
double edge razor blade, .004 thick
Electron Microscopy Services
PO Box 550
1560 Industrial Road
Hatfield, PA 19440
Tel: (215) 412-8400

CR-39 plastic sheet
HOMALITE™
Division Brandywine Investment Group, Corp.
11 Brookside Drive
Wilmington, DE 19804
Tel: (800) 346-7802
www.homalite.com

glass block
McCrone Microscopes & Accessories
850 Pasquinelli Drive
Westmont, IL 60559-5539
Tel: (800) 622-8122
www.mccrone.com

Polaroid film coater
Polaroid Corporation
North America Sales & Marketing

1265 Main Street W2-2C
Waltham, MA 02451
Tel: (800) 343-5000

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CUSTOM SKIRT HANGER

KATHERINE SAHMEL AND LISA STOCKEBRAND

The June 2005 Textile Specialty Group meeting in Minneapolis, Minnesota included a "tips" session, held mid-day before the lunch break. The following was presented at that session.

1. INTRODUCTION

In preparation for relocating the Costume and Textiles Department at the Philadelphia Museum of Art (PMA), an Institute for Museum and Library Services (IMLS) funded survey was carried out between May 2002 and April 2003. The survey data was used to estimate the space needs of the collection and to initiate a planned re-housing program, begun in May 2004. Survey results showed that approximately 25% of the costume and textiles collection was in need of re-housing.

One aspect of the housing upgrade was assessment of hanging storage for skirts. In particular, skirts from the late 18th and 19th centuries with bustles, trains, and embellishments require significant support to prevent stress and possible damage over time. The skirt hangers previously in use for over-size skirts included commercially available clip hangers, which crush skirts at the waist and do not hold the weight of heavy pieces, and padded wooden and plastic hangers, which are bulky and too wide for most skirts in the collection, causing stress on side seams and panels at the hips.

The skirt hanger described here was developed in the summer of 2004, when the author completed an eight-week summer work project at PMA under the supervision of Sara Reiter, Associate Conservator of Costume and Textiles. Subsequently the hanger was further refined and

fabricated by Project Conservator Julie Randolph and Conservation Technician Lisa Stockebrand.

It makes use of soft density extruded cylindrical polyethylene backer rod, chosen for its flexibility and shape. The final prototype has a semi-rigid, horizontal segment of medium grade Ethafoam sheeting attached in the center. The long, flexible, sloping arms of the backer rod provide support along a portion of the length of the skirt.

This hanger prototype was based on a National Park Service model, discussed by Jane Merritt in *Instructions for Making Customized Ethafoam Hangers* (www.nps.gov/hfc/cons/con-faq5.htm). Merritt described how to use Ethafoam to carve specific forms for custom hangers.

2. MATERIALS

- 7.6cm (3") diameter x 188cm (74") soft density extruded cylindrical polyethylene backer rod
- medium grade Ethafoam sheeting
- 7.6cm (3") diameter white cotton stockinette
- .3cm (0.125") 302/304 soft temper stainless steel wire
- stainless steel washers (#6 or #8)
- 3M Jet Melt #3792Q ethylene vinyl acetate hot melt glue
- wire cutters, pliers, measuring tape, glue gun, bone folder, Ethafoam knife

3. CONSTRUCTION STEPS

1. A 188 cm (74") piece of soft density extruded cylindrical polyethylene backer rod is cut and notched four times (fig. 1). The distance between

CUSTOM SKIRT HANGER



Figure 1. Notches are cut into the polyethylene backer rod.



Figure 2. Notches are placed according to the dimensions of the individual skirt.

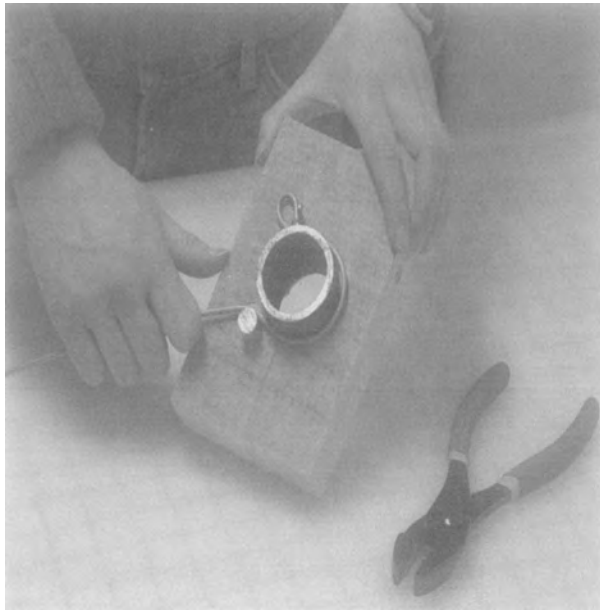


Figure 3. Jig for shaping the hanger wire.

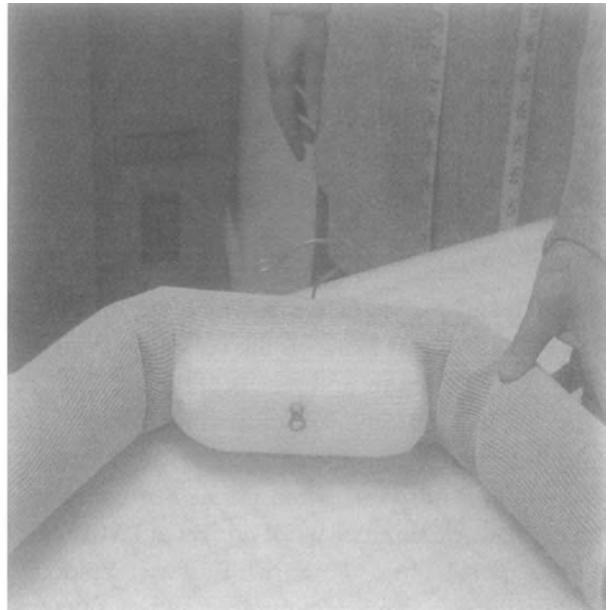


Figure 4. Completed hanger viewed from below.

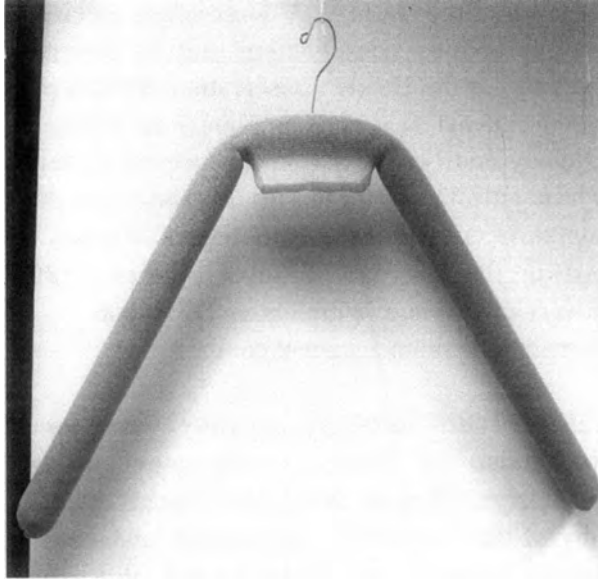


Figure 5. Completed hanger viewed from the side.

the second and third notches is dictated by the waist measurement of each skirt and is usually between 25 and 28cm (10 and 11"). The first and fourth notches are placed about 2.5cm (1") from, and to the outside of, the second and third notches (fig. 2).

2. A 20 x 5 x 5cm (8 x 2 x 2") piece of medium grade Ethafoam sheeting is used to support the center section of the backer rod. The backer rod is first trimmed between the second and third notches to create a flat surface to improve contact between the two. The support segment of Ethafoam sheeting is centered between the second and third notches of the backer rod and adhered with hot melt glue. This piece of Ethafoam sheeting serves to reinforce the central horizontal segment of the hanger so that the backer rod does not

buckle and deform under the weight of the garment.

3. The length of backer rod and Ethafoam sheeting support segment is covered with cotton stockinette. To secure the stockinette, the cut ends are pushed into cross-notches at either end of the backer rod with a bone folder.

4. A piece of wire is cut about 39.4cm (15-1/2") long and shaped using a jig (fig. 3). Sharp ends are sanded to create a smooth surface.

5. Small holes are cut in the stockinette (generally just one thread is enough), on the top and bottom of the center segment of the hanger. Jane Merritt suggests using a pin to ease a hole large enough to fit the wire. These holes for wire insertion should be carefully centered between the inner set of notches, otherwise the hanger will not hang evenly. The straight end of the wire is inserted through the top side of the backer rod and Ethafoam sheeting support segment so that the "hanger" portion sits on the upper side.

6. The bottom end of the wire is turned up on itself, in a "U" shape, so that the end of the wire points directly upwards. A washer is placed on the end of the wire, to prevent movement, and the end is inserted back into the Ethafoam sheeting support segment (figs. 4, 5).

ACKNOWLEDGEMENTS

The authors would like to thank Sara Reiter, Anne Peranteau, and Jane Merritt for their inspiration and also for consultations. Thanks are also due to

CUSTOM SKIRT HANGER

Behrooz Salimnejad, Associate Conservator of Furniture and Woodwork at PMA, who made the jig for bending the hanger. PMA Conservation Technician Lisa Stockebrand appears in figures 1-4; photos are courtesy Joe Mikuliak, Conservation Photographer at PMA.

SOURCES OF MATERIALS

3.9 and 7.8cm (1-1/2 and 3") diameter soft density extruded cylindrical polyethylene backer rod

Nomaco

Tel: (800) 345-7279

www.nomaco.com

5.1 and 7.8cm (2 and 3") cotton surgical stockinette

Sunshine Surgical Inc.

6546 Torresdale Avenue

Philadelphia, PA 19135

Tel: (215) 624-1998

3M Jet Melt (#3792Q) hot melt glue (ethylene vinyl acetate and hydrocarbons)

Hughes Enterprises

2 Industrial Drive

Trenton, NJ 08619-3245

stainless steel soft-temper wire #886K29

McMaster-Carr

PO Box 440

New Brunswick, NJ 08903

Tel: (732) 329-3200

www.mcmaster.com

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