FOR KATHY LUDWIG

It is with profound sadness yet sincere pride in all that she was and did, that we dedicate the 2015 BPG Annual to Kathy Ludwig. She passed away on Saturday, May 16, 2015 after a long struggle with cancer. Until her retirement in July 2014, Kathy had served as a Senior Conservator in the Conservation Laboratory at the National Archives for 17 years. Prior to joining the staff of the National Archives and Records Administration, Kathy was an Archives Conservator at the Minnesota Historical Society.

In preparation for her work in conservation, Kathy earned degrees in Art History and Studio Arts from the University of Minnesota and completed one year of training in art conservation at the Rosary College Graduate School of Fine Arts in Florence, Italy. Kathy was in the first class of conservators who graduated from Columbia University's Conservation Education Program with an MS in Library Service and with a Certificate of Advanced Study in Library and Archives Conservation.

Kathy was passionate about her work. She continued to study and learn throughout her career, taking workshops and seminars on subjects ranging from papermaking, to disaster planning and response, to the history and making of parchment. Kathy always generously shared the knowledge she gained. She developed and taught numerous preservation classes over the years to National Archives staff and volunteers and also imparted her knowledge of materials and conservation techniques to interns and other conservators.

Kathy loved her work at the National Archives. She was a highly skilled conservator and over the years treated thousands of records, including such significant documents as the Monroe Doctrine and the Delaware Ratification of the Bill of Rights. A valued member of NARA's conservator-on-call team, Kathy conducted independent research on drying methods and assisted with the recovery of Orleans Parish records following Hurricane Katrina.

Most importantly, Kathy was a good friend and a valued colleague. She was a thoughtful and reliable presence who always made us smile. We miss her.

THE BOOK AND PAPER GROUP

ANNUAL

VOLUME 34 2015

Papers presented at the Book and Paper Group Session, AIC's 43rd Annual Meeting, May 13–16, 2015, Miami, Florida

The Book and Paper Group Annual

Managing Editor
ELIZA GILLIGAN
University of Virginia Libraries
Charlottesville

Designer
AMBER HARES
Conservation Center for Art and Historic Artifacts
Philadelphia

Editorial Office: 160 Newcomb Rd, Charlottesville VA 22904–4105 434–924–6961 emg3b@virginia.edu

Online Version: www.conservation-us.org/bookandpaper

The *Book and Paper Group Annual* is published once each year in print format by the Book and Paper Group (BPG), a specialty group of the American Institute for Conservation of Historic and Artistic Works (AIC).

The *Annual* is distributed as a benefit of membership to those who were members of the BPG in the date year of the issue. Additional copies or back issues are available from AIC. All correspondence concerning subscriptions, memberships, back issues, and address changes should be addressed to:

American Institute for Conservation of Historic and Artistic Works
1156 15th Street, NW, Suite 320
Washington DC 20005–1714
info@conservation-us.org www.conservation-us.org

The *Book and Paper Group Annual* is a non-juried publication. Papers presented at the Book and Paper Session of the annual meeting of the American Institute for Conservation of Historic and Artistic Works are selected by committee based on abstracts. After presentation authors have the opportunity to revise their papers before submitting them for publication in the *Annual*; there is no further selection review of these papers. Independent submissions are published at the discretion of the BPG Publications Committee. Authors are responsible for the content and accuracy of their submissions and for the methods and/or materials they present. Publication in the *Annual* does not constitute official statements or endorsement by the BPG or by AIC.

ISSN 0887–8978
Printed in the United States of America by Edwards Brothers, Inc.

The paper used in this publication meets the minimum requirements of ANSI/NISO Z39.48–1992,
American National Standard for Permanence of Paper for Publications and Documents in Libraries and Archives.

ANGELA M. ANDRES

Superstorm Sandy: Response, Salvage, and Treatment of Rare Pamphlets from New York University's Ehrman Medical Library

ABSTRACT

This paper will present a case study in the recovery of a small collection of pamphlets from the Frederick L. Ehrman Medical Library at New York University following Hurricane Sandy. The article will cover the immediate recovery operation, long-term salvage treatment, and lessons learned from the project. The Ehrman Medical Library experienced heavy flooding and sustained extensive damage during Hurricane Sandy. After the storm, Ehrman staff turned to the Barbara Goldsmith Preservation and Conservation Department of New York University Libraries to provide assistance with the recovery of approximately 200 water-damaged rare medical pamphlets. Over the following two years conservators carried out salvage treatment on the materials. While early treatments were intensive, conservators found that the salvage workflow greatly affected their regular conservation program and as a result they significantly scaled back the treatment protocol for the pamphlets. While the salvage project was completed successfully, the impact it had on conservation lab operations led conservators to reconsider how they might approach a similar situation in the future, specifically, carefully weighing the benefits and impacts of handling a salvage project in-house versus employing a vendor.

INTRODUCTION

Hurricane Sandy made landfall near New York City on October 29, 2012. Sandy's landfall coincided with the local high tide and two other large regional weather systems, earning it the unofficial designation of "Superstorm" and causing a 14-foot storm surge that inundated lower Manhattan and the East Side with billions of gallons of water, while widespread power outages, flooding, infrastructure damage, and transportation shutdowns occurred throughout New York City and the North Atlantic region.[1]

Presented at the Book and Paper Group Session, AIC's 43rd Annual Meeting, May 13–16, 2015, Miami, Florida

New York University (NYU) Langone Medical Center, which is situated immediately adjacent to the East River, took a direct hit from the storm surge. Hospital staff and emergency personnel evacuated patients as power grids failed and flooding at the Medical Center caused damage to clinical and research facilities, including the Frederick L. Ehrman Medical Library, which is part of NYU Health Sciences Libraries and serves the NYU Langone Medical Center and the NYU School of Medicine.[2] The Ehrman Library is centrally located within the Medical Center complex and occupies three levels; its Lower Level, a sub-basement, was entirely submerged by the storm surge and its next level up (which is a basement level but is referred to as the Ground Floor), was flooded with approximately one and a half feet of water. The uppermost, or Mezzanine, level did not experience any flooding. As the storm subsided and work got underway restoring power and services to the Medical Center, Ehrman Library staff reached out to the Barbara Goldsmith Preservation and Conservation Department at NYU Bobst Library for help with the recovery of their collections.

RESPONSE

Three days after landfall, Conservation Librarian Laura McCann and Special Collections Conservator Lou Di Gennaro of the Barbara Goldsmith Book and Paper Conservation Laboratory at NYU's Elmer Holmes Bobst Library arrived at the Ehrman Library to assist with the recovery effort. At that time, there was still no power in many parts of the city, including at the Medical Center and throughout most of lower Manhattan, and much of the subway and bus system was still not functioning. In addition, there were widespread restrictions on car travel throughout much of the city, so McCann and Di Gennaro made the two-hour walk from their neighborhoods in Brooklyn to the Ehrman Library.

On arriving at Ehrman, the conservators observed the lack of power in the space but little physical damage on the Mezzanine level. Most of the library's rare bound materials were housed on this floor and were therefore not affected

Fig. 1. Staining on stairwell walls indicating the highest level reached by floodwaters.

Fig. 2. One of two cartons containing rare medical pamphlets that were submerged in the floodwater.

by the floodwater. On the Ground Floor, there was staining from floodwaters on cubicle walls, and in the stairwell, more staining on walls indicated the highest level that the water had reached (fig. 1). In the stairwell leading to the Lower Level, several feet of standing floodwater, polluted with sewage and various medical contaminants, completely blocked access to a storage room where map cases and filing cabinets housed prints, photographs, paintings, records, and archival documents.

Although the floodwater had subsided from the Ground Floor, humidity levels in the building were very high. It was early November, but the weather outside was quite mild in the days after the storm so conservators opened up as many windows as possible to promote air movement and reduce the potential for mold growth. Nearby, workers from the disaster recovery firm Belfor were at work on the larger Langone Medical Center recovery; Ehrman Library did not have an existing disaster response contract in place but administrators quickly contracted Belfor to conduct the library recovery effort. To aid Belfor and the conservators in focusing their efforts, Ehrman staff hastily drew up maps to help locate items that had been identified as salvage priorities during a recent inventory of Ehrman's collections. Belfor would handle the removal and safe storage of all unaffected collections—both special and general—as well as disposal of affected general collections designated as irrecoverable by Ehrman staff. It was also agreed that Belfor would conduct the salvage of the contents of the submerged Lower Level at such time as it was deemed safe to be entered. With Belfor's role well defined, Ehrman Library staff were able to concentrate on salvaging vital computer equipment and restoring basic library functions to provide continuity of service to the Medical Center community.

The majority of affected collections at Ehrman were from the general collection; nearly all of the special and rare

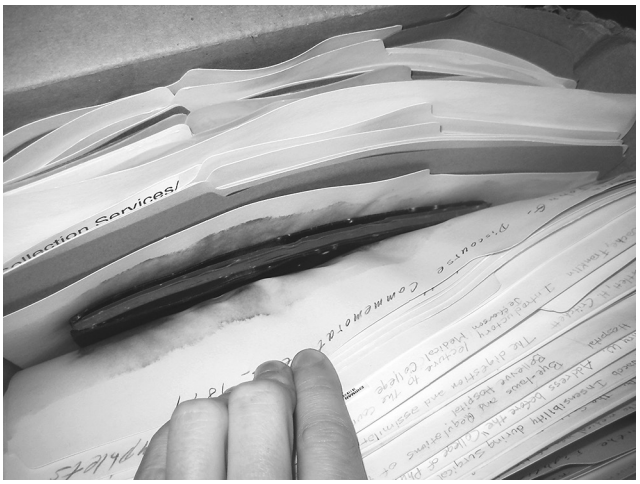


Fig. 3. Detail of water-damaged pamphlets in wet carton.

Fig. 4. Pamphlets laid out to dry in a Medical Center conference room.

materials were either unaffected and being packed up for safe storage, or they were still submerged and inaccessible in the Lower Level. However, two record cartons containing approximately 200 rare medical pamphlets were found on the Ground Floor underneath a desk in a cataloger's office where they had been temporarily stored (fig. 2). These materials belong to the Lillian and Clarence de la Chapelle Medical Archives of the NYU Health Sciences Libraries, which includes works by prominent physicians and founding members of the NYU School of Medicine. These two boxes had been completely submerged, and the conservators turned their attention to these materials (fig. 3).

Although the cartons and folders had begun to dry partially, mold growth was evident on a small number of the pamphlets. The conservators began triage recovery work in a conference room located in another part of the Medical Center complex, where large windows provided both light and ventilation. Conservators removed and discarded the wet folders the pamphlets were stored in, retaining just the top edges of folders with bibliographic information and barcodes, and placed the pamphlets on tables lined with plastic sheeting (fig. 4). They worked until nightfall, when the lack of electricity made it necessary for all personnel to leave the building.

The conservators returned the next day to continue the work, but it was clear that the pamphlets would need to be frozen to prevent mold. With the ongoing power outages citywide there was no immediate prospect of finding a working freezer or freezer truck, and any such equipment that could be spared was being put to use supporting the damaged medical facilities. However, NYU's Bobst Library, some 30 blocks downtown from Ehrman, was one of the few buildings in lower Manhattan that hadn't lost power during the storm due to its connection to NYU's cogeneration power plant, and the preservation department in Bobst had a freezer that could accommodate the pamphlets. The conservators wrapped the pamphlets in sheets of absorbent polyester/cellulose nonwoven cloth from Ehrman's disaster response kit and packed them into totes to be transported via taxi to Bobst Library. At the conservation lab in Bobst, conservators unwrapped the pamphlets and removed the saturated absorbent sheets, then divided the pamphlets into small groups separated by waxed paper, and put them into polyethylene zip-top bags which they then placed in the freezer.

SALVAGE TREATMENT

Over the next two years, the conservators carried out the recovery and treatment of the pamphlets by working on one or two frozen groups each week. NYU's three full-time conservators—McCann, Di Gennaro, and the author—conducted the treatments in alternating turns, with undergraduate and graduate student employees sometimes assisting with the treatments.

The conservators established a treatment protocol for thawing each batch of frozen pamphlets. First, a pamphlet would be placed whole into a plain water bath and allowed to thaw, then transferred to another tub and disbound while in the bath using either scissors to cut thread or microspatulas to release staples or other fasteners (fig. 5). Conservators used brushes to help separate pages and to dislodge dirt deposited by the floodwaters and adhesive residues from pamphlet binders or previous repairs. As individual folios or leaves were removed from the bath they were placed in a stack of absorbent non-woven sheets, and when each pamphlet was stacked it was transferred to a drying rack and allowed to air dry (some dried pamphlets required pressing but most did not). Conservators or student assistants then collated and reassembled the dry pamphlets and evaluated them for further treatment, always being careful to keep the original barcoded folder fragments with their corresponding pamphlets.

In the early days of the project, most pamphlets treated received extensive surface cleaning, mending, guarding, and rebinding into original covers or new paper covers, but progress was considerably slower than had been initially

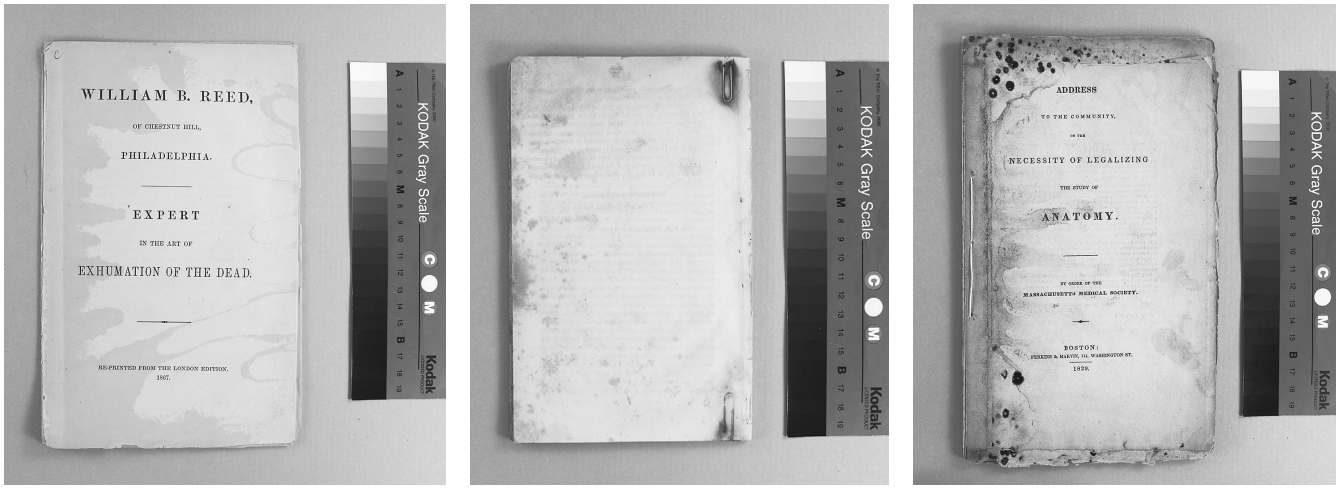
Fig. 5. The author working on thawed pamphlets in a water bath.

estimated. It became clear to the conservators that the pamphlet workflow was too unwieldy to effectively integrate into the conservation lab's everyday program. In order to advance the pace of the project, conservators greatly scaled back the level of treatment performed on individual pamphlets. Considering how dirty the floodwater was, thorough surface cleaning was deemed necessary for all of the pamphlets. However, conservators were increasingly selective about employing advanced interventions; they did only very simple resewing (where the volume could support it) and/or minimal guarding/mending (when absolutely necessary to facilitate handling). In time, the conservators simplified the treatments even further; they stopped doing nearly any guarding or resewing altogether, and most pamphlets received only minimal mending for stabilization.

At around the time that the conservators were making these changes they were informed by Sushan Chin, Archivist at Ehrman Library, of plans to digitize some or all of the pamphlets in this collection. This development provided a further justification for the reduced treatment protocol, as leaving the pamphlets disbound would facilitate the digitization process. Ehrman Library also provided some funding to cover a part-time contract assistant conservator to work on the pamphlets, and this staffing addition did relieve some of the stress that the project placed on NYU's regular conservation program. Work on the project continued at a steady pace through August 2014, when the last group of frozen pamphlets was thawed, and in December 2014, the treated pamphlets were returned to Ehrman Library. Because Ehrman is still operating out of a temporary space more than two and one-half years after Hurricane Sandy, the pamphlets are currently being stored at NYU Libraries' remote storage facility.

The majority of the pamphlets emerged from the treatment in surprisingly good condition. Most pamphlets are stable following treatment but have cosmetic damage such as extensive staining from the starched cloth spines, hinges, and covers of old pamphlet binders, or from the colored paper covers of the pamphlets themselves (fig. 6). In some cases the water exposure exacerbated existing damage from fasteners, resulting in rust staining and losses or weakening of paper (fig. 7). As expected following a flood event some items did have mold, but this number was relatively small: 10 items—approximately 5% of total volumes—received additional mold remediation after thawing, which included surface cleaning and a light spray of alcohol solution (fig. 8)[3]. In the offsite facility where the pamphlets are stored, carefully monitored environmental conditions should inhibit reactivation of the mold; in addition, notes on mold remediation are included in the treatment documentation so that archivists and conservators can monitor vulnerable items.[4]

For this project, conservators treated 223 items total, including the 205 pamphlets from the wet cartons and 18 rare books that were retrieved from the top of a desk in the same office where the pamphlets were found. (The books were not directly affected by the floodwater but were in need of surface cleaning and protective enclosures.) Most of the titles treated (164 items) are 19th century imprints; of the rest, 34 are 20th century imprints and 26 date from the 18th, 17th, or 16th centuries. Conservators spent a combined total of 534.5 treatment hours on the project (including 155 hours for the contract conservator) with an average treatment time per item of approximately two and one-quarter hours.



LEFT TO RIGHT

Fig. 6. A pamphlet with staining caused by the floodwater.

Fig. 7. Rust staining and damage from paperclips.

Fig. 8. An exceptional example of mold growth on a flood-damaged pamphlet.

SUCCESSES AND LESSONS LEARNED

In looking back on how this project unfolded, the conservators can point to a number of successes along the way that can be attributed either to good planning or just fortunate circumstances. One critical factor was engaged leadership from Ehrman Library administration. The recovery effort was aided by good collection control at Ehrman, where a relatively recently updated disaster plan and an even more recent inventory with identified collection priorities were extremely helpful in the immediate salvage and recovery. Ehrman Library staff and administrators also acted quickly in securing a contract with Belfor and were very responsive to recommendations by Belfor and conservators. In addition, there was an effective division of labor for the cleanup effort. Belfor had the bulk of the collection recovery well in hand so that Ehrman Library staff were able to focus on restoring their core services, and two conservators were perfectly adequate to handle the rare materials that needed attention; any more people would have been redundant and inefficient. Concerning the removal of the pamphlets from Ehrman to Bobst, all parties—Ehrman staff, conservators, and Belfor—agreed that these materials needed immediate attention and supported their transfer to a facility that could house them; the move was the best decision under the circumstances.

Although the plans to digitize the pamphlets came after the salvage treatment project was already underway, this was a silver-lining development. Ehrman archivists seized this opportunity and in doing so, just at the time when conservators were coming to grips with managing the pamphlet workflow, allowed conservators to cut back the level of treatment and relieved some of the strain caused by this project. Individual pamphlets can always be evaluated for additional treatment in the future if archivists determine that there is a need for it. The necessary removal from the pamphlets of many non-contemporary, acidic, restrictive or otherwise harmful pamphlet binders can also be seen as a positive result of this event. Despite having been subjected to the stress of being immersed in floodwater, frozen, and immersed once again in the thawing process, many of the pamphlets are more stable and accessible now than they were before the flood.

However, the significant investment of resources that the pamphlet salvage project demanded greatly impacted conservation lab operations, ultimately affecting the core conservation program even after streamlining of the pamphlet treatment procedure. This led conservators to reconsider how they might approach a similar situation in the future. Before taking on the treatment, conservators should have more carefully weighed the impact of handling a salvage project in-house versus employing a vendor or hiring a contract conservator from the outset. Conducting trials of varying treatment levels on a sampling of pamphlets, for instance, may have given conservators a better sense of how many treatment hours the project would require.

Once the conservators had committed to treating the pamphlets, it would also have been beneficial to explore additional funding sources to reduce the financial impact of the project. Ehrman Library had a small readily accessible fund from which they were able to cover the contract conservator's salary and the cost of some supplies, but securing additional funding would have been complicated because Ehrman's institutional systems were severely disrupted by the storm[5]. In addition, it might have been helpful to engage curators from the collections normally served by the conservation lab in a discussion about the potential for a reduction in conservation services resulting from the salvage project. By clearly communicating this possibility the conservators could have alleviated some of the pressure they felt to continue to deliver at normal capacity while the pamphlet project was ongoing.

With the benefit of hindsight, the conservators recognize that the highly charged emotional climate in their surroundings following Hurricane Sandy played a powerful role in affecting their decision-making and may be the most important factor that prevented their considering the salvage treatment undertaking as critically as they might have. Sandy was an extremely devastating storm and the conservators, like many others in the region who were not personally affected by the storm but were witness to the destruction it caused, had a very strong feeling of wanting to help in whatever way they could. While taking physical custody of the pamphlets was certainly the right thing to do, this should have been only a temporary solution. The conservators realize in retrospect that once the pamphlets were in their possession it was very difficult to let go of their sense of custodial responsibility toward the materials.

Although the conservators acted with the best of intentions, the obligation they felt to take care of the pamphlets prevented them from clearly seeing that sending the pamphlets to a vendor for treatment would have been the better solution for this project. Participation in disaster response and recovery efforts is an important service that the conservation lab provides to the NYU community, but the scale of the treatment portion of this project was beyond what could be comfortably accommodated in a busy, multifunctional academic library conservation lab with a small staff. A disaster recovery firm or regional conservation center, on the other hand, would be adequately equipped and have well-established procedures in place for large-scale salvage treatments.

CONCLUSION

It has now been nearly three years since Hurricane Sandy. The Ehrman Medical Library remains closed to the public while its administrative offices operate out of a temporary space; the renovated library is expected to reopen in late 2015. For

all of the challenges that they encountered along the way, the conservators at NYU consider the outcome of the project to be a success. They continue to apply the lessons they learned in practical ways both small and significant, from investing in a larger freezer and finding new ways to incorporate the versatile polyester/cellulose non-woven material—which had been so useful during the pamphlet recovery—into more treatments, to improving the conservation lab's documentation procedures and revising NYU Libraries' disaster response and recovery plan.

ACKNOWLEDGEMENTS

The author would like to thank Laura McCann, Lou Di Gennaro, Paula De Stefano, Fletcher Durant and the Book and Paper Group of AIC, Sushan Chin, Claire Kenny, and Cathleen Andres. All photographs are courtesy the Barbara Goldsmith Preservation and Conservation Department at New York University Libraries.

NOTES

1. "Effects of Hurricane Sandy In New York," Wikipedia, accessed May 11, 2015, https://en.wikipedia.org/wiki/Effects_of_Hurricane_Sandy_in_New_York.
2. J. David Goodman and Colin Moynihan, "Patients Evacuated From City Medical Center After Power Failure," New York Times, October 30, 2012, http://www.nytimes.com/2012/10/30/nyregion/patients-evacuated-from-nyu-langone-after-power-failure.html?_r=0.
3. Conservators always wore nitrile gloves during thawing procedures and used a dedicated fume hood for mold remediation that is located in a dirty room separate from the lab. Any additional mold cleaning was done in that room with appropriate PPE (fitted half-face respirators, gloves) and a HEPA-filter vacuum. Pamphlets with mold were treated with a 70% alcohol solution modeled after Conservator of Textiles and Historic Objects Elise Yvonne Rousseau's presentation at the 42nd annual meeting of AIC in 2014, "New Approaches in Comprehensive Mold Remediation & Recovery." The solution is comprised of 12 parts isopropanol, 8 parts Ethanol, 2 parts Hydrogen peroxide, and 5 parts distilled deionized water. In a fume hood, objects were sprayed with the solution, allowed to air dry, cleaned with low-suction HEPA vacuum, brushed with the alcohol solution, blotted, and cleaned again with HEPA vacuum.
4. Conditions at NYU's remote storage facility are kept at 50°F and 35%RH [+-5%].
5. Sushan Chin, email message to author, February 26, 2015.

ANGELA M. ANDRES
Special Collections Conservator
New York University Libraries
New York, NY
angelaandrestwo@gmail.com

SARAH BERTALAN

Foxing and Reverse Foxing: Condition Problems in Modern Papers and the Role of Inorganic Additives

ABSTRACT

Works of art on modern papers are known for their conservation treatment challenges. Many do not respond predictably to typical conservation treatment procedures. Stains and discoloration that have been successfully addressed will reappear, in some instances, almost immediately after treatment. An ideal, or successful, treatment begins with a knowledge of materials and the chemical reactions that cause condition problems. However, because of omissions in theory, paper conservators may lack accurate information about the complexity of the works of art in their care.

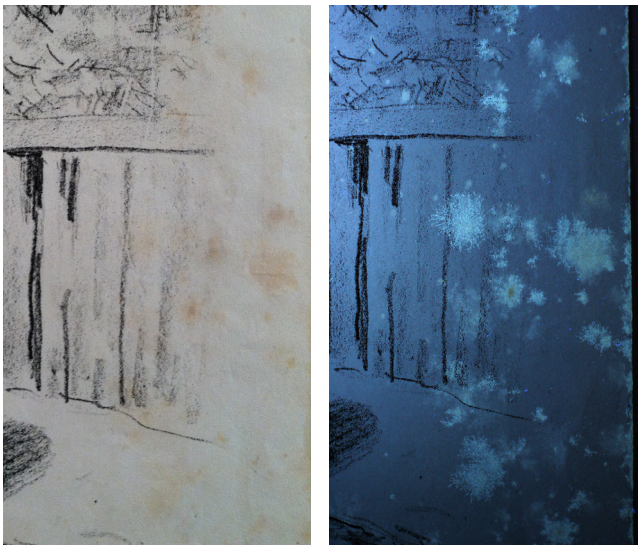
We may lack information in part because our field has adopted theory and terminology from the paper making and paper testing literature. Paper condition is described in terms of cellulose and carbohydrate chemistry. Tests designed to assess cellulose condition employ un-aged samples or specially-prepared test papers. Overall darkening or local disfiguring stains that may develop in paper over time are problems that are not explored by the paper manufacturing industry and its testing body. Paper conservators are in a unique position to observe and document the condition of modern papers over time.

When maintained in a stable museum environment, modern papers retain their original, neutral, off-white tone. Extreme condition problems are more likely to develop when works of art on modern papers have been in private hands. An alternative explanation of condition problems is suggested by the systematic examination and treatment of such late nineteenth- and early twentieth-century works of art. Observation and treatment over more than thirty years suggested that the instability of modern papers may be due to something other than cellulose degradation. The inorganic additives widely employed in modern paper manufacturing processes may be a source of discoloration in modern papers. Both foxing and reverse foxing may occur because inorganic additives in paper react. This alternate theory is suggested by the condition of works of art, among them, the examples illustrated below.[1] (Fig. 1)

Presented at the Book and Paper Group Session, AIC's 43rd Annual Meeting, May 13–16, 2015, Miami, Florida

MODERN PAPERS OBSERVED

An extreme example of reddish-brown foxing stains on medium-weight, smooth-textured, off-white, wove paper is shown in Figure 1. The stains appear to be spreading and growing from a dense center, another characteristic of foxing. Under ultraviolet light (Fig. 2), the reddish-brown stains fluoresce white and yellowish-white. Organic hyphae of mold absorb ultraviolet light and do not fluoresce. When closely examined under ultraviolet light, the areas of foxing resemble dendrites or efflorescence. This example suggests that something other than mold growth has occurred.



LEFT TO RIGHT

Fig. 1. Camille Pissarro, *Rue*, ca. 1890, lithograph, H. 14 1/4 x W. 10 13/16 inches, detail of foxing stains.

Fig. 2. Camille Pissarro, *Rue*, ca. 1890, lithograph, detail of foxing stains, ultraviolet light.

Fig. 3. Edouard Vuillard, *A Travers Champs*, 1899, lithograph, H. 12 1/4 x W. 15 7/8 inches, verso, after treatment, ultraviolet light.

Figure 3 shows a lithograph on China paper under ultraviolet light after treatment. (Fig. 3) Papers from China were highly valued in Europe and used for luxury editions in the nineteenth century. These papers often exhibit brownish stains throughout. Treatment of this lithograph consisted of immersion in pH adjusted deionized water and flattening. Treatment successfully addressed the discolored areas, which were no longer visible as brown stains in normal light. However, when the print was examined under ultraviolet light after treatment, all of the areas that had been brown are still distinct and fluoresce white. The areas are no longer brown in normal light but have not been removed from the paper. This is only one example to illustrate that after typical conservation treatment procedures, previously stained areas remain distinct from the surrounding paper and have not been "rinsed away." Invariably, these areas fluoresce brightly under ultraviolet light.

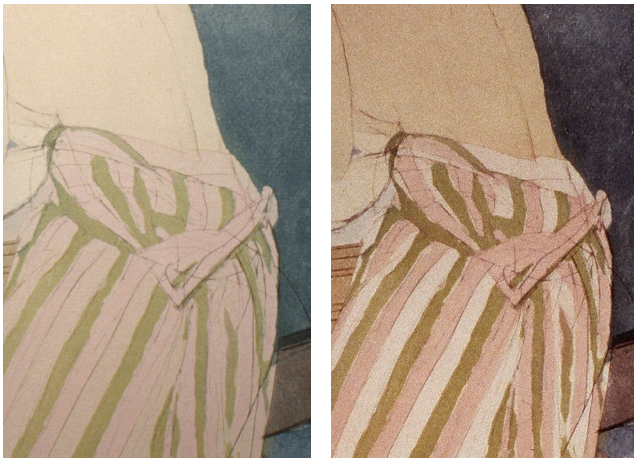
Local discoloration is often observed when a component of the paper has been unevenly dispersed or clumped within the fibrous cellulose web. In figure 4, there are several dense spots in the paper in normal light. (Fig. 4) In transmitted light, the area appears dark and more opaque than the surrounding paper. (Fig. 5) Rather than a stain, there appears to be something in the paper that is not an accretion but part of the paper composition.[2] Over time, the area has aged differently than the surrounding paper and appears discolored.

Often, unusual colors develop in modern papers. The tone shifts toward a very even warm beige, orange or pink. Color shifts so extensively and evenly that it can be difficult to determine the intended tone of modern papers. In figure 6, the colors of the stripes of the garment appeared to be green, pink and beige but this was not the original palette. (Fig. 6) When contrasted with another impression, it becomes evident that the stripes of the garment are intended to be pink, green and un-inked paper. (Fig. 7) This example demonstrates how

LEFT TO RIGHT

Fig. 4. Henri Matisse, *Grand Bois*, 1906, woodcut, H. 22 5/8 x W. 18 inches, detail, dense area in paper.

Fig. 5. Henri Matisse, *Grand Bois*, 1906, woodcut, detail, dense area in paper, transmitted light.



LEFT TO RIGHT

Fig. 6. Mary Cassatt, *La Toilette*, 1890, etching, H. 15 5/8 x W. 12 3/16 inches, printed in color, detail, altered paper tone.

Fig. 7. Mary Cassatt, *La Toilette*, 1890, etching, printed in color, detail, intended paper tone.

far the tone of modern papers will change from the neutral, off-white color originally intended.

Many European papers dating from the turn of the 20th century and up until the 1940's change color when works of art are exposed to daylight. Colors include brown, orange-brown and even black. Generally, the verso is unchanged, the extent of the stain is not matched or a very different stain

pattern has developed. This condition problem is colloquially referred to as "light staining." An extreme example is illustrated in figure 8. (Fig. 8) The extent of "light stains" on modern papers suggest that they are highly sensitive to unfiltered daylight.[3] Later in the twentieth century, although paper tone does not change to such an extent, any portion of a modern paper that is covered by a mat will invariably age differently from the area within the window.

Stains in many modern papers appear to be extreme but are superficial. Changes in paper tone appear to occur as a result of precise contact rather than migration. Figures 9 and 10 show an example of a relatively thin paper. (Fig. 9) (Fig. 10) The margins had been folded under to fit its frame. The extensive, dark stains have not migrated through the sheet. Darkening has occurred only in the areas in direct contact with poor-quality framing materials. All of the discoloration has stayed at the surface.

Reverse foxing is most often observed on Van Gelder Zonen wove papers. In the example illustrated in figure eleven, the verso of the sheet was extensively darkened. (Fig. 11) It was also disfigured by large blotchy, white patches of "reverse foxing." This is not a case of adhesive protecting paper tone from acid migration. No adhesive was applied to

Fig. 8. Edgar Degas, *Mary Cassatt at the Louvre: Etruscan Gallery*, 1879–80, etching, H. 16 5/8 x W. 12 1/8 inches, detail, "light stain".

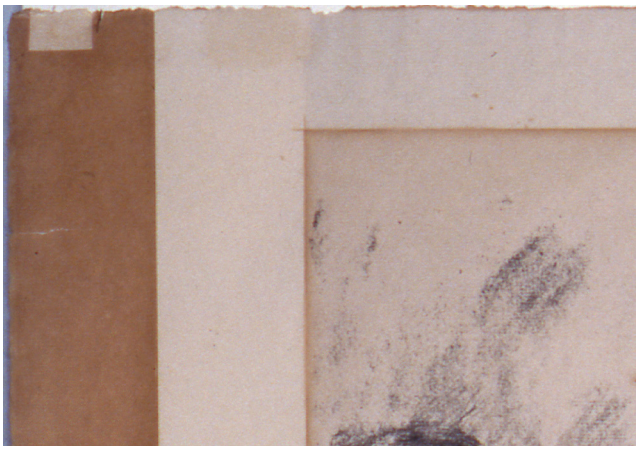


Fig. 9. August Renoir, *Maternité*, 1912, lithograph, H. 18 3/4 x W. 24 7/8 inches, overall, before treatment.

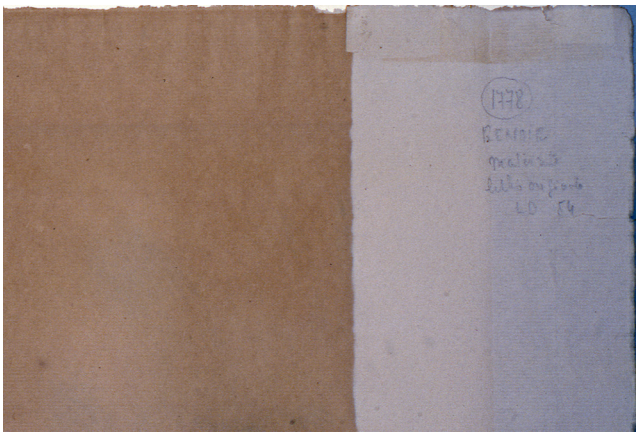


Fig. 10. August Renoir, *Maternité*, 1912, lithograph, overall, before treatment.

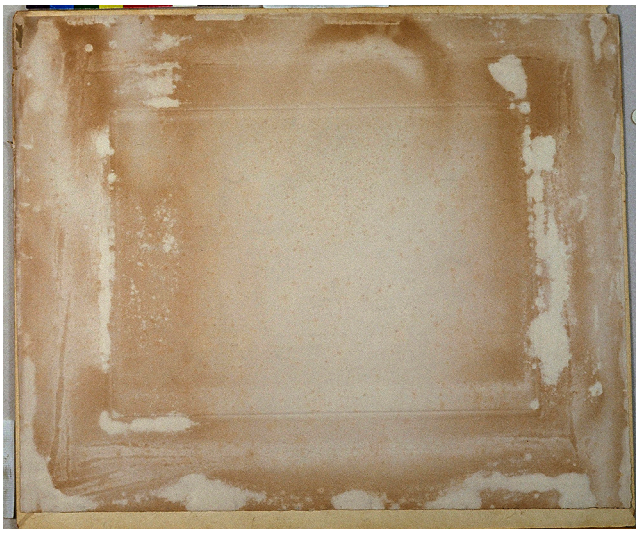


Fig. 11. Luigi Kasimir, *Winter Landscape*, 19ll, etching, H. 19 1/2 x W. 24 inches, verso, before treatment.

the verso. Adhesive was applied only on the recto and does not correspond to the broad, amorphous shape of these white areas. The print had not undergone previous treatment but it had been drum mounted to its window mat.[4]

These and numerous additional examples examined by the author suggest that:

- Foxing "growth" may not be caused by mold.
- Aqueous treatments may not remove or rinse discoloration out of paper.
- Modern papers may contain something other than cellulose or metal inclusions that cause local discoloration.
- Overall discoloration in modern papers can be extreme, making it difficult to determine the intended paper tone.
- Modern papers are prone to extreme darkening with exposure to unfiltered daylight.
- Stains are superficial and appear to be due to direct contact at the surface rather than migration.
- Examination with ultraviolet light provides invaluable clues, both before and after treatment.

MODERN PAPERS—THE PAPER CONSERVATION LITERATURE

When a paper conservator consults the literature, theory contradicts experience:

- Condition problems in modern papers are generally attributed to poor-quality fiber but significant condition problems occur on papers composed of linen, cotton and Asian bast fibers.
- Paper condition and discoloration are explained in terms of carbohydrate chemistry. Both oxidation and acidity cause cellulose degradation and paper darkening. In practice, modern papers do not respond predictably to conservation treatment procedures that, in theory, address cellulose degradation. Often, stains reappear.
- Conservation treatment improves the condition of cellulose by removing water-soluble by-products of cellulose degradation. In practice, examination under ultraviolet light reveals that, after many typical conservation treatment procedures, formerly discolored areas remain distinct and have not been "rinsed away."
- Acids migrate into cellulose. However, numerous examples suggest that stains are superficial and may be caused by contact rather than migration. The surface of a modern paper can react as a kind of litmus test of contact with both acidic and alkaline housing materials.
- Alum rosin is most frequently blamed for unusual colors. In practice, the papers that exhibit the most extreme orange-beige or pink tones are hand-made papers manufactured before alum-rosin size came into use for machine paper making. Alum-rosin size is unlikely to be present in papers manufactured for fine art printing.
- Metal content in paper is always accidental and repeatedly attributed to bits of paper-making machinery that inadvertently find their way into the pulp slurry. Empirically, non-destructive analysis detects iron content throughout modern papers.
- Foxing is defined as reddish-brown, round stains that occur in a random pattern throughout a sheet.[5] The debate has never been resolved as to whether foxing stains are due to mold or caused by metal-induced degradation of cellulose. Again, metal content is always there by accident. In practice, the appearance of "foxing" under ultraviolet light contradicts that of organic mold growth.[6]
- Reverse foxing is rarely seen. It is undefined and the cause is not known. It is discussed almost exclusively with regard to Van Gelder Zonen wove papers. Uneven deposition of size is mentioned in the literature but this isn't a very likely explanation for printmaking papers that are lightly sized or unsized. Empirically, reverse foxing is also observed on other modern papers. Areas of reverse foxing appear as a paper dries or after a paper has fully dried after typical aqueous conservation treatment procedures.

INORGANIC ADDITIVES—THE TECHNICAL AND HISTORICAL LITERATURE

Apart from the aluminum sulfate in alum-rosin sizing, the role that inorganic additives may play in the condition of works of art is not acknowledged in the paper conservation literature.[7] Although almost entirely absent from the paper conservation literature, the technical literature and periodicals of the paper industry are filled with references to inorganic additives. In the paper testing literature, inorganic additives are acknowledged but their potential to effect condition is generally dismissed. In small percentages, inorganic additives do not interfere with inter-fibril bonding and are non-damaging to cellulose fiber. Inorganic additives are reported in the forensic analytical literature where they are useful for paper dating.

Beginning in the nineteenth century, and inherent to the science of paper making today, non-fibrous, inorganic additives were routinely and selectively added to fiber stock to increase opacity, modify texture and absorption, fill gaps and determine paper tone. Long before the end of the 19th century, paper had evolved from craft to science. As the uses of paper multiplied, inorganic additives were found to modify fiber stock to suit many purposes. Inorganic additives act as fillers, brighteners and opacifiers. They aid in drying and improve ink retention. Additives increase bulk and are cost-effective. Finely-divided inorganic particles tend to settle at the surfaces where the newly-formed sheet dries first. Thus, physics puts them where the paper manufacturers want them. Paper conservators are familiar with many of the paper

additives listed below and acknowledge their use as coatings for commercial printing rather than fine art papers. However, inorganic additives were also mixed into fiber stock.

A Chronology of Inorganic Paper Additives:

Barium Sulfate	1820
Calcium Sulfate (gypsum)	1823 (Europe)
Clay	(1807), mostly after 1870
Satin White (coatings)	1879-1880 (England, Germany)
Zinc Sulfide	After 1932
Calcium Carbonate	About 1925-1927
Titanium Oxide	(1906) 1930
Zinc Oxide	About 1933
Diatomaceous earth	About 1938

Browning, B.L. Analysis of Paper. Appendix XIX. New York, 1969

Paper manufacturers also added dry pigment to pulp. Paper conservators acknowledge that something called "bluing" is used by the industry to make papers appear less yellow. "Bluing" is not a benign organic dye. It's usually synthetic ultramarine (sodium aluminosilicate), smalt (silica) or Prussian Blue (potassium ferrocyanide).[8] Thus, modern European papers were further complicated by these unstable, inorganic pigments. It is less well-known that naturally occurring earth colors or synthetic iron oxide pigments were used in hand-made Dutch, French and English papers in the nineteenth century. This kind of mechanical coloring is traditional and requires no mordant. Dry pigment is simply dispersed in the pulp slurry.[9] This practice has serious consequences for paper conservators because mechanically-toned papers were exactly the type of paper sought by artists for etchings.

Extensive information about inorganic additives is found in the paper making and paper testing literature. Paper manufacturers consider small amounts of inorganic additives non-damaging to cellulose fiber.[10] However, impurities in mineral additives and the metal oxides employed by the paper industry are not inert in the conditions that are known to cause damage to works of art. When selected for a work of art, these complex substrates undergo rigorous, unpredictable and uncontrolled processes. Over a long lifetime, many works of art on paper reside in unstable environments with fluctuating temperature and humidity. Affixed to a wall, they may be exposed to acidic mats and unfiltered daylight for decades. These papers are also subject to intervention by restorers, framers and paper conservators. Over time, papers with additives may develop foxing or reverse foxing stains, become "light stained" within a window mat, "time stained" at a sheet's edges or "burned" by acids exposed at the beveled edge of a poor-quality mat. Given the chemistry of the inorganic additives employed for modern paper making, it is possible that additives, rather than cellulose, have reacted under these uncontrolled conditions.

The inorganic additives employed by the paper industry are primarily naturally-occurring minerals and metal oxides. When naturally occurring minerals are added to papers, impurities such as iron, calcium, manganese and potassium are inevitably present. These impurities act as salts and readily undergo acid-base reactions. The earth colors or iron oxides used to tone papers are among the most reactive compounds on earth. As in nature, these additives are unstable in the very conditions that make paper into a work of art and in the conditions known to cause damage to works of art on paper over time - fluctuating humidity, daylight and low pH.[11] The extreme and inevitable color changes that occur in modern papers in daylight may be due to the photo-catalytic properties of metal oxides.[12] The naturally-occurring iron oxides (earth colors) and the synthetic iron oxides added to late nineteenth- and early twentieth-century papers may be the cause of foxing and reverse foxing. With pH changes, when the paper is wet, or in the presence of other elements in the paper, air or water, these additives undergo reactions and form new compounds that crystallize on the surface or within the fibrous web. Each time the paper is wet and dried as the art is made, and each time the paper undergoes humidity changes over its lifetime, conditions for crystal formation occur.[13]

When the historical and paper conservation literature is searched, documentation of condition problems can be found. Papers from China were the preferred support for luxury print editions.[14] We know from the historical literature that this paper tended to develop stains. Writing in 1874, the French bibliophile Alphonse Lemerre advised collectors that humidity hastened the development of little spots on Chinese paper, and that spots could develop within a year.[15] One need only examine a clay-filled paper from China or Japan under ultraviolet light to see many brightly fluorescing impurities throughout. They are prone to discolor in uncontrolled conditions over time.

As for the iron oxide pigments in European papers, references in the paper making and historical literature can also be found. Lumsden writes in his etching manual, "In nearly all modern paper, the pigment employed is too crudely yellow. For beauty of colour, one has to rely upon Japan."[16] George Plowman gave the following instructions in his treatise on etching, "Old account books of handmade French or Dutch paper are much sought after by etchers. Dry out any paper that may be left after printing before putting it away, as it is liable to mildew."[17] In 1880, when the results of an inquiry into the poor quality of nineteenth-century British papers was published, the authors stated that "the earth pigments employed in papers are reactive compounds" and "... there are few papers made which do not receive some addition of coloring matter."[18]

When evenly dispersed in a sheet and exposed to daylight, metal oxide additives sensitize paper to light. A clue to the light sensitivity of papers containing metal salts comes from

the literature regarding historic photographic processes. The earliest photographic images were salted paper prints, produced by exposing paper coated with metal salts to sunlight.[19] Any portion of a modern paper that is covered with a mat will inevitably differ in tone, not because of acidity but due to the photo-catalytic activity of metal oxide pigment additives. This is frequently a problem with Picasso's linocuts from the 1960s. Judging from the condition of prints by Robert Motherwell, Jasper Johns, David Hockney and Lucien Freud in private hands, when any portion of a modern paper is covered by a mat, differential coloring of the sheet will occur over time.

Two articles in the conservation literature provide the context and vocabulary for a new interpretation of foxing and reverse foxing. In 1998, Ordonez and Twilley published a paper about salt crystals on the surfaces of paintings. The authors identify the multiple inorganic additives in modern media and suggest that salts from additives effloresce on painting surfaces. In 2007, Deborah La Camera published her findings on crystal formations within iron gall ink. It is interesting that many of her examples are not early ink formulations but inks used by nineteenth-century artists on contemporary papers. When we observe foxing and reverse foxing, we may be seeing efflorescence and crystal formation, the reactions of inorganic iron oxide pigments in paper.[20]

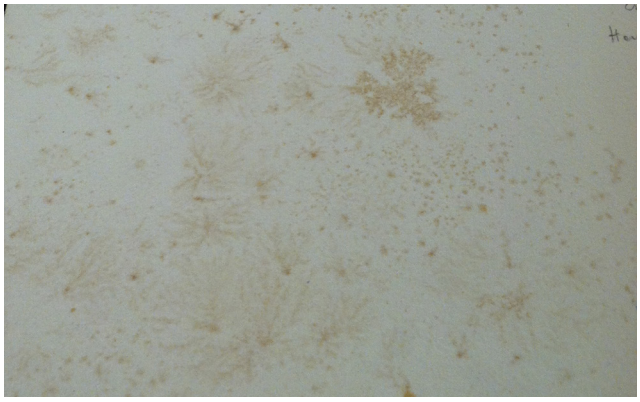


Fig. 12. Detail. Inorganic crystals formed along cellulose fibers in paper.

INORGANIC ADDITIVES—FOXING AND REVERSE FOXING

This paper is intended to suggest that paper conservators begin to consider foxing as crystal growth or polymerization. Frequently, crystals or salt efflorescence are observed inside a framed work of art. These are generally explained by weeping glass or off-gassing from acrylic glazing. However, such crystals may arise not from glazing or media but from inorganic components in paper. Crystals form under the same conditions as mold. On a surface, their fluffy appearance may suggest organic growth. In paper, they may form along cellulose fibers and resemble the spreading mycelia of mold. (Fig. 12)

A component in the handmade Dutch paper illustrated in figure 13 has reacted and darkened over time. (Fig. 13) This is especially visible in transmitted light. (Fig. 14) The Arches

LEFT TO RIGHT

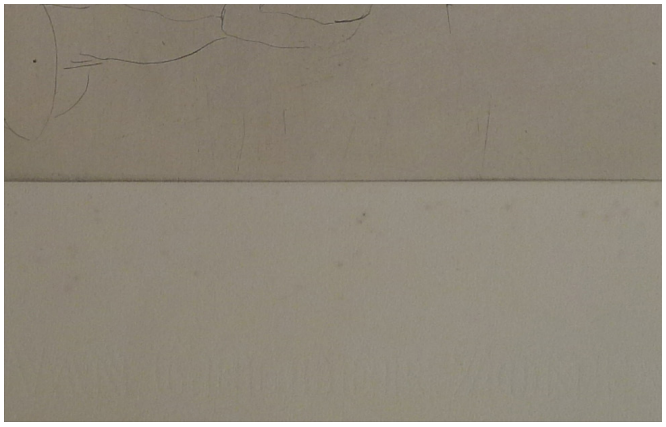
Fig. 13. Mary Cassatt, *Gardner and his Mother,* 1889, drypoint, H. 14 x W. 8 3/8 inches, overall, before treatment.

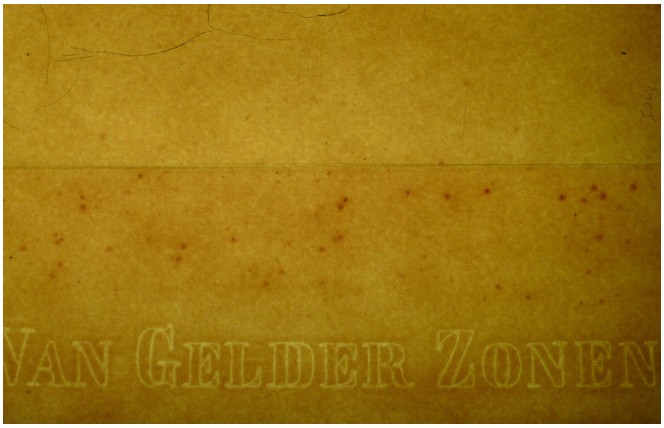
Fig. 14. Mary Cassatt, *Gardner and his Mother*, 1889, drypoint, overall, before treatment, transmitted light.

LEFT TO RIGHT

Fig. 15. Henri Matisse, *Jazz*, 1947, pochoir, H. 16 1/2 x W. 25 1/2 inches, detail, "stain" due to dense component in paper.

Fig. 16. Henri Matissse, *Jazz*, 1947, pochoir, detail, "stain" due to dense component in paper, transmitted light.





LEFT TO RIGHT

Fig. 17. Pablo Picasso, *Family of Saltimbanques*, 1905, etching, H. 25 7/8 x W. 20 inches, detail, dense component in paper.

Fig. 18. Pablo Picasso, *Family of Saltimbanques*, 1905, etching, detail, dense component in paper, transmitted light.

paper used for Matisse's pochoir prints would have been repeatedly wet and dried during printing. In normal light, the detail of a Jazz print in figure 15 appears unstained. (Fig. 15) With transmitted light in figure 16, opaque areas in the paper are visible under the ink. (Fig. 16) Stains will predictably develop when this paper is kept in damp conditions. The beginnings of disfiguring local reactions are visible in a detail of an untreated Van Gelder Zonen wove paper. (Fig. 17) This paper was employed for the Saltimbanques series published by Vollard in 1905. In transmitted light, additional dense areas are revealed. (Fig. 18)

Reverse foxing may be related to a phenomenon often observed by paper conservators that may be termed "reverse media patterns." The Jazz print illustrated in figure 19 was exposed to excessive light and framed against a corrugated

Fig. 19. Henri Matisse, *Jazz*, 1947, pochoir, H. 16 1/2 x W. 25 1/2 inches, verso, overall.

Fig. 20. Henri Matisse, *Jazz*, 1947, pochoir, verso, detail, top left corner.

Fig. 21. Detail of hinge on twentieth-century paper.

Fig. 22. Pablo Picasso, *The Frugal Repast*, 1904, etching, H. 25 7/8 x W. 20 inches, detail, "reverse foxing".

Fig. 23. Pablo Picasso, *The Frugal Repast*, 1904, etching, detail, "reverse foxing" under ultraviolet light.

Fig. 24. Pablo Picasso, *The Frugal Repast*, 1904, etching, detail, "reverse foxing" in transmitted light.

cardboard backing. (Fig. 19) It may not be accurate to say, as paper conservators generally do, that the ink protected the paper from darkening. Rather, the white areas under the ink are not protected paper but areas where an inorganic reaction has taken place as a result of water introduced during print-making and/or later interventions. In a close-up of the verso of the top right corner (Fig. 20), one sees that the white areas are bright white. These areas are hard, chalky and no longer wet out with water. This suggests that something other than cellulose is present and has proliferated in these areas. It could be an oxide, a hydroxide, an oxide-hydroxide or a compound oxide. Its composition would depend on pH, on the presence of other elements available in the paper, the air, the inks, the water used for printing or for later interventions. Each time the paper is wet out and dries, when it is dampened for mounting and with high or fluctuating humidity, conditions for crystal formation occur.[21] A slow-drying paste is sufficient to initiate this reaction. In figure 21, the area under the hinge is distinct from the surrounding paper not because the paste

has protected the original paper tone but because a local reaction was initiated under the wet paste. (Fig. 21) This area no longer reacts as the rest of the sheet. Over time, the area appears more distinct from the surrounding paper because the photo-sensitized paper around it has darkened.

Figure 22 shows a detail of the most well-known print from the Saltimbanques series. (Fig. 22) It is also the most well-known example of reverse foxing problems. In this case there is a white area near the plate mark and in the forehead of the subject on the right. There is a "light stain," indicating that the print has been exposed to some unfiltered daylight. The reverse foxing in the paper became visible over time, as the sensitized paper around it darkened. Under ultraviolet light, (Fig. 23) the areas reflect brightly and a somewhat larger area of an inorganic content is indicated. In transmitted light when the print was wet, (Fig. 24) a much larger area was affected, that begins to approach the extensive, blotchy white patches of the Van Gelder Zonen paper illustrated in Fig. 11.[22]

CONCLUSION

When maintained in an ideal environment, modern papers remain neutral and off-white.[23] In high or fluctuating humidity, in contact with poor-quality housing and in unfiltered daylight, modern papers undergo changes that may be due to the chemistry of inorganic additives rather than cellulose chemistry. Foxing may be caused by inorganic additives as they polymerize in and on paper. Reverse foxing may not be due to uneven deposition of size but to reactions that create local deposits of inorganic compounds. This alternative explanation of condition problems in modern papers has significant consequences for treatment.[24] It is sincerely hoped that paper conservators and conservation scientists will begin to analyze modern papers with their complexity in mind.

NOTES

1. This paper is a summary of a presentation given at the Book and Paper Group Session at the 43rd Annual Meeting, American Institute for Conservation of Historic and Artistic Works, May 13–16, 2015, Miami, FL. Many more examples of condition problems were illustrated in that presentation. The author intends to publish a more detailed and thoroughly referenced article on this topic in the near future. The author's observations and findings are presented in abbreviated form here. Only a fraction of the many references consulted over the course of the author's research are included here.

2. Under UV, the appearance of this area is distinct from the surrounding paper.

3. Such stains appear to be exacerbated by framing techniques, such as stretch mounting, where the paper is dampened overall before the edges are attached to a window mat or backing.

4. Often, prints provide the most extreme examples of condition problems but additives are certainly present in papers manufactured for drawing and other purposes.

5. The literature on foxing and reverse foxing is summarized in the Paper Conservation Catalog, Chapter 13, and in Choi, S. "Foxing on Paper: A Literature Review," Journal of the American Institute for Conservation, Summer, Vol. 46, No. 2 (2007):137–152.

6. Distinct colors of "foxing" stains under ultraviolet light have been noted. See Cains, C.E. and Miller, B. A. "Proposed Classification of Foxing," Postprints from the 10th Annual Meeting, Milwaukee, WI, American Institute for Conservation of Historic and Artistic Works (1984): 29–30. Catherine Nicholson has also published this finding and discussed it with the author.

7. See Bruckle, I. "Aspects of the use of Alum in Historical Papermaking," Institute of Paper Conservation Conference Papers, Manchester (1992): 201–206. In this and subsequent publications, Irene Bruckle has drawn attention to aluminum sulfate. Present in trace amounts and evenly distributed throughout the fibrous cellulose web, that an inorganic additive may play an active role in local stains may be overlooked by non-destructive, qualitative analytical methods.

8. These pigments are unstable to light and undergo color changes with changing pH. Virtually all of the recipes published by John Dunbar in his "Handbook of Paper making" contain ultramarine. Dunbar, J. "Handbook of Papermaking," London, 1881, passim.

9. Mechanical coloring with earth pigments was also done in Japan. See Dwan, A. "A Method for Examining and Classifying Japanese Papers Used by Artists in the Late Nineteenth Century: The Prints of James Abbott McNeill Whistler," Conservation Research, Monograph Series II, Studies in the History of Art, National Gallery of Art, Washington, D.C. No. 41 (1993):105–132.

10. Our own conservation scientists have tended to overlook additives. The role of metals as catalysts for oxidative degradation of cellulose is acknowledged, however, metal content is invariably described as accidental.

11. The color range of earth pigments depends on the degree of hydration of iron and the presence of ores. For the reactivity of iron oxides, see Cornell, R.M. and Schwertman, U. "The Iron Oxides: Structure, Properties, Reactions, Occurrences and Uses," J. Wiley and Co., 2003.

12. Catalytic reactions are known to occur most rapidly in high humidity.

13. Many inorganic additives are also transition metals, which have received attention lately in connection with iron gall ink corrosion. The chemistry of transition metals merit further attention in this context as well.

14. Kim Schenck has written about the European preference for China paper for fine art printing in, "The Role of China Paper in Nineteenth Century French Printmaking," Looking at Paper: Evidence and Interpretation. Proceedings of Toronto symposium, 1999. Edited by John O'Neill. Canadian Conservation Institute, Ottawa (2001):32–40. In an addendum to this article, Deborah Mayer published her findings that China paper contains silica or clay.

15. Lemerre, A. "Le Livre du Bibliophile," Paris, 1874, n.p. Clay and other naturally-occurring minerals would contain impurities that act as salts and react readily with humidity and changing pH. Such impurities would result in local stains. Iron, just one example, begins to react or rust at relative humidity levels of 50%.

16. Lumsden, E.S. "The Art of Etching," New York, 1924, p. 137.
17. Plowman, G. T. Etching and other Graphic Arts: An Illustrated Treatise. New York, 1914. I believe he is referring to papers containing iron oxide pigment additives.
18. Cross, C.F., Bevan, E.J. and Briggs, J.F. "A Textbook of Paper-Making, London, 1880, p. 225.
19. Newhall, B. "The History of Photography," Museum of Modern Art, New York (1982): 13–25. Over the course of the century, it appears that the use of iron oxides diminished, however, the compounds of zinc and titanium later used as brighteners and opacifiers are known to act as photo-catalysts. Many useful references have come to us from the textile industry. These properties are also discussed in compendia of artist's pigments.
20. The definition of foxing may have originally encompassed a three-dimensional or "fuzzy" aspect. See Ordonez, E. and Twilley, J. "Clarifying the Haze," WAAC Newsletter, Vol. 20, No. 1 (January, 1998): n.p. The authors sought the appropriate terminology to describe their observations and proposed the word "efflorescence." See also La Camera, D. "Crystal Formations within Iron Gall Ink: Observations and analysis," JAIC, Vol. 46, No. 2, (Summer, 2007): 153–174.
21. This is emphasized by Ordonez and Twilley, op. cit. Inorganic crystals form in the same conditions as mold - high humidity or as a paper dries after being wet.
22. Using polarizing light microscopy, Walter McCrone had identified yellow ochre along with linen fibers in a sample taken from the Kasimir print. None of the paper conservators or scientists I conferred with knew what to make of this finding, since we generally think about condition in terms of organic or cellulose chemistry.
23. The importance of preventive conservation measures to ensure the long-term preservation of modern papers cannot be overstated. However, when paper conservators see only well-preserved examples, important information may be understandably missed.
24. The scope of the presentation of this subject to the Book and Paper Group was preliminary. The presentation, and this summary in the Book and Paper Group Annual, are focused on sharing observations with fellow conservators and suggesting a new theory about condition problems inherent to modern papers. The author intends to pursue treatment implications elsewhere.

SARAH BERTALAN
Conservator and Consultant
New York, NY
anumbrella2@gmail.com

JULIE L. BIGGS AND YASMEEN R. KHAN

Subject and Object: Exploring the Conservator's Evolving Relationship with Collection Material

INTRODUCTION

The changing relationship between conservators and cultural material has long been a subject of discussion in our field. Indeed, it was by questioning our role as conservators that in the past we transitioned from purely treating individual items to taking active roles in collections care and management: from advising on repository environment, collections security, disaster preparedness, exhibition guidelines, outreach, acquisition, and so on, leading some of us to feel like victims of our own success!

In 1971, after conducting a survey of the conservation needs of the Library of Congress's rare collections, it was calculated that 12,500 person-years of work would be required to treat all materials defined as rare at the time. To manage this workload a phased system was necessary, whereby conservators could survey and re-house large numbers of materials, placing them in archival enclosures and climate-controlled storage areas, while providing full treatment to other items that were given high priority by the custodial and conservation divisions. Peter Waters, the Chief of Conservation at the time, stated that, "significant technological advances have revolutionized the manner in which library materials are stored, used and preserved" (Waters, 1990, 35). He went on to state that technology had provided the means and the need for the phased approach to conservation at the time.

From our vantage point today, our role in collection repositories continues to expand as institutional missions evolve and grow. As a result, conservation must compete—or literally keep up—with a variety of initiatives, the most significant of which is digitization of collections. Transition, it would seem, is with us again. As one of our colleagues put it, "It is like you're middle aged people trying come to terms with a changing landscape that you're not totally comfortable with." We discussed our concerns with conservators, preservation managers, and curators in other institutions. Everyone feels stretched a little thin. Optimal thinking about conservation treatment is challenging under these circumstances.

This paper is an amalgam of our views on conservators' evolving relationships with the objects they work with, using the Library of Congress as an institutional case study for these experiences. We will discuss the stresses that are being placed on conservators' interactions with material culture through two particular workflows: exhibitions and digitization; and juxtapose them with "single-item treatment". Subsequently, we will critique factors that affect our work and how we address them. We do not seek to answer questions, rather we hope to illuminate some of the gray areas that we function in and invite discussion within our profession.

THE CONSERVATOR AND THE QUICK TURN-AROUND

It is ironic that while technology has provided us with more tools and approaches to do our work, it has also helped to erode the time we devote to close examination and treatment. In many institutions, exhibits and/or digitization projects are the main drivers of their conservation programs. At the Library of Congress, these programs are large and generate a lot of work, which translates into statistics that in turn are used as a measure of job effectiveness.

The exhibits program in the Conservation Division has one half-time and two full-time conservators. They manage the workflow, assess items for exhibition, work with mountmakers and, along with the rest of the conservation staff, treat, house, condition and install most of the objects for the program. There are 18 Library exhibition spaces and they have four to six-month rotations. The two largest exhibition spaces show between 200–280 objects each. The program also handles exhibition loans to 50–60 cultural institutions per year. To meet these needs, the exhibit conservators review approximately 1000 objects and track up to 2000 in any one year.

In recent years the pace of work has increased. One of the main reasons is that more physical space is allocated to exhibitions. In addition, the time allotted to the Conservation

Presented at the Book and Paper Group Session, AIC's 43rd Annual Meeting, May 13–16, 2015, Miami, Florida

Division for in-house exhibit preparation has shrunk from a minimum of four months to between one to two months, on average. As more items are rejected for in-house exhibition by the exhibit conservators, due to lack of treatment time, they have had to increase the number of exhibition items they review. And, with a growing emphasis on the virtual exhibition experience, still more collection material must be reviewed and treated for scanning in the same way as it would if it were on actual display.

The impact of these changes on conservators has been in three areas: increased work in a shorter timeframe; less treatment, especially for aesthetic reasons; and an increased emphasis on 'stabilizing' books and other objects in situ, in lieu of treatment.

The pace of the digitization workflow and its impact on treatment is even more relentless. In the Conservation Division, the digitization program is coordinated by a full-time book conservator, assisted by three additional contract conservators (two book and one paper), and one experienced conservation technician. This team performs all of the assessment and treatment for digitization. At present, 21 scanning devices are used for rare collections and special format material. Some Library scanning is contracted to outside companies, which is done both in-house and offsite. Currently, there are 25 active digitization projects encompassing approximately 750,000 special collections items. The uniquely large scale of the digitization program necessitates that conservators on the digitization team invest a lot of time tracking items through the workflow. The collections are diverse and the conservators are required to stabilize items to facilitate the capture of an optimum image by the scanning staff. Occasionally, an optimum image may require a change in the format of an item in order to scan all textual information. Thus, for example, a book may be dis-bound, scanned and re-housed as loose leaves in a box. When scanning is contracted to a company, then a very quick turn-around is necessary as the Library is contractually obligated to meet the company's scanning goals of 900–1100 images per day.

The impact of these parameters on the conservator's workflow is manifold. Condition is assessed at an item-level, with a view to handling for scanning only. Treatment may be carried out piecemeal and is—almost exclusively— limited to stabilization. And, most revealingly, every time a new scanning device is added by an outside contractor, the workflow in conservation increases to such an extent that it would require the addition of one full-time conservator to absorb it (which has happened once). Ongoing planning for digitization continues and, at the Library, the program will continue to expand with the addition of image-capture devices, digitization contractors, and digital projects.

The problem is not with digitization or exhibition programs per se, rather it is that these programs insert themselves into the relationship between the conservator and the object and become dominant partners. Thus, the theme of the 2015 American Institute for Conservation annual conference, *Making Conservation Work*, where the conservator is a willing partner, shifts to an imperative, where the conservator is obligated to *Make Conservation Work*! We believe this approach erodes the bedrock of the conservator's work ethic and confidence.

THE CONSERVATOR AND THE STEADY GAIT

We would assert that of all the responsibilities and tasks conservators undertake and perform, one of the most important is the work that leads to an intimate relationship with the object. As in real life, such a relationship takes time and care; its path is not defined at the outset; it requires thought and flexibility; to get comfortable with it you need practice, which leads to both missteps and successes, and perhaps a combination of the two.

Now, let us look at two different projects that were completed by conservators at the Library of Congress. The decisions the conservators made and the methods they used follows a traditional "single-item-treatment" approach.

The two iron-gall-ink-inscribed leaves in Figure 1 are George Washington's handwritten notes on growing barley that are from a series of extracts from texts and notes on agriculture that Washington transcribed between 1766 and 1799. The two leaves were brought to the Conservation Division to be prepared for a loan to Mount Vernon, Washington's home in Virginia, four months later.[1]

The leaves were listed as part of a group of notes, so the conservator arranged with the curator to examine all of the notes, in order to provide context and compare the leaves' condition with that of the other items. It was during this

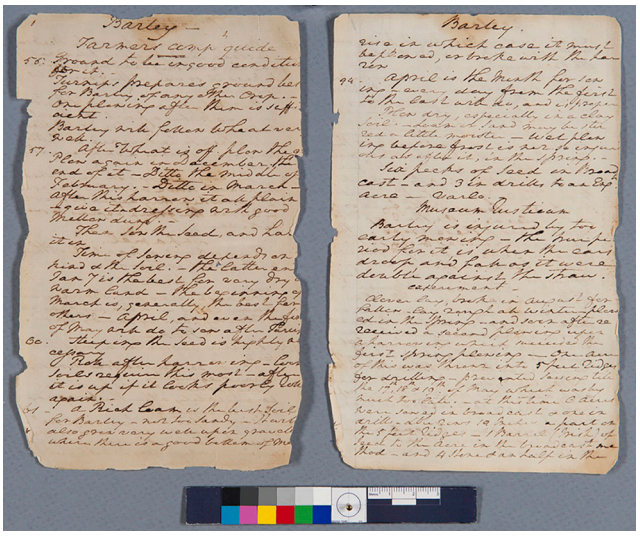


Fig. 1. George Washington's notes on barley, from Extracts and Notes on Agriculture. (before treatment)

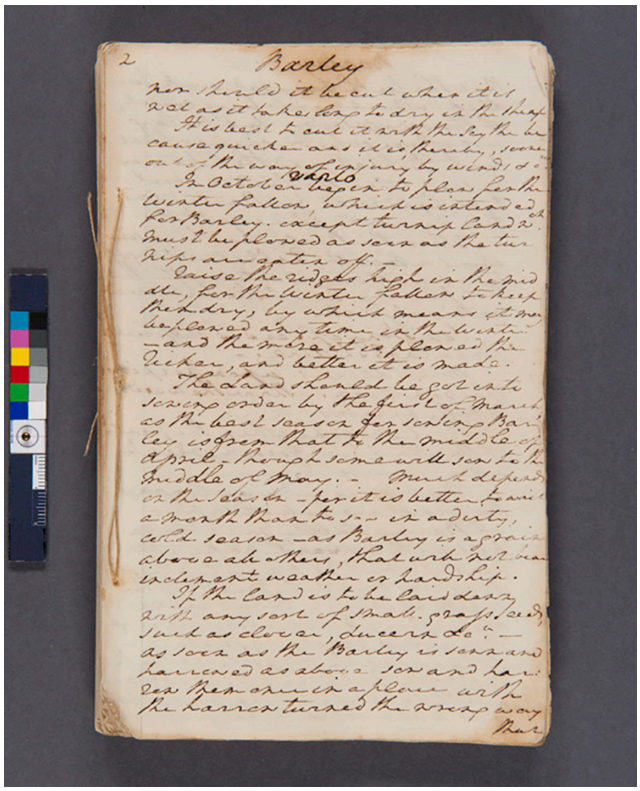


Fig. 2. Notebook from George Washington's Extracts and Notes on Agriculture. (untreated)

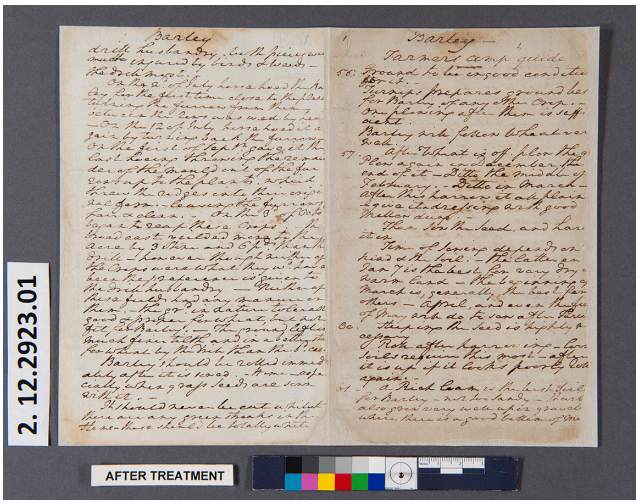


Fig. 3. George Washington's notes on barley, from Extracts and Notes on Agriculture. (after treatment)

Fig. 4. Homer Buford Clonts Collection, Map of the Pacific Ocean, recto. (before treatment)

examination that the conservator noticed the two leaves were from an existing stab-sewn gathering (Figure 2), and discovered that the separate leaves were originally joined together, forming the first, folded, single section of the notebook. There is an extant eyewitness account that Washington sewed leaves of his manuscripts together and it is possible that he may have bound this notebook himself.[2]

The two separated leaves were discolored and the outer margins of the paper were fragile, with significant tears and losses from the edges. Examination of the ink revealed indications of iron-gall-ink corrosion: discoloration around the ink, slight burn-through, and a positive test for iron (II) ions.

The condition of the paper and the ink suggested that aqueous treatment to reduce acidity and complex the iron ions was warranted. Also, the kind of repair that would be necessary to mend the leaves' edges and allow them to be reunited, would be best achieved using water-based adhesive and tissue. These repair techniques would not be recommended without prior treatment of the ink (Figure 3).

The leaves were washed, treated with calcium phytate and calcium bicarbonate, resized with gelatin, and repaired, as seen in Figure 3. By slowing down the corrosion process now, the leaves will not degrade to the point where the paper becomes brittle and hydrophobic; and to where handling and flexing would cause damage and loss to the ink-inscribed areas. Such advanced degradation would make treatment more complicated, risky, and possibly less effective in the long-term.

Now, let us imagine a different outcome. Suppose the leaves were only stabilized for the exhibition and time was of the essence; treatment would involve repairing the edges alone and the conservator would not have time to investigate the relationship between the two leaves: their origin, the relationship between them, and their artifactual significance. While there is no detriment to the leaves—or rather the *section*—during exhibition, there is no long-term benefit.

Our second example in Figure 4 is an Eastern Pacific map from World War II that belonged to Harold Clonts, a signalman third-class for the United States Navy, who served in the Pacific Theater from 1943 to 1945. It is part of the Library's collection of artifacts and supporting documents for the Veteran's History Project. The Project was established in

2000 by an Act of Congress, with a mandate to collect and preserve veterans' accounts and experiences in American wars, from World War I onwards.

On the recto of the map, Clonts charted the path of the ships that he was stationed on, beginning with his departure from San Diego, California. On the verso, Clonts recorded significant events throughout his two years of service, on three different ships, at sea and in various ports, and sometimes under attack (Figure 5).

Since Clonts retained the map and constantly updated it, and given that it returned with him to the United States after the war ended, it is entirely logical that its many folds would need to have been repaired and reinforced multiple times with pressure-sensitive tape. The variety and quantity—more than 30 feet!—of tape, the different stages of oxidation of the adhesive, the short-fibered paper, and soluble media made this a very challenging project. The acrylic tape was especially difficult because, although the carrier released and peeled off fairly easily, a residual layer of tacky adhesive remained firmly attached to the paper surface. The adhesive had to be removed mechanically with great care to minimize disrupting the paper and the media. Throughout the treatment, the conservator constantly had to evaluate and adjust her technique; she called upon her thirty years of experience as a bench conservator, which provided both the expertise and the confidence necessary to complete the treatment successfully, as shown in Figure 6.

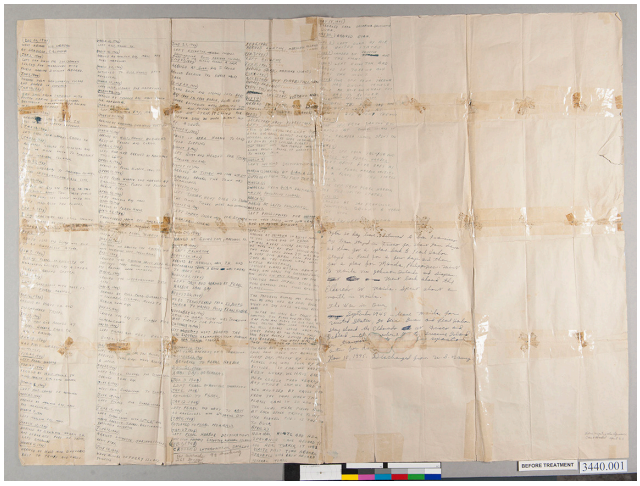


Fig. 5. Homer Buford Clonts Collection, Map of the Pacific Ocean, verso. (before treatment)

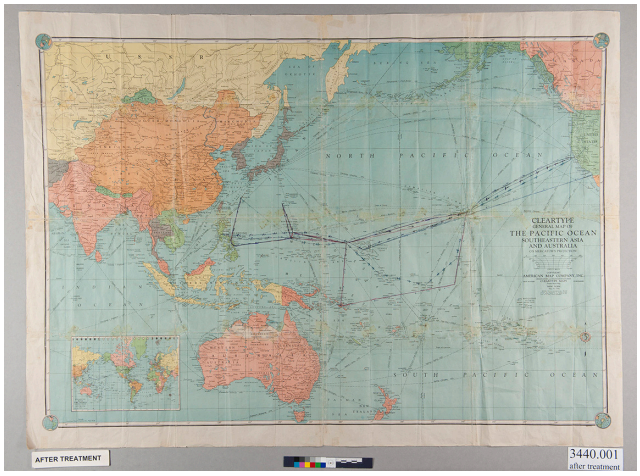


Fig. 6. Homer Buford Clonts Collection, Map of the Pacific Ocean, recto. (after treatment)

Again, we can look at a different outcome. Let us say this map, and the large collection it pertains to, was selected for digitization. The map would be rejected for scanning because the workflow would not allow sufficient time for it to be treated; further, in its pre-treatment condition, shown in Figure 4 in raking light, an optimal scan could not be made.

STEPPING BACK

Ideally, from a Library of Congress collections management viewpoint, the workflow for collections should mimic Figure 7, where conservation resides in one location on the life cycle of the object, after cataloging and research access. The main point illustrated by the diagram is that conservation activities are conceived as separate, with their own discrete workflows and goals. Of course, it is assumed that conservation has a consultative role in each of the other activities, as seen in Figure 8, whether it is reviewing items for acquisition or storage, adding value to catalog records, or treating an item in order to facilitate cataloging or research access.

On the other hand, Figure 9 illustrates what happens more often in practice, where collections go directly to digitization. Rarely do the digitization-focused conservators try to fit a typical conservation workflow into the digitization schedule, because usually there is no time to include complex treatment considerations. For the digitization workflow, conservation acts in an auxiliary capacity to further the goals of the digital program alone. It has a single role—stabilization for image capture. Although the Conservation Division has a place at the planning table for both exhibition and digitization programs, we do not set the scope of these programs. Our sole responsibility is that the objects are made accessible and are not damaged in making them so.

CONSERVATION IN THE DRIVER'S SEAT

Where there is a true partnership with conservation, or where conservation sets the scope of a project, then preservation of the materials for future access is the goal, with present access as an added benefit. Where the emphasis is placed, shapes our conservation activities. An example of such a project is the Peggy Clark Collection, acquired by the Library of Congress in 1998. The collection was selected in 2006 by the Music

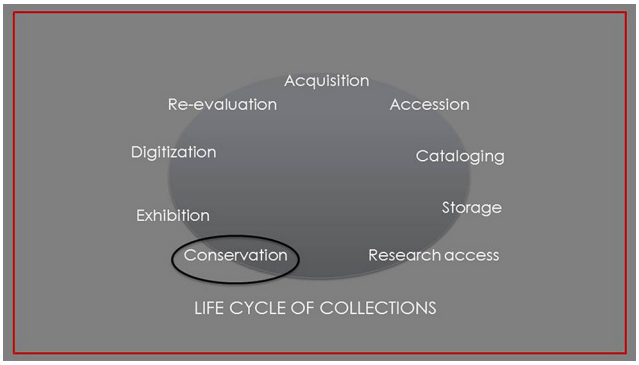


Fig. 7. Life cycle of collections with conservation as a separate step.

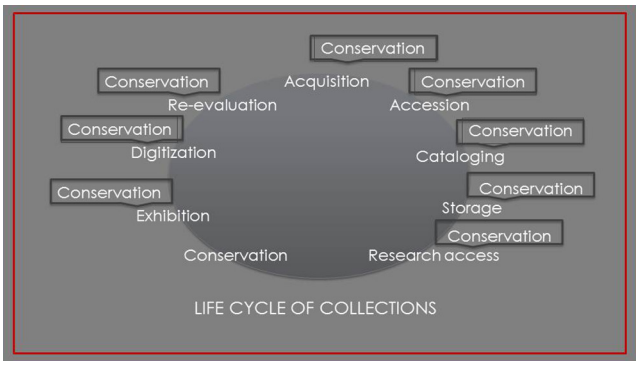


Fig. 8. Life cycle of collections with conservation in an auxiliary capacity for the other steps.

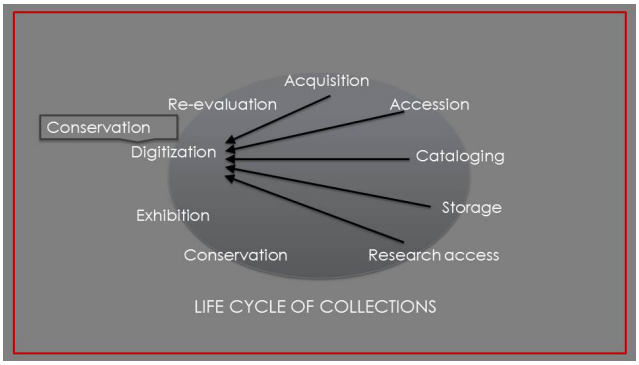


Fig. 9. Life cycle of collections illustrating shortcuts to digitization with conservation working for digitization goals.

Division for conservation, in preparation for its transfer to custom-built off-site storage. Peggy Clark was the foremost lighting, costume and set designer for theater in the United States from 1940's to 1970's; important works include the original productions for the *Sound of Music* and *Peter Pan*. The collection contains photographic, print, and other visual material documenting Clark's theatrical productions. While the collection had been superficially accessioned, it had not been cataloged or even unpacked. Conservation staff decided on a multi-tiered approach to preservation that included: preparing the collection for the off-site storage facility; creating housing solutions to enhance access to individual items; and treating individual items to prolong their useful life, for example, pigment consolidation and tape removal.

The project required five years to complete, from assessment to the final report (the team was not working exclusively on the project during this time). Conservation staff assessed and rehoused 34,000 works on paper, sketches and textual records; 8,000 photo-reproductions and photographs; 700 3-dimentional objects; and 100 bound volumes. Based on their findings, 5,000 works on paper, 1,000 photo and photo-reproductions, 75 3-D objects and 18 volumes were treated. Of additional benefit to the Conservation Division was that a team of preservation technicians received on-the-job training in assessment, characterization of media and process, and the development of housing solutions; and the conservator for the project developed a new method of hinging friable art-on-paper. The lessons learned from working on the Peggy Clarke Collection, such as creating more efficient workflows and requiring clearer descriptive information, have honed our approach to other theatrical production collections that the Library has acquired.

CONCLUSION

In this paper we chose to focus on the Library of Congress to illustrate the issues we face in approaching our work because of the size of our institution and our own experiences here. The Library has a collection of 175 million items, and it expands by the tens of thousands on a weekly basis. As with any large institution, the strengths and weakness in the system and its workflows are magnified. And thus we hope that, through our own examples, we have touched on issues that conservators observe in their own institutions and in conservation activities related to their collections.

Against the backdrop of conservation workflows articulated above, we would like to explore the concerns that moved us to write this paper at the outset: mainly how we view ourselves and the state of our practice.

Are we becoming generalists and losing our specialized skills?

As we become generalists we lose our specialized skills, at least as they relate to actual treatment. When we begin our training in conservation it is through an exposure to general principles, then we hone in on our specialization, and build our expertise through study, practice and observation. This knowledge is as prone to erosion as any free-standing structure. As Tom Albro, former Head of Conservation at the Library of Congress, stated in 1996:

> The nature of the craft of conservation is a solitary one, made up of repeated ordinary tasks enhanced by unconscious innovation. Fine work is based on accurate observation, guided

> by an unspoken but always evident just-out-of-reach perfection. Because of its anachronistic nature, the continued existence of the conservation profession in the modern world is as fragile as the objects it cares for. It is, however, one of the few ways we have of indicating to future generations what we really stood for. (Albro, 1999, 93)

What is the value of accrued knowledge for complex treatment?
As implied in the quotation above, the value of accrued knowledge from treatment practice and examination is unquantifiable. Many conservators achieve a high degree of expertise, and some just exist in conservation nirvana at the deep end of the pool. A conservator uses all of the senses when engaging with an object; and the more experienced the conservator, the more honed are the senses. Treatment choices and decisions are made confidently and efficiently, based on nuanced observations that would be extremely lengthy to catalog and tease out, and which the conservator may have made without conscious thought.

What compromises are inherent in the shifting priorities and changing roles for conservators?
There are compromises of skill and judgment inherent in shifting priorities and changing roles for the conservator. In the Conservation Division at the Library, all of the conservators are involved in activities outside of the realm of treatment, as in training, assessments, exhibitions, research, disaster response, emergency remediation projects, outreach, and writing and presenting papers. Thus, we are all called away from the bench, which makes it challenging to maintain a high-level of engagement with in-depth conservation treatment and examination. The more tasks we absorb, the harder it is to give any one full attention. Years ago a manager stated that a senior conservator should be able to take on a complex treatment and be able to do it in ten minutes stints between other more important tasks. As we know, it takes ten minutes to clear our heads, settle down and re-engage with an object.

This increasing division of a conservator's resources leads to questions such as, are we to create types of conservators within and outside of institutions? Do we retain generalists in-house and send high-value treatment to technical virtuosos in private practice and regional centers? Or, as a result of shifting conservation priorities in institutions, are we creating a two-tiered system?
Institutionally, the junior conservators treat, and the ones with technical expertise do less or none, but are paid more. Unlike in the medical profession, there is little financial incentive to be technically expert in our field.

Other issues come into play in such scenarios. Conservation treatment skills atrophy with dis-use and practitioners may grow risk averse and chose well-worn decision-making paths that may or may not be in the best interests of the object. According to behavioral scientists, when confronted with choice, human beings are more likely to choose the path of least resistance, especially when decisions are more complex. The safe and easy approach does not always serve a field that ideally continues to grow and become more sophisticated.

By meeting the ever-growing demand for access, are we serving cultural institutions optimally?
If we are reacting to an institution's mission then we could state that we are serving its mission, however we may not be fulfilling *all* of our responsibility to the institution's collections. As conservators, our role is to conserve collections for continued future access. But we are asked to make present access a priority with only the *possibility* of future access as a goal. For the most part, when faced with the juggernaut of stabilization for present access, we take solace in the principles of reversibility, statistical management of light levels, and occasionally hope in the existence of a principle of benign neglect.

At the Library, we are fortunate that we can maintain and extend our treatment skills as management continues to invest in us; however, our colleagues involved in the digital and exhibit workflows best experience many of the stresses that continue to erode away at and reshape our profession. Occasionally, compromising and choosing a more immediate treatment is acceptable; but, consistent compromises that are less than ideal for the objects, leave us dissatisfied and questioning ourselves and our abilities. In our desire to care for collections and not put them at risk at any cost, we are responding to demands for immediate access. We are treating for present consumption, while our training is based on treating for the future. The assumption, at least for digitization, is that culture and objects do not change. But the fact is that what is meaningful to people does change over time, and if we do not retain our mission, which is to help extend the life of collection materials, our cultural institutions and preservation personnel will be held culpable.

To conclude on a positive note, we see conservators as practical, service-oriented, problem-solvers, who care deeply for the collections and materials they work with, proactive where possible, and always reactive where necessary: we *make conservation work* in a variety of circumstances. In fulfilling our responsibilities as conservators, the one compromise we make, from our perspective, is with that most precious commodity: time; and all of our subsequent decisions follow from there.

ACKNOWLEDGEMENTS

We would like to thank our colleagues at the Library of Congress, who discussed the topic with us: Elmer Eusman, Holly Krueger, Nancy Lev-Alexander, Maria Nugent, Kaare Chaffee, Alan Haley, Susan Peckham, Sylvia Albro, Heather Wanser, Zachary Long, Tamara Ohanyan, Kate Morrison-Danzis, Jeanne Drewes, Phil Michel, Andrew Cassidy-Amstutz, and Barbara Jo Bair. We are also grateful to

colleagues in our field who kindly shared their time and opinions: Mary Studt, Rhea DeStefano, Holly Hero, Dr. William Sherman, Margaret Cowan, Amy Lubick, Katherine Kelly, Susan Kellerman, Bill Minter, Sue Murphy, Olivia Primanis, Tessa Gadomski, and Saira Haqqi.

NOTES

1. The exhibition at Mount Vernon was *Take Note! George Washington the Reader.*

2. A.C. Isaac, Associate Curator at Mount Vernon, quotes a letter from Washington's step-granddaughter, Nelly Parke Custis Lewis, on January 31, 1852 to her cousin, Lewis W. Washington, where she describes seeing Washington stitch together the initial text of his farewell speech: "I always passed the door of his Office in my way to my Grand Mother's chamber at the head of the steep stairs, which landed close to his door—That door was generally open, & I have been sent to his room with messages, & at night have passed the door & seen him writing as I passed to ascend the stairs with Grand Mama. When his work was completed, he called me from her chamber & requested me to bring him a Needle with silk to sew the leaves together—The Address was in his hand when I gave him the needle & I saw him sew them in the form of a Book; the only circumstance I could not take an oath on, is the color of the silk. It was a spool of tambouring silk, light blue or light lead color."

REFERENCES

Albro, T.C. A Delicate Balance. Conservation Treatment and the Demands of a Modern Research Library. In *International Conference on Conservation and Restoration of Archival and Library Materials*, Erice, 22nd–29th April 1996, ed. C Federici, P.F. Munafò, D. Costantini, G.B. Palumbo editore on behalf of Assessorato regionale dei beni culturali, ambientali e P.I., 1999.

Haun, W. and J. Beenk. 2010. Library Collections Discussion Group 2010: Conservation in the 21st century: Revisiting Past Practices and their Evolution in Institutional Settings. In *The Book and Paper Annual* 29: 91–94.

Isaac, A.C. Personal communication. Associate Curator, George Washington's Mount Vernon, Mount Vernon, VA.

Jones, S. and J. Holden. 2008. It's a Material World—Caring for the Public Realm. London: Demos. (ISBN 978–1–906693–07–7).

Marcal, H.P., R.A.S.P. Macedo, and A.M.S.P. Duarte. 2014. The Inevitable Subjective Nature of Conservation: Psychological Insights on the Process of Decision Making. In *ICOM-CC 17th Triennial Conference Preprints, Melbourne, 15–19 September 2014*, ed. J. Bridgland, art. 1904, 8 pp. Paris: International Council of Museums. (ISBN 978–92–9012–410–8).

O'Brien Miller, L. and M. Tedone. 2011. Archives Conservation Discussion Group 2011: Digitization and its Effect on Conservation Treatment Decisions: How has Wide-Spread Digitizing of Collections Changed our Approach to Treatment? In *The Book and Paper Annual* 30: 115–127.

Taylor, J. 2014. Recontextualising the 'Conservation Versus Access' Debate. In *ICOM-CC 17th Triennial Conference Preprints, Melbourne, 15–19 September 2014*, ed. J. Bridgland, art. 1906, 9 pp. Paris: International Council of Museums. (ISBN 978–92–9012–410–8).

Waters, P. 1990. Phased Preservation—A Philosophical Concept and Practical Approach to Preservation. *Special Libraries* 81, no. 1: 35–43.

JULIE L. BIGGS
Senior Paper Conservator
Library of Congress
Washington DC
jubi@loc.gov

YASMEEN R. KHAN
Senior Book Conservator
Library of Congress
Washington DC
ykha@loc.gov

LORRAINE BIGRIGG AND DEBORAH LA CAMERA

Update to the Case Study: A Practical Approach to the Conservation & Restoration of a Pair of Large Diameter English Globes

ABSTRACT

Historic globes are fragile objects, casualties of curious viewers and probing fingers. Few survive without damage to the varied materials used in their fabrication, including structural damage, discoloration of the varnish, or loss of paper and design media. While an improvement in condition is the primary focus of treatment and the foundation of an improvement in appearance, attention directed specifically at the legibility of a globe is equally legitimate. When designing a conservation treatment, it is critical to compare how a particular globe could appear relative to its individual condition, and how that globe should appear relative to other examples of the same edition. This vision must then be married with the desires and budget of the client and custodian.

The large format globes produced in mid-nineteenth century Britain were extraordinary works of cartography, instrumentation, and the decorative arts. The thirty-six inch diameter pair of celestial and terrestrial globes, dated 1845 and 1851 respectively, were the largest productions available from the Malby and Co. and mirror on a larger scale the general methods of fabrication that were developed in the early sixteenth century on smaller diameter globes. The complex construction incorporates fabric and papier-mâché, plaster, intaglio printing on paper, hand coloring, coatings, engraved brass, glass, wood, and faux finishes. The conservation of these complex artifacts required an interdisciplinary approach and the collaboration of paper, furniture and horology specialists.

The Malby globes, produced using intaglio printing and hand coloring, held great visual and textural appeal. The desire for complete restoration of large areas of design losses propelled the exploration of the most innovative options for image reproduction via digital photography, image manipulation, and archival printing, and their viability for effective integration into a work of cartography. With the development of commercial pigment-based ink jet printing, digital reproduction in conservation practice became viable. This technique reproduced the graphic quality of the original media with the requisite light, moisture, and solvent stability. However, the tone and density of ink jet lines vary substantially from intaglio printed ink lines. As a result, finessing of contrasts and colors was required to simulate the original.

Studio practices have now evolved to the use of lithographic polyester plate printing to generate reproductions of lost design. Commercial polyester films such as Pronto-Plate 5000® offer an efficient option for direct-to-plate printing in smaller offset printing applications. The image to be reproduced is printed directly onto the polyester film with either a laser printer or photocopier. The polymer plate is then inked with a brayer just as a traditional lithographic stone would be, yielding the same range of tone and values as a lithographic stone or metal plate. This technique employs traditional printers' ink, handmade in small batches from carbon black pigments in linseed oil, and is therefore visually comparable to the original medium while being stable to light, moisture and solvents. This method of printing allows for a wide variety of papers to be used. In general, we select a lightweight handmade paper, such as Ruscombe Mills conservation papers.

The conservation and restoration of this pair of Malby & Co. globes serves as a case study of the methodology for designing a conservation treatment, the coordination of interdisciplinary experts and state-of-the-art methods for image reproduction.

The talk presented at the Book and Paper Group Session, AIC's 43rd Annual Meeting, May 13–16, 2015, Miami, Florida was a summary of the article *Case Study: A Practical Approach to the Conservation & Restoration of a Pair of Large Diameter English Globes* by TK McClintock, et al., and included an update to the studio treatment practices that have evolved since the completion of the original 2007 treatment (McClintock 2015).

REFERENCES

McClintock, T.K., L. Bigrigg, and D. LaCamera, 2015. Case Study: A Practical Approach to the Conservation & Restoration of a Pair of Large Diameter English Globes. *Journal of the Institute of Conservation*, 38 (1): 77–91.

LORRAINE BIGRIGG
Senior Conservator
Studio TKM Ltd.
Somerville, MA
lorraine@studiotkm.com

DEBORAH LA CAMERA
Conservator
Studio TKM Ltd.
Somerville, MA
deborah@studiotkm.com

LESLIE COURTOIS

Multitasking on a Shoestring: Storage and Display Mounts for Oversized Maps at the Library of Virginia

The Library of Virginia had modest beginnings. When it was established by the state legislature in 1823, it was housed in the attic of the state capitol, a building designed by Thomas Jefferson, modelled after the Maison Carre in Nimes, France. Nowadays, the library has its own modern facility, and in addition, has a massive offsite storage facility. Between the two buildings, there are over 55 miles of shelving, holding over 97 million pieces of Virginia history dating from the early 1600s to today. And, as a state government archives, the library is mandated by law to make all of this material accessible to the public. Of course, in this era of mass digitization initiatives, there is a big push at our institution to get everything online. However, all original materials must still be made available to view in person. Particularly for maps, it is wonderful to see the physical object. Although maps are considered archival material, they are highly aesthetic as such. However, many of the most interesting maps in the collection are very large, and it is difficult to access them on short notice. To facilitate their viewing, our institution has committed to displaying maps on a regular basis.

Here are a few examples of the types of maps that might be typically displayed. John Mitchell's *Map of the British and French Dominions in North America*, 1755 (fig. 1) was the primary source used during the Treaty of Paris to define the borders of the new United States after the American Revolution. It is the most comprehensive map of the eastern part of North America made during the colonial period. The Sayer & Bennett, *New and Accurate Chart of the Bay of Chesapeake*, 1777 (fig. 2) is a highly accurate, yet beautiful documentation of the bay area. It drew heavily on the depiction of the bay established by the earlier Fry-Jefferson map of Virginia. The John Henry, *New and Accurate Map of Virginia*, 1770 (fig. 3), provides a fine depiction of the Northern Neck and Middle Peninsula regions of the state. The Herman Boye *Map of Virginia*, often called the nine sheet map as it was printed from nine copper plates, was commissioned by the general assembly in 1816 in order to have an accurate depiction of each county all in one map. This was for the purpose of planning internal improvements such as roads and canals, and so it is in fact a government document. Yet it is highly decorative and visually interesting (fig. 4). In addition to the large cartouche, there are enormous vignettes at each corner.

Fig. 1. John Mitchell's Map of the British and French Dominions in North America, 1755, copper plate engraving on paper, on two sheets, 138 x 100 cm each, hand colored, mounted on linen.

Presented at the Book and Paper Group Session, AIC's 43rd Annual Meeting, May 13–16, 2015, Miami, Florida

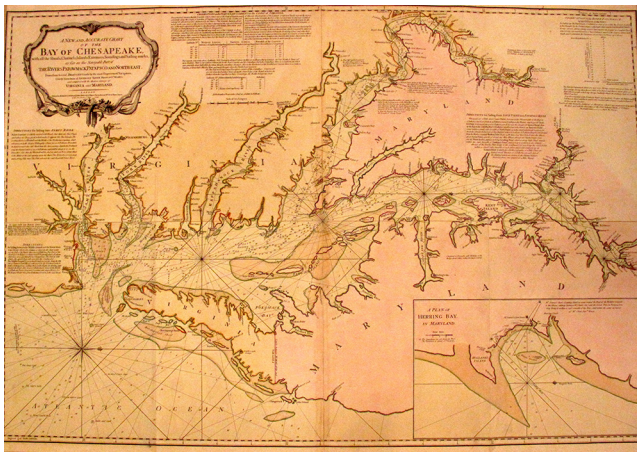


Fig. 2. Sayer & Bennett's A New and Accurate Chart of the Bay of Chesapeake, 1777, copper plate engraving on paper, 99 x 142 cm, hand colored.

Fig. 3. John Henry's A New and Accurate Map of Virginia, 1770, copper plate engraving on paper, mounted on linen, 98 x 133cm, hand colored.

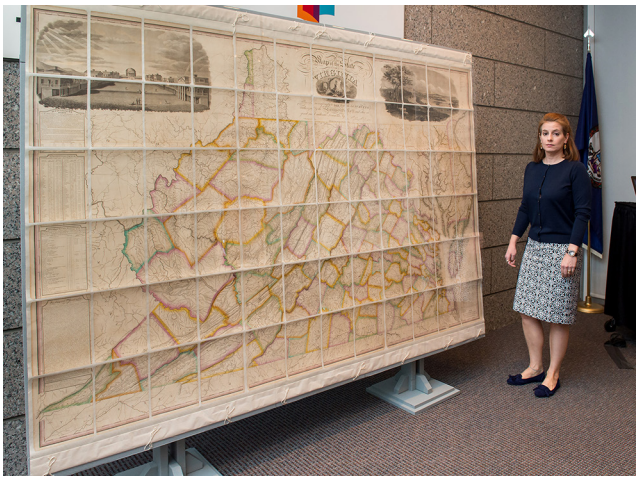


Fig. 4. Herman Boye's A Map of the State of Virginia, 1826, copper plate engraving on paper, dissected and mounted on Japanese tissue and linen, 160 x 248cm, hand colored.

One portrays a pastoral view of Richmond from the banks of the James River, showing the capitol building where this very map would have resided, and on the other side there is Jefferson's idyllic campus of the University of Virginia in Charlottesville. Because of its great size (160 x 248cm) and level of detail, the map took ten years to complete.

There are difficulties in displaying maps of this size, but we are committed to doing so in order to allow map researchers and aficionados to have access to them. The Library of Virginia currently sponsors a map lecture series where outside speakers are invited to present scholarly papers on Virginia related map topics, and it was decided that maps from our collection could be used to enhance these events by illustrating the topics being discussed. As there are no funds dedicated to displaying the maps, in the beginning, they were just laid out in their storage folders on tables in the conference rooms, which were guarded by volunteer staff. There are two obvious problems with this scenario. First, the viewers have to constantly bend over to see the detail in the maps, which is not ideal (fig. 5). Second, it does not really allow for the display of very large maps. Therefore, it was necessary to devise a way to vertically mount the maps in a way that would be both economic and time saving, since our staff is small and staff time is at a premium.

The idea would be to use the current form of map storage, the map folder, and adapt that into a display mount. This avoids creating another costly containment system for the maps, saves time, and also, by keeping the maps in their folders, it avoids unnecessary handling of the maps which is always desirable. The folders we use are made of folder stock with a 0.005 mil polyester cover, attached on one side with double sided tape. These folders would need to be securely attached to a rigid mount in such a way that they could be

Fig. 5. Visitor attending one of the Library of Virginia's temporary map exhibits.

easily detached, allowing the maps to be quickly returned to storage, and using a method that would not cause the folders to be significantly altered or damaged. It was decided that Hexamount panels would be used as the mounting surface because of its thickness and stability, while remaining lightweight. A non-adhesive attachment mechanism for the folders was devised, and then custom purposed floor stands were designed and built. The panels are attached to the stands with industrial Velcro, so they are easy to set up and break down quickly.

The first issue was to decide how to mount the map folders to the Hexamount securely, without altering or damaging the folders in any significant way. The solution was to use polyester strips that would traverse the folder and mounting substrate. A discreet slit was made through both, and the polyester strip was passed through both and attached to itself on the back of the mount with double sided tape (fig. 6). For most maps that fit into the 40 x 60 inch format, it is sufficient to use one attachment loop at each top corner of the folder (fig. 7). The map is allowed to rest freely inside of the folder. From a distance, the attachment is almost non visible. When it is ready to be removed, it can just be cut open

Fig. 6. A polyester strip is passed through the map folder and the Hexamount panel, a loop is made and fastened to itself on the back of the mount.

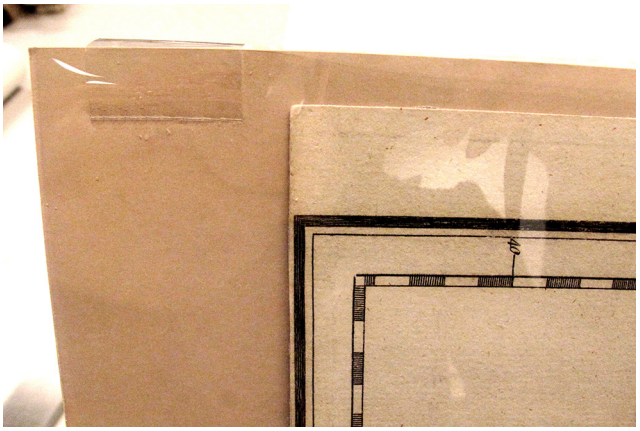


Fig. 7. Close up view of the polyester attachment.

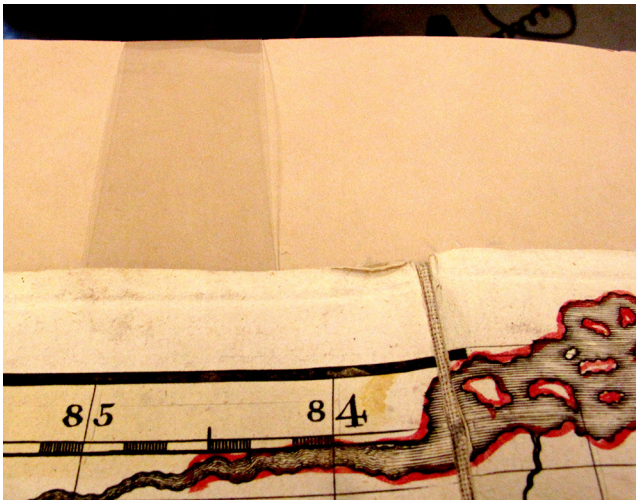


Fig. 8. A polyester hinge is used to securely attach the map to the mount.

Fig. 9. One of the floor stands, constructed of common lumber and industrial Velcro.

Fig. 10. This system allows for close up viewing of the displayed material.

Fig. 11. Detail of the Boye Map of Virginia showing the scale of the text that is viewable in a 1 inch area.

and discarded. The slit made in the folder does not affect its stability and the visual consequences are minor.

In the case that a map might need to be displayed vertically when it is actually stored horizontally, it is possible to turn the map folder on its side and mount it this way. In this case, there is no closure in the folder to hold the map in place at the bottom, but this can be solved by temporarily hinging the map to the mount using polyester hinges (fig. 8).

For the floor stands, the emphasis was sturdiness and functionality rather than aesthetics, since most of the stands remains out of view. They were constructed from common lumber using ¾ inch furniture grade plywood for the bases and pine 2 x 4 boards for the vertical elements. The topmost piece was attached with a 5 inch hex bolt with a wing nut to allow for adjustment of the display angle (fig. 9). Panels were attached to the stands using 36 inch lengths of 2 inch wide Industrial grade Velcro. The total cost for constructing a set of six stands was $184. This does not include the Hexamount panels, which are the most costly part of the display system. Other materials can be used which are more economical, such as double corrugated board or foam core board.

One of the main advantages of this system, other than economy, is that it allows viewers to get very close to the

material (fig. 10). It is important to note that although the maps are very large, they contain an incredible amount of fine detail, as seen in figure 11. We have found that when the effort is made to make these maps available to viewers, they do become incredibly engaged in what they are seeing. This makes our efforts extremely satisfying and we are encouraged to continue to come up with practical solutions to make our collections more accessible.

LESLIE COURTOIS
Conservator
Library of Virginia
Richmond, Virginia
leslie.courtois@lva.virginia.gov

Unlocking the Secrets of Letterlocking to Reseal the Letters of John Donne and Other Early Modern Letter Writers

What is letterlocking, and how can a better understanding of it benefit conservators and other scholars? These presentations focus on historical practices of letterlocking, asking how men and women folded and sealed their letters before (and after) the invention of the envelope. Why have there been so many letterlocking formats throughout history, and what did they mean? This session brings together a conservator, a curator, and a literary historian interested in the historic practices of sealing and locking letters. The first presentation, by Jana Dambrogio, will sketch the history of letterlocking and explain its significance to conservators. Dambrogio will demonstrate ways that letters have been folded to become their own envelopes, drawing on various formats employed by regents, professional secretaries and everyday people. She will discuss the conservation of originals and how making models of them helps encourage information exchange between scholars and the general public; the engaging tactility of the "locked giveaway" helps demonstrate the important work that conservation and the humanities do to preserve our past for access and interpretation. Daniel Starza Smith will then explain the relevance of this knowledge to an understanding of the letters of John Donne—one of seventeenth-century England's most prominent literary and religious figures—as well as to literary and historical methodologies more broadly. Heather Wolfe will widen the scope of these observations and arguments based on her extensive work on early modern letters, particularly those at the Folger Shakespeare Library. Together, we will argue that a more thorough understanding of this technique should influence conservatorial best practice with regard to letters. Furthermore, we also aim to demonstrate the benefits of collaboration between conservators and scholars in other disciplines such as literature and history, and will show how this conservation-based practice is leading to new theoretical advances in the humanities.

JANA L. DAMBROGIO
Thomas F. Peterson (1957) Conservator
MIT Libraries
Cambridge, MA
jld@mit.edu

DANIEL STARZA SMITH
British Academy Post-Doctoral Fellow
Lincoln College, University of Oxford
Oxford, UK

DR. HEATHER WOLFE
Curator of Manuscripts
Folger Shakespeare Library
Washington DC

Presented at the Book and Paper Group Session, AIC's 43rd Annual Meeting, May 13–16, 2015, Miami, Florida

YANA VAN DYKE AND ANGELA CAMPBELL

Preserving the Spirit Within: Bringing Twenty-Five Tibetan Initiation Cards into the 21st Century

ABSTRACT

This paper discusses the history and rarity of twenty-five fifteenth-century Tibetan Initiation cards; their methods of manufacture as supported by an in-depth examination and analysis; the development and implementation of a complex conservation treatment plan designed to incorporate sensitivities towards the objects' sacred function, select specific materials used in the conservation treatment, address former inappropriate restoration campaigns, achieve aesthetic coherence between three conservators treating twenty-five cards; and identify the advantages and disadvantages of using a web-based forum to convey a multifaceted decision-making process to the public.

INTRODUCTION

In 2000, The Metropolitan Museum of Art acquired a complete set of twenty-five early fifteenth-century Tibetan Initiation cards in various states of disrepair. The form and function of the cards is complex and multifarious. Individually, the cards invoke their respective deities; together, they form a mandala, a spiritual and ritual symbol representing the Universe (Fig. 1). Comprised of the four directional guardian deities along with major divinities and Bodhisattvas, the comprehensive set reflects a multidimensional Buddhist pantheon. Well-worn, undoubtedly used and handled throughout numerous rituals, and housed in environmental conditions of high humidity, the pieces exhibited overall surface abrasion, unstable paint layers, and evidence of both mold and insect damage upon acquisition. In addition, several but not all, of the pieces had undergone previous campaigns of substantial restoration before entering the museum's collection. The authors and a third conservator[1] collaborated in the treatment of the twenty-five cards in discussion with each other along with the curator. All aspects of the treatment had to be thoroughly explored, discussed, and practically applied with similar principles and methodologies to ensure visual consistency for the debut exhibition of all twenty-five cards within The Metropolitan Museum of Art. In preparation for treatment, the cards underwent thorough examination and documentation, utilizing multi-spectral imaging equipment, some of which was specifically modified for the project. Throughout the course of treatment and after treatment had been completed, all three conservators and the curator created web-based material to convey specific aspects

Fig. 1. The complete set of tsakli forming a mandala. Image copyright The Metropolitan Museum of Art (2000.282.1–25)

Presented at the Book and Paper Group Session, AIC's 43rd Annual Meeting, May 13–16, 2015, Miami, Florida

of the project to the public via the Met's website. These short online articles, web videos, and social media posts provided opportunities to engage with the public and develop audience-appropriate material that gave the public insight into these twenty-five complex treatments.

HISTORIC BACKGROUND AND FUNCTION

Tsakli or tsakalis is a Sanskrit term used to describe a small ritual painting, generally the size of a playing card, created in sets, and used in Buddhist and Bon rituals and initiations. The paintings are most often illustrations of Buddha, Bodhisattvas, gurus, animals, sacred symbols, ritual implements, and abstract images. Each card would have been used by a Tibetan Buddhist practitioner—a monk, a nun, or initiate— to invoke a specific Vajrayana Buddhist deity.

Used by itinerant teachers (lamas) moving from one monastery to another, the tsakli cards incite the imagination and aid the process of visualization during study and in ritual practice. The cards' function in rituals and religious education continues to this day. Lamas display tsakli on an altar at the end of a stick or show them to initiates or disciples by holding the card at arm's length. The cards displayed on the altar are changed over the course of many days as the teachings progress. During long journeys or pilgrimages the cards will be placed singularly within a portable altar called a Gau to be carried along. Because of their readily procurable material constituents, tsakli often serve as substitutes for esoteric ritual items, which are difficult to acquire, such as precious stones or flayed skins of demons.

Tsakli also serve a protective function. For example, cards depicting the guardians of the four quarters or directions are often set up facing their corresponding zones during the construction of a new monastery building as talisman or protectorates. Additionally, their protective role in Tibetan funeral ceremonies is central and continues to this day. The cards are thought to guide the deceased as they travel through the intermediate worldly and onto metaphysical realms. These funerary rituals may last for as long as forty-nine days. An effigy of the deceased in the form of a monochrome woodblock-printed tsakli is created either in their home or at the home of the local lama priest, accompanied by a large set of full spectrum cards representing the individual deities and spirits encountered in the transitional stages along the death path. A funeral set of tsakli may consist of only a few cards or it may have the complete mandala of the death deities and their attributes individually depicted, amounting to eighty cards or more.

The Met's set of tsakli was likely a funeral set and is remarkable and rare in its wholeness. It is noteworthy that these early fifteenth century initiation cards, perhaps the oldest set that survives intact, form a mandala suitable for initiation. Forming a fixed sacred space like that of a temple, the order in which the cards were placed to form the mandala is important (Fig. 2). Each card is inscribed with a Tibetan letter on its verso, designating its specific placement within the mandala. The deities shown on these initiation cards include the Tathagata Buddhas, various bodhisattvas, fierce protectors, and the six possible realms of rebirth seen across the bottom. The cards form a mandala if the first one is placed in the middle and the following cards are arranged clockwise, as is auspicious. The bodhisattvas, both male and female, appear in the upper corners of the mandala and attend the central and most important figure, Vajrasattva, venerated for purifying the mind prior to undertaking advanced tantric techniques. This understanding is in accord with the inscriptions on the back of each card (Fig. 3), which associate mental states with each

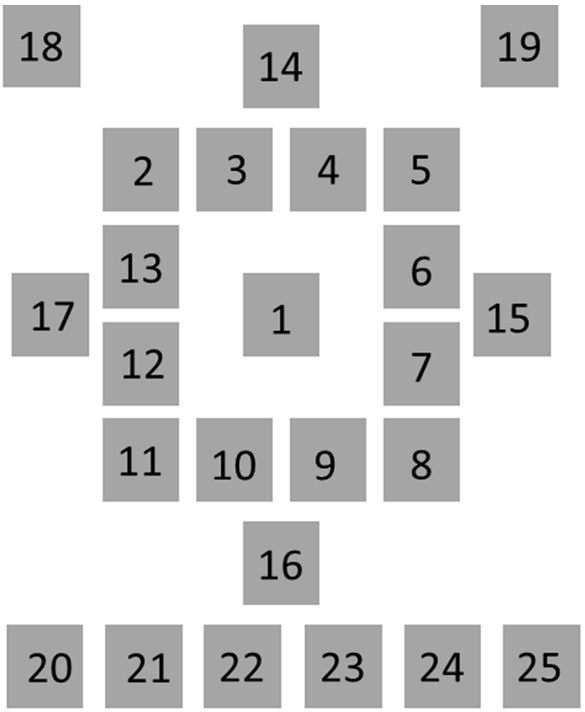


Fig. 2. Numbered mandala.

Fig. 3. Recto and verso. Image copyright The Metropolitan Museum of Art (2000.282.1)

deity, and delusions, such as pride, jealousy and hatred, with each of the possible rebirths.[2] This historical background and ritual function of the cards informed the treatment process and provided insight into the technical analysis of the objects.

CONSTRUCTION AND ANALYSIS

THE SUBSTRATE: COMPLEX TO THE CORE

One of the most fascinating components of the cards is the core substrate. The cards were created by laminating five to six sheets of recycled Tibetan writing paper. Each sheet was pasted to another by coating the page with a carbohydrate in the form of a polysaccharide adhesive, probably a starch. The papers were aligned in a cross-grain orientation; creating a cardboard of tremendous dimensional stability. Access to the inner core was limited to only a few cards and it was difficult to observe unambiguously this evidence throughout the set, but in the few instances where the layers were weak and delaminating, the Tibetan script was discovered to be oriented in alternative directions, layer after layer (Fig. 4). Despite their exposure to moisture along the top edge, areas of the initiation cards that were free from moisture exposure were unaffected and remained relatively stable and strong, laminated together and rigid, free of air pockets with only minor to moderate undulations and delamination overall.

The individual leaves of paper possess a very coarse finish, unrefined in nature with long unbeaten fiber clumps and bits of rope and twine making for a particularly topographical surface (Fig. 5). Burnishing marks can be seen in strong raking light evidencing vigorous strokes from a polishing stone or tool (Fig. 6). Fibers were sampled from nine of the twenty-five objects in areas of unambiguously original primary support. The initiation cards are composed of ~90% jute fibers that stained grayish green and interspersed with ~10% bamboo (or other straw fiber that has naturally associated cellular elements, such as large vessels), which stained blue (Fig. 7). Comparisons were made against a freshly stained fiber reference slide of jute.[3]

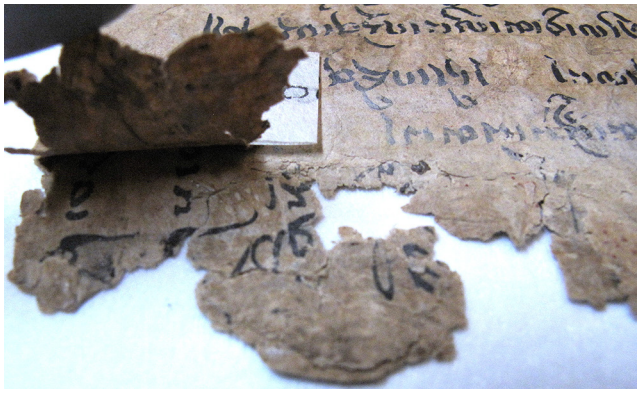


Fig. 4. Detail of delamination and calligraphy of the inner core. Image copyright The Metropolitan Museum of Art (2000.282.21)

Fig. 5. Photomicrograph through stereo binocular magnification. (100X) Image copyright The Metropolitan Museum of Art (2000.282.15)

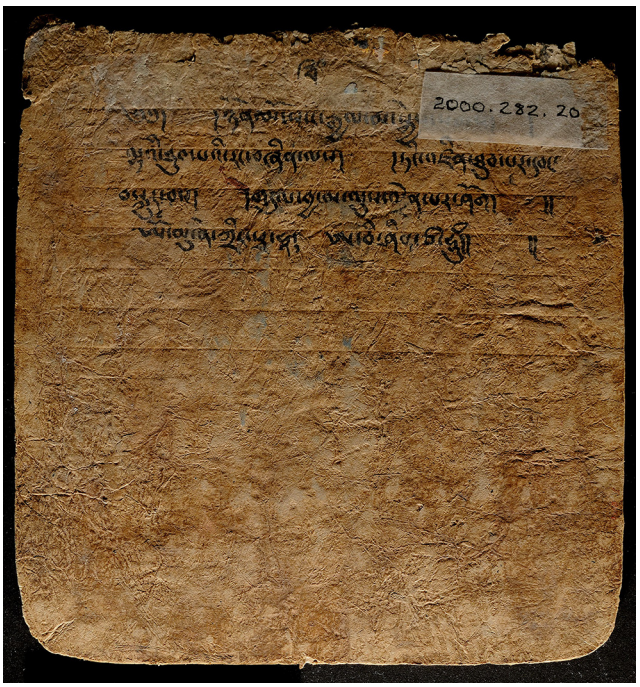


Fig. 6. Verso, raking illumination. Image copyright The Metropolitan Museum of Art (2000.282.20)

DESIGN LAYER

On the surface of this complex core, dynamic figural compositions are framed by painted borders in an almost perfect square format pigmented with subtle variations of oranges (red lead) melting into reds (vermilion), followed by a yellow (orpiment) ruled line outlined in carbon black. Some of the paintings contain triangular upper corner pieces of azurite

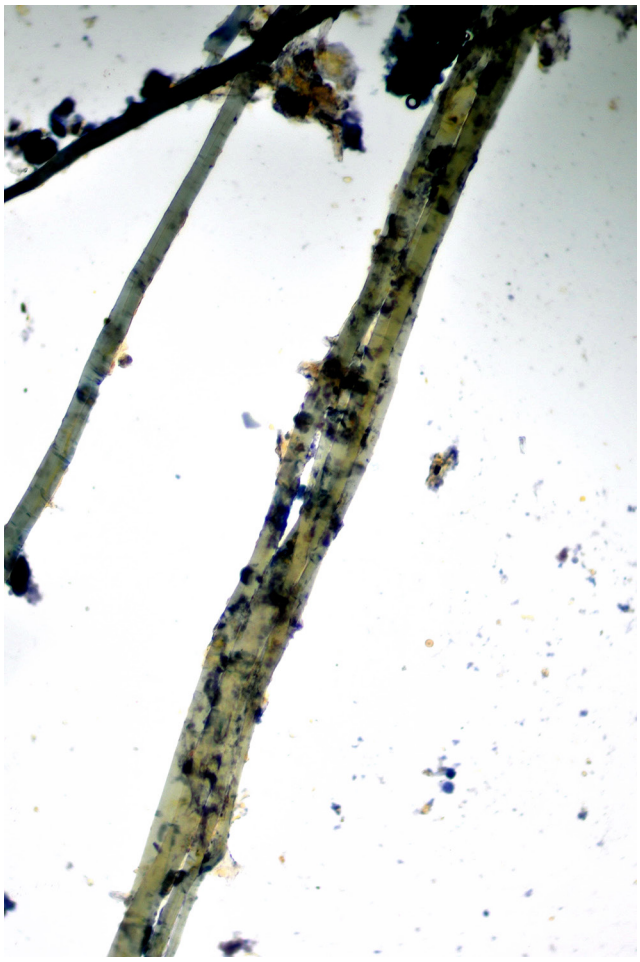


Fig. 7. Polarizing light microscopic image (200X) of jute fibers.

embellished with stylized leaf and flower forms. Most figural creatures are arranged within an arched framework, some of them haloed by a rainbow, some set against a flaming background of red and orange overlaid with spiraling arabesque patterns created with a red organic glaze, others with blue background with white rich swirling patterns. In general, the palette is limited yet pure and vivacious with mainly opaque and thick layers of brush-applied mineral pigments. Very few mixed pigments are present, excepting the greens which are created by a mix of indigo and orpiment and dilute solutions of indigo used to indicate volumetric form. There is a ubiquitous organic red glaze that is difficult to identify but fluoresces brightly under ultra-violet light with a fine crizzled and crazed otherwise known as a craquelure pattern. Although no non-destructive Raman analysis was pursued, false color infrared coupled with observation under long and short wave ultra-violet radiation reveal traditional colors known to be used in South Asia during this period. Whites are not lead white, but instead are estimated to be calcium carbonate (Fig. 8).

Fig. 8. Reflected ultra-violet radiation photo-micrographic image. (150X) Image copyright The Metropolitan Museum of Art (2000.282.10)

Fig. 9. Infrared reflectogram (with 1000nm long-pass filter). Image copyright The Metropolitan Museum of Art (2000.282.10 & .11)

As part of the initial examination, infrared reflectography was used in an effort to determine whether or not the remarkably similar designs had been stenciled or printed onto the cards as underdrawings and then painted over as this would help with determining later in-painting needs. The infrared images revealed that the carbon-ink underdrawings are close, but not identical to one another, indicating that they were not stenciled or printed and, instead, were individually drawn by a hand quite familiar with the repeated design (Fig. 9).[4]

VERSO INSCRIPTIONS

Along with a letter ordering the set, the reverse of each tsakli card has a Tibetan inscription on the back written upon an incised ruled line.[5] The inscriptions each relate one of the five senses to a mental condition and to the specific deity shown on the front. The inscriptions were presumably read as the cards were laid down, in this way purifying and focusing the practitioner's mind.

The carbon-based penned inscriptions on the versos of the cards were written on incised lines as previously mentioned. Despite the thickness and strength of the cards, the incisions were applied with a force creating deep cuts clearly perceptible to the naked eye on the versos of all cards and, in many cases penetrating through to the rectos as well. The peaks of the incised lines are prone to abrasion, contact damage, and subsequent loss of the paint layer which had been aggravated by frequent handling and stacking of the cards on top of one another (Fig. 10).

PRINCIPLED CONSIDERATIONS

Knowing and understanding the construction, composition, and properties of all the materials used in the creation of the initiation cards was essential in assessing their physical condition and necessary in devising a thoughtful and considered treatment approach. Respect of their form and structure along with observations of the stresses caused by uninformed choices in former restoration campaigns helped predict how the objects would respond to our tailored treatment procedures as well as their new home within the museum's stable environment. In addition to our material concerns sensitivity to the object's historic and cultural context was equally important in our assessment of the objects in order to acknowledge the intangible properties with which the cards may have been invested, as well as to recognize alterations that may have taken place through its use and function.

Fig. 10. Recto and verso, raking illumination. Image copyright The Metropolitan Museum of Art (2000.282.25)

Fig. 11. Before and after treatment. Image copyright The Metropolitan Museum of Art (2000.282.10)

Ethical considerations of conserving these particular sacred objects involved shared conversations amongst the curators and conservators, each expressing attitudes in regards to loss compensation. Considering the whole set, the losses suffered were not that egregious, but it was determined by unanimous consensus among conservators and curators that the voids, jagged edges, and overall ragged forms distracted the viewer when the cards were displayed in the intended mandala formation. We decided that we would best serve the set of Tibetan initiation cards by addressing their losses (from a physical integrity point of view) and exhibiting and treating the cards as a visually whole puzzle. The wounds and damages incurred from neglect needed to be attended to while also respecting the cards for their age and natural wear.

Considerations also included their end use and how frequently these objects will be handled or originals requested for study. To facilitate study without compromising the original pieces, all of the initiation cards have been captured both front and back, digitized in high-resolution image files, accessible online through the museum's website.

From monastic creation to museum display, these cards are one of the only known sets from this time and place to survive. They are not only appreciated singularly but are impactful as a group and must be displayed together to achieve their complete power. Ultimately, the purpose of treatment was to create a harmonious flow and to quiet their injurious states so that the viewer can concentrate with focused mindfulness on the all-important deities, central to each composition. In a sense, our goals were not only to impart strength and physical integrity to each individual object, but aesthetically to enable each card to shine as brightly as possible within the figurative constellation of the mandala (Fig. 11).

TREATMENT AND DISPLAY

CONSOLIDATION

The most pressing concern from a conservation perspective was the unstable paint layer. In examining the cards, it was immediately apparent that the paint layers of all twenty-five were fragile. Some of the cards had already been consolidated, heavily, and some appeared to have barely been touched.

In the magnified image, the fibrous paper support can be seen beneath the cracked and lifting paint layer (Fig. 12).

Most often, flaking paint is due to the dehydration of the binding vehicle used in the original mixing of the paint. This causes friability, flaking and tenting, resulting in a considerable loss of integrity and permanence in the paint layer. In all of the objects in the set, the paint layer appears to have been generally applied rather thickly, causing it to become brittle and inflexible with age with a tendency to crack if there is movement of the support. Once a crack or loss in the paint layer occurs, the area surrounding it becomes extremely vulnerable and susceptible to further damage. The previously described areas of incised lines were particularly vulnerable to this type of damage. The cards exhibited all forms of the most common injuries found in a paint layer, including: stress cracking, delamination, separation of the paint layer from the paper, friable media, desiccated binders, and the tenting or cupping of paint. Additionally, six of the twenty-five cards were invasively filled during a prior restoration campaign (Fig. 13). The earlier fill material was thick, substantially stiffer and much stronger than the jute-fibered layers of the original primary support paper. In all six cases, these fills resulted in substantial structural distortions and increased risk for future damage.

Before any in-depth treatment could be carried out in order to facilitate exhibition display, the paint layers of all twenty-five cards required stabilization. In an effort to do this, several organic consolidants were considered for adhering the paint layer to the paper surface, including natural gelatin, JunFunori,[6] and isinglass. Empirical testing found that the best consolidant for the media was isinglass. It met all of the criteria necessary for consolidating media, proving effective at stabilizing paint flakes and islands without changing the color or surface character of the paintings (Fig. 14).[7]

In small, controlled amounts, this pre-prepared adhesive material was reconstituted into solution at appropriate percentages, determined by the strength requirements of the damaged media. In this case, the conservators generally used a 1.0–1.5% solution. The isinglass was applied under the lifting paint surface, often assisted by an immediately-preceding application of ethanol used to facitate the flow of the consolidant, and the unstable areas of the paint layer were secured to the surface of the paper support. Once the paint layers were consolidated and stable, the objects were considered safe for further treatment.

MOLD REMEDIATION

The next step was to address the mold. Mold mitigation falls into a category where treatment intervention is not debated. Mold must be addressed and treated. Deterioration by fungi depends on the nature of the materials upon which they grow. The evidence of fungi left behind on the cards was the same in all cases, a white powdery substance found on both the recto

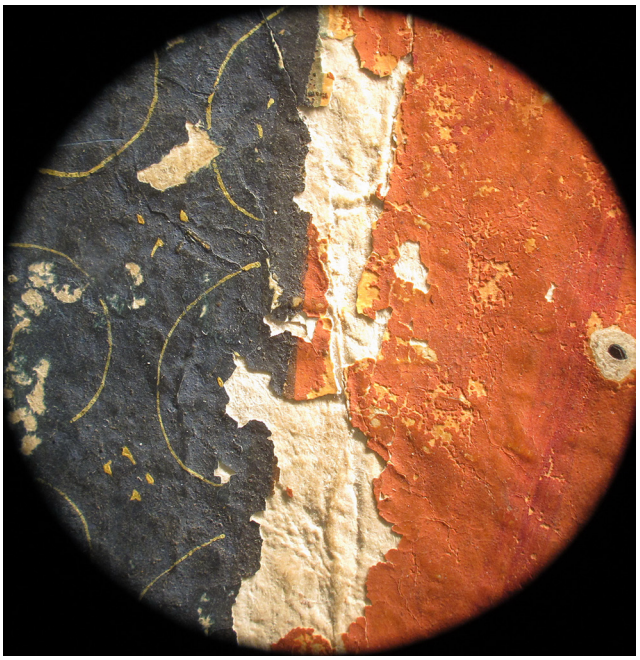


Fig. 12. Stereo binocular microscopic detail of paint layer showing losses. Image copyright The Metropolitan Museum of Art (2000.282.23)

Fig. 13. Detail of former loss compensation and planar distortion. Image copyright The Metropolitan Museum of Art (2000.282.4)

Fig. 14. Isinglas disks, detail.

Fig. 15. Mold damage along top. Image copyright The Metropolitan Museum of Art (2000.282.20)

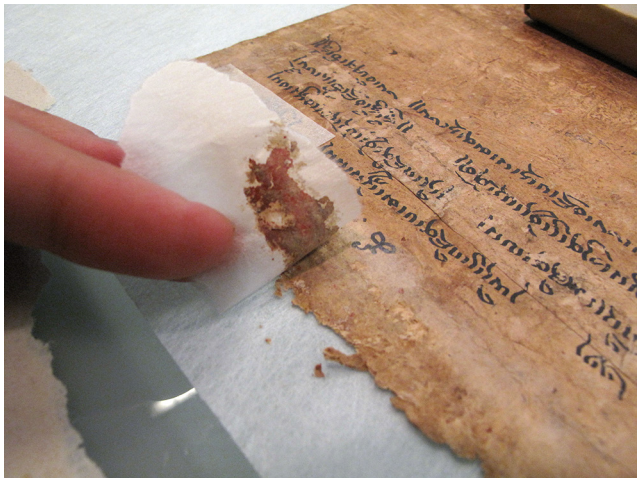


Fig. 16. Facing and salvaging off-set paint layer from verso. Image copyright The Metropolitan Museum of Art (2000.282.22)

and the verso (Fig. 15). Isolated along the top edges where a water event had occurred at some point in the objects' history. The evidence of injuries and damages from this water event make it obvious that the cards were stacked on top of each other. In some instances, attachments and accretions covering over images along the top edge were actually substantial fragments of offset paintings in direct contact with the verso above. These singular layers of paint with one layer of paper support as substrate were delicately removed and reused as possible in the reintegration of design phase (Fig. 16).

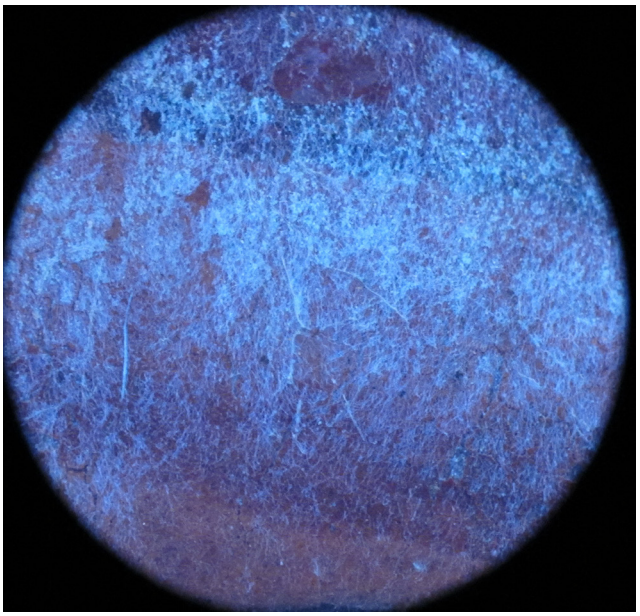


Fig. 17. Stereo binocular microscopic detail of hyphae (150X). Image copyright The Metropolitan Museum of Art (2000.282.20)

Damages at the bottom half of the stack of twenty-five cards were considerably worse than the top half, following their numbering system. In addition to rodent and insect damage, the water damage appears to have caused some of the stack to fuse together along the top edge. Subsequent mold growth following the water event was not surprising as pasteboards and the presence of substantial amounts of starch provided a feast of nutrients upon which the mold could feed. Richly bound paint layers also lent themselves as hosts to dense hyphae (Fig. 17).

Ultimately the mold areas were decontaminated[8] with a 70% alcohol 30% deionized water solution (after testing) and then gently cleaned locally[9]. It should be noted that though the areas of mold damage were relatively straightforward to identify and could be treated accordingly, other apparently dirty or discolored areas were more complex: surface accretions of smoke, dirt, and oil were deposited and absorbed onto the paint surface of most of the cards from use and handling. The main purpose of the cards' creation was to educate and inspire the initiate: to be held in the hand, studied, and turned over to read the inscription, which was intoned, chanted, and recited repeatedly. As a result, most surface accretions were left in place and respected as evidence of the use and history of the cards. In very few cases where surface accretions were particularly disturbing to the overall reading of a deity or the foreign matter was identified as insect deposits, the accretions were removed mechanically, in a dry manner, under binocular magnification with especially fine surgical tools.

LOSS COMPENSATION AND FORMER REPAIRS

Once the paint layer had been stabilized and cleaned, the damage along the top edges of all the cards could be addressed. The losses were both structurally and aesthetically problematic. The damaged top edges were weakened, frayed, and vulnerable to further injury; and visual focus was drawn away from the illustrations, toward the damage. The areas needed physical stabilization and design reintegration. From an aesthetic perspective, any disruption of the border pulls focus away from the central image, whereas a completed border allows the viewer to appreciate centralized and framed individual images as well as the full mandala as they and it were intended to be seen. Thus, the six cards that had been previously repaired and poorly filled, were visually disruptive when displayed as a set. Additionally, these six cards were heavily over-painted (both in the fill areas as well as copiously across the original surface in pinpoint losses) with ill-matched paints. It was not a difficult decision to remove these unsightly and structurally problematic fills. Using a combination of localized Gore-Tex humidification and gentle mechanical manipulation, these fills were gently removed from the original supports. It was imperative to use as minimal intervention as possible while salvaging and keeping the primary support along with its original paint layer intact.

After the old fills and their adhesive residues had been removed, the twenty five cards were ready for structurally-appropriate loss compensation and design reintegration through in-painting. Though each of the three conservators treating the cards inevitably used slightly different treatment techniques, the delaminating layers of the support were consistently stabilized with wheat starch paste and soft-sized, flexible papers were selected for the new multi-layered fills, which brought the primary substrate into plane through minor overlapping and chamfering (Fig. 18). The inpainting techniques employed by all three conservators also differed slightly, but were uniform in the application of Winsor & Newton watercolors which reflected and complimented the evidence of surface damage from centuries of handling, visible across the surfaces of the cards. Ultimately, the fills returned regularity to cards' designs and allowed the margins to fulfil their original function as frames for the images while returning structural soundness to the cards and protecting them from further damage.

HUMIDIFICATION AND FLATTENING

Since a number of the cards exhibited moderate warping and buckling, a Gore-Tex humidification package was employed to relax the cards, as needed. Testing was first carried out on several small corners of a few cards to determine if the multi-layered support, delicate paint layer, and recently applied inpainting and fills could withstand prolonged moisture vapor without offsetting paint or delaminating attachments.

Fig. 18. During treatment (loss compensation) inserting chamfered-edged fill. Image copyright The Metropolitan Museum of Art (2000.282.24)

Once it was determined that this form of humidification was possible, the selected cards were placed in individual Gore-Tex packages and allowed to relax fully. They were then removed from the packages and flattened in a blotter press, under a weight, for several days. One tremendous advantage of this slow, gentle, and effective vapor humidification procedure is the significant reduction of the risk of causing stains and tidelines direct applications of water or mist.[10]

After the pieces flattened in the press for several days, they were removed, returned to the set, and the entire mandala was reassessed by all three conservators. The cards were thoroughly examined and it was determined that the consolidation of the media, the removal of mold, the newly applied and inpainted fills, and the overall flattening of several of the cards returned a visual uniformity to the set as well as much-needed structural soundness: the tsakli were ready for exhibition.

DISPLAY

The cards were simply and dramatically displayed in their mandala format, placed directly on the deck of their exhibition case and covered with a Plexiglas vitrine. The exhibition, *Sacred Traditions of the Himalayas*, was on view in the changing exhibition galleries for South Asian Art from December 20th, 2014 through June 14th, 2015. Other works included in the exhibition were elaborate mandalas, embroidered *tangkas*, devotional sculpture, and jewelry for the gods. All the objects on display served as visually pleasing tools or vehicles that allowed individuals/initiates to reach toward the elusive idea of transcendence (Fig. 19).

Fig. 19. *Sacred Traditions of the Himalayas* exhibition installation, Gallery 251. Asian Art, The Metropolitan Museum of Art

DISSEMINATION OF INFORMATION

Though presenting a paper at the American Institute for Conservation (AIC) Annual Meeting as well as publishing in the Book and Paper Group (BPG) Annual has traditionally been an effective and well-supported method for sharing information with colleagues in the field, it was determined early on in the course of this project that each of the three conservators and the curator involved with the exhibition would also submit blogs to the Met's website and share details of the treatment on three of the social media platforms supported by the Met: Twitter, Instagram, and Facebook. This broader array of distribution approaches had advantages as well as disadvantages and required both more time and greater flexibility from the conservators. While curators are generally expected to produce both scholarly research for their fields and object labels with simplified, but informative, material for visitors, conservators are less-frequently expected to interact directly with the public. Producing blogs and posting information to social media sites necessitates an appreciation for and understanding of what might interest viewers, both online and offline. For conservators, this can complicate what and how information is shared. With that said, allowing conservators the opportunity to interact directly with the public in any form available is universally beneficial to the field. Without public appreciation, particularly at a time when media presence (social or otherwise) is so highly valued, conservation risks obfuscation.

The Met has spent the past several years restructuring their website to better represent the depth and breadth of its encyclopedic collection as well as the scholarship that accompanies it. Embedded into the main website are a variety of resources that support conservation research and documentation, including the *The Heilbrunn Timeline of Art History*; *Now at the Met*; a *Conservation and Scientific Research* site; and several specific departmental and exhibition sites, some of which are meant to exist in perpetuity. The blog posts created in conjunction with the *Sacred Traditions of the Himalayas* exhibition, for example, can be accessed permanently at the following address: http://www.metmuseum.org/exhibitions/listings/2014/sacred-traditions/blog-series. These posts, which covered curatorial as well as conservation topics, were published and made available to the general public through the main Met website and were promoted through various social media platforms (Twitter, Instagram, and Facebook) by both the Met itself as well as by the individual authors. One of the increasingly difficult areas to deal with in the dissemination of information is the different levels of understanding among the Met's readership. This applies to the original text, but also applies to public-inquiry responses. As a case in point, one reader asked:

> Just wanted to know why the isinglass was dried in sheets. It looked like these sheets were set on the surface and then reconstituted on top but the video looks like the liquid form of isinglass was just applied to the under the cracks after ethanol was used to wet the surface.
>
> I just ask as I am a student looking at potentially using the same sort of idea on another treatment.
>
> Thanks

In publicly responding to the posted inquiry, the author of the blog must weigh several factors with only the information provided in the text of the question. Is the student an undergraduate student? Graduate student? Conservation student? Does s/he have a basic understanding of the materials (both artists' and conservation) discussed? Regardless, since whatever reply the author gives will be seen by the general public, it can be assumed that the majority of readers are neither conservation students nor conservators and they do not have a firm grasp of artists' materials and/or adhesive

science. A blog occupies a difficult middle ground between presenting research at a conference, where clarifying questions may be asked of both the speaker and, in return, of the person inquiring, and publishing the research in a printed journal, where there is no forum for questions. Publicly responding to blog inquiries requires that conservator reveal some information, but not too much, to prevent a misunderstanding. In this particular instance, the response was:

> The isinglass is taken from a relatively impure form and then it is soaked, cleaned, and strained. Once the solution has been strained and as many inclusions as possible have been removed, the resulting collagen-infused liquid is distributed onto a non-stick surface in small droplets and allowed to dry for several days. The resulting disks allow for easier long-term storage of the material in its purer form and they are also helpful when calculating weight/volume measurements. In this instance, a specific concentration of isinglass solution was chosen for consolidation, the materials were measured, and a solution was mixed for the project. Ethanol was used to reduce the surface tension of the isinglass solution.
>
> Good luck with your treatment!

By leaving out specific measurements and calculations, the intent was to give the inquirer basic and accessible information about why and how the adhesive material was selected and applied.

In addition to blogs, social media platforms provide another opportunity for conservators to share information directly with the public. As it relates to this exhibition, various aspects of the treatment of the cards were tweeted and posted about on personal Twitter, Instagram, and Facebook accounts, and promoted further by official Met accounts, allowing the material to reach a broader audience (Fig. 20). The distinct advantage of sharing information via social media is the tweets and posts are succinct and instantaneous, even more so than blogs. Readers expect posts to be short (in the case of Twitter, only 140 characters are permitted, inclusive of hashtags) and superficial—a snapshot of the object during treatment, for example, and a 140-character explanation of what it is and why/how it is being treated is sufficient. The disadvantage, of course, is the same: the information is succinct and instantaneous, and in a field where complex decisions and ethical considerations are paramount, there is little opportunity to thoroughly explain how and why specific courses of treatment are chosen.

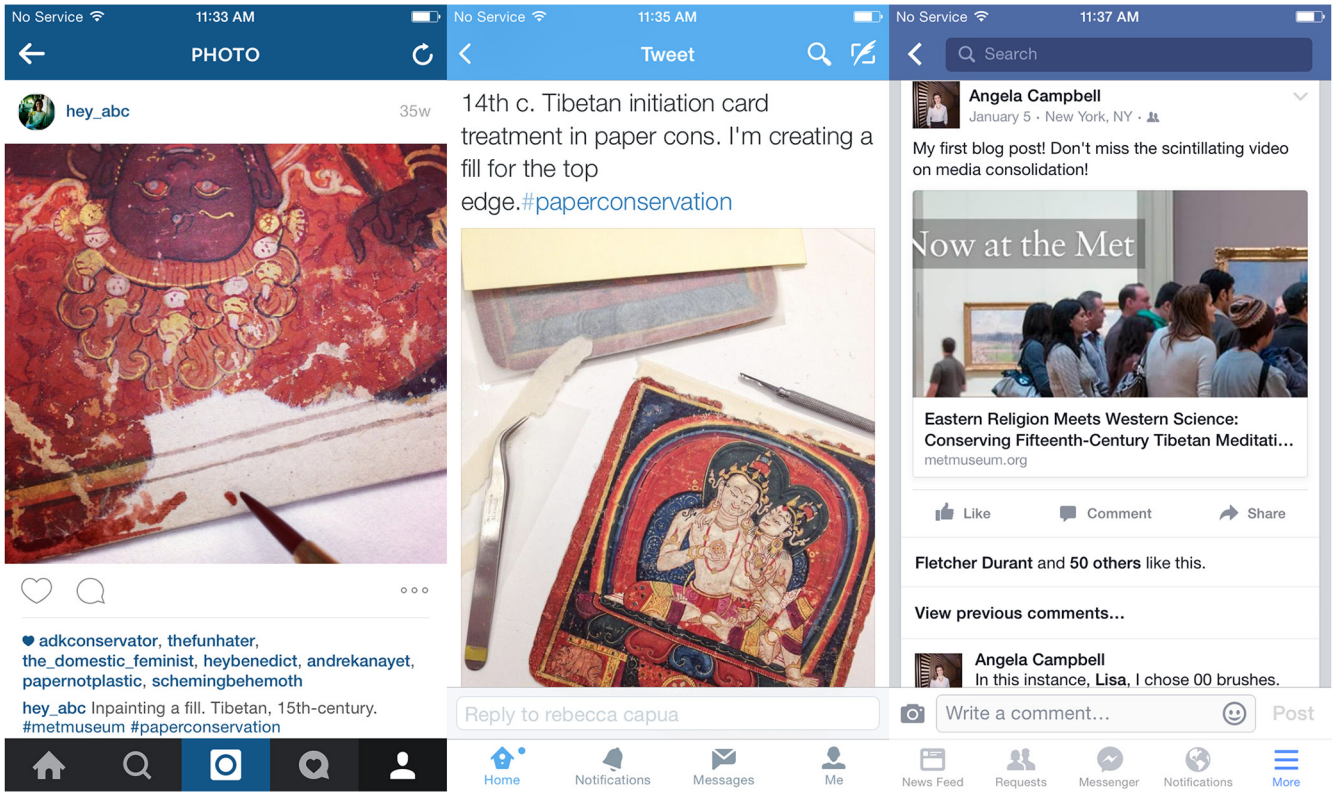


Fig. 20. Screen shots of social media presence.

CONCLUSION

Overall, a relatively conservative, yet time-consuming conservation strategy addressed the essential and fundamental physical stabilization needs of the cards, making the objects safe to handle and display while respecting them for their age and signs of use. Considerations included how the treatments would ultimately affect the structural, chemical and mechanical characteristics and long-term stability of the object and natural products with good aging properties were utilized whenever possible. The disrupted overall aesthetic appearance of the mandala was treated in a manner sympathetic to the history of its handling and its religious significance, which effectively returned an evenness to the visual flow of the cards. Sharing information about the history and conservation treatment of the cards through various blog and web-based publications encouraged public interaction. Although these online forums in no way can or should replace scholarly research and publication, it provided a platform for both conservators and curators to stimulate public and scholarly interest in the complexities of these fascinating objects. The project was an extraordinary opportunity to examine and treat a rare set of powerful works of art while closely collaborating with colleagues regarding concerns as specific as residual smoke removal and as broad as public perception of the ethical considerations of conservators. Even though the treatment of the cards is completed, this enduring, celestial group of inspirational tsakli will no doubt continue to inspire and enthrall experts and the public alike.

ACKNOWLEDGMENTS

The authors would like to extend their gratitude to: Kurt Behrendt, Associate Curator, Asian Art, The Metropolitan Museum of Art; Rebecca Capua, Associate Conservator, The Sherman Fairchild Center for the Conservation of Works of Art on Paper, The Metropolitan Museum of Art; Marjorie Shelley, Sherman Fairchild Conservator in Charge, Sherman Fairchild Center for the Conservation of Works of Art on Paper, The Metropolitan Museum of Art; Lyudmyla Bua, Conservation Intern, Sherman Fairchild Center for Works of Art on Paper, The Metropolitan Museum of Art (2013).

NOTES

1. Rebecca Capua, Associate Conservator in The Sherman Fairchild Center for the Conservation of Works of Art on Paper, The Metropolitan Museum of Art.

2. Behrendt, Kurt. Evoking the Divine: Mental Purification Using a Tibetan *Tsakali* Mandala. Blog post, March 13, 2015 (http://www.metmuseum.org/about-the-museum/now-at-the-met/2015/tsakali-mandala)

3. Areas around losses and fills were avoided to alleviate doubts as to which paper the fibers were coming from as well as avoid sampling adhesives that were not original from inception/creation. Samples were always taken from the verso, in areas that did not contain any media and selection was given preference to areas of the sheet that appeared to be the healthiest, least affected by contaminants, stains, accretions, etc. The objects were dampened with deionized water and while under binocular magnification, fibers were teased from the object with a pair of surgical tweezers and placed onto a microscope slide. There, the fibers were separated with two tungsten needles and examined with a stereo binocular microscope to evaluate the general composition of the fiber. Examined while dampened, dry, and stained with Graff C-stain the samples were analyzed under a range of 100-400 times magnification in an Olympus polarizing light microscope.

Graff C stain is an all-purpose stain commonly used in paper fiber microscopy. A dispersed fiber sample is stained and the color reaction is observed with transmitted light through the polarizing light microscope at varying degrees of magnification (10X; 20X 40X oculars which translates to 100–400X magnification).

4. KTS640 Infrared camera, blank filter used for imaging.

5. The creation of the Tibetan alphabet is attributed to a minister of Songsten Gampo, Thonmi Sambhota (569–649 AD). It is said that he was sent to India to study the art of writing, and upon his return introduced the alphabet. The form of the letters are based on an Indic alphabet, marked by heavy horizontal lines and tapering vertical lines; it is the most common script for writing in the Tibetan language. As in other parts of East Asia, nobles, high lamas, and persons of high rank were expected to be proficient calligraphy. Unlike Chinese, Japanese, and Korean techniques, Tibetan calligraphy was carried out using a reed pen as opposed to a brush. Nevertheless, East Asian influence is apparent visually, as Tibetan calligraphy is at times more free-flowing than calligraphy involving the descendants of other Brahmi scripts. Given the overriding religious nature of Tibetan culture, many of the traditions in calligraphy come from religious texts, and most Tibetan scribes have a monastic background.

6. http://talasonline.com/photos/msds/junfunori.pdf

7. van Dyke, Yana. *"Sacred Leaves: The Conservation and Exhibition of Early Buddhist Manuscripts on Palm Leaves"* in The Book and Paper Group Annual, AIC, Vol 28 pp.83–99, Washington, D.C., 2009.

8. Information on the air cleaner unit: www.airsystems-inc.com: Extract-All™ Model S-984-1

9. Hygienic mold decontamination and dry cleaning was performed in an enclosed mold decontamination unit equipped with a HEPA filter air cleaner, a fume trunk, a stereomicroscope, and cleanable Plexiglas partitions. Conservators wore appropriate personal protective equipment, such as gloves, N-95 or P-100 particulate masks, disposable smocks, and/or ear plugs, and goggles, to protect dermal, respiratory, ear and eye systems. Removal of fungal structures and associated accretions were carried out using a Nilfisk GM 80i HEPA-filtered vacuum cleaner under low suction and employing soft brushes and small tools.

The objects were then placed on a clean paper surface and the procedure was repeated. A seventy percent alcohol to thirty percent deionized water mixture was first tested on all the colors in the palette.

Customized micro swabs saturated with the cleaning solution noted above were gently rolled across top third of each painting while working under binocular stereo magnification. Minor areas of painting were irreversibly damaged from mold in the form of embedded amorphous circular clusters altering the paint layer's saturation, in the worst cases.

10. The Gore-Tex™ barrier is a micro-porous membrane of polytetrafluoroethylene laminated to non-woven polyester or polyester felt. The membrane transmits water in the form of vapor while preventing the passage of liquid water, thus giving extra protection and control in introducing moisture to sensitive objects. When Gore-Tex™ is used in the blotter sandwich, two sheets of Gore-Tex are placed dry, one on either side of the object. The smooth membrane side of the Gore-Tex sheets is thus in contact with the object's recto and verso. Moist sheets of blotting paper dampen the felted side of the Gore-Tex, and Mylar sheets are placed on top of the blotters to retain moisture levels. Humidification times varied between twenty to forty minutes for complete relaxation of the cards after which they were placed into a blotter drying pack between lens tissues and shuffled over several weeks while drying and reaching a moisture content equilibrium.

REFERENCES

Behrendt, Kurt. 2014 *Tibet and India: Buddhist Traditions and Transformations*. The Metropolitan Museum of Art Bulletin: The Metropolitan Museum of Art, Winter.

Behrendt, Kurt. 2014 Evoking the Divine: Mental Purification Using a Tibetan *Tsakali* Mandala. (website)

Kapstein, Matthew. 2009. *Buddhism Between Tibet and China (Studies in Indian and Tibetan Buddhism)*: Wisdom Publications, Boston (Sommerville, MA).

Kossak, Stephen. 2010. *Painted Images of Enlightenment: Early Tibetan Thangkas, 1050-1450*. Gaithersburg, Maryland: Marg Foundation.

Labarre, EJ. 1952. *Dictionary and Encyclopedia of Paper and Papermaking*. Amsterdam: Swets & Zeitlinger.

Leidy, Denise Patry. 2008. *The Art of Buddhism: An Introduction to its History and Meaning.* Boston and London: Shambhala. 137

Snellgrove, David. 1982 Buddhism in North India and the Western Himalayas: Seventh to Thirteenth Centuries: *In The Silk Route and the Diamond Path,* edited by Deborah Klimburg-Salter (Los Angeles: UCLA Art Council)

Wayman, ALex. 1990. *The Buddhist Tantras: Light on Indo-Tibetan Esotericism*. New Delhi: Motilal Banarsidass.

YANA VAN DYKE
Conservator
The Sherman Fairchild Center for Works on Paper and Photograph Conservation
The Metropolitan Museum of Art
New York, NY
Yana.vanDyke@metmuseum.org

ANGELA CAMPBELL
Assistant Conservator
The Sherman Fairchild Center for Works on Paper and Photograph Conservation
The Metropolitan Museum of Art
New York, NY
Angela.Campbell@metmuseum.org

DEBORAH HOWE

The Brut Chronicle: Revived and Reconstructed

INTRODUCTION

Rauner Library is the Special Collections Library within the Dartmouth College Library system. Totaling more than 100,000 volumes, the rare book collections constitute a resource of major importance to the institution and the scholarly world at large. Principal concentrations include nineteenth- and twentieth- century British and American literature, printing and the book arts, the literature of the White Mountains, and New Hampshire imprints.

The Library has a strong commitment to integrating rare books, archives, and manuscripts into the Dartmouth curriculum. Since 2004, Rauner staff have collaborated with faculty on over 400 courses across multiple disciplines including Anthropology, Environmental Studies, and English History.

In 2006, through the William L. Bryant Foundation Library fund, Rauner Library purchased The Beeleigh Abbey Brut, now referred to as: Rauner Codex MS 003183 or simply, the Dartmouth Brut. The manuscript was purchased in order to expand the Library's selection of secular materials from the Middle Ages to enhance scholarly research in this area. The Dartmouth Brut is believed to have been written around 1430, and chronicles Britain's history from 1377 to 1419. (fig. 1)

HISTORY

The medieval prose Brut, first written in 1272 and extant in over 240 copies, is a chronicle of England covering her history from the first settlement up until the year 1461. It is named after England's first hero, Brutus, the founder of Britain, and includes factual information, such as the chronicles of rulers, major battles and conquests, as well as mythical stories of Merlin, King Arthur and King Lear.

There are 240 variant manuscript copies of the text written in the three major literary languages of medieval England; Latin, Anglo-Norman French and Middle English. The Middle English variants represent 181 of 240 manuscripts, with no two versions being identical.

Fig. 1. Rauner Codex MS 003183. The Dartmouth Brut, full stationers binding.

THE MANUSCRIPT

The manuscript is written on parchment in semi-cursive Anglican script in what is now brown ink. The text is laid out in single columns of 36 lines and situated between two pairs of scored or faintly ruled verticals. The first text leaf is simply illuminated and throughout the text there are rubricated initials with flourished decorations in blue. (fig. 2)

This copy is significant because it contains a high number of annotations and marginal inscriptions made by as many as ten individuals, in 15th and 16th century hands. Because this manuscript had been in private hands until its purchase by Dartmouth, these inscriptions and even the text itself had not been thoroughly documented. Therefore it instantly became popular and available to Brut scholars for new and undocumented research.

THE BINDING

The manuscript textblock measures 30 cm high, 22 cm wide and 4.8 cm in thickness comprising of sixteen parchment quires of mostly four folios each. The binding consists of a

Presented at the Book and Paper Group Session, AIC's 43rd Annual Meeting, May 13–16, 2015, Miami, Florida

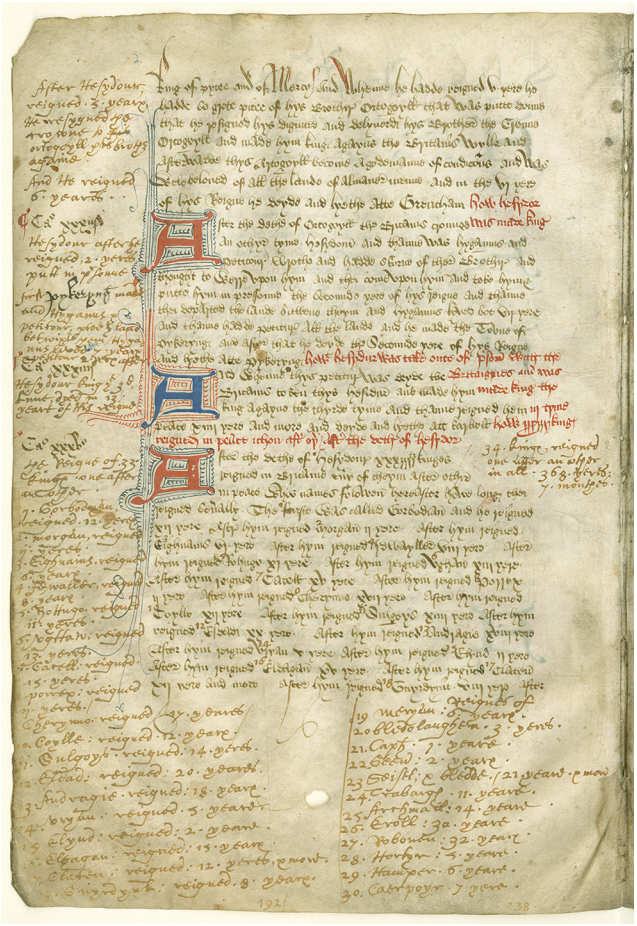


Fig. 2. Page of marginalia and text layout. Taken from scanned image.

Fig. 3. Detail of cut and pierced leather sewing support with tacket.

Fig. 4. Cover with clasp and blind tooling.

blind tooled flexible leather case with a fore edge flap and three reinforcing leather overbands covering areas of the spine. The textblock is attached through the overbands to the sewn textblock with six secondary tackets. This style of binding involving a leather case, overbands, blind tooling, fore edge flap, and a closure system is sometimes called a "stationer's binding" and was commonly used for account books and other record keeping texts. It is less often found on literary or historical manuscripts, though non-account book texts were sometimes sold in simple tacketed bindings without tooling or overbands that may have been considered temporary bindings.

In many stationers bindings the sewing supports are left long in anticipation of new quires as new transactions and updated information became available. In the Brut binding, the supports have been cut short indicating that there would be no need for further additions.

A detail I found interesting about the sewing supports was that in the center of each support there is a pierced hole located at the first and last signature station with the tail support having an additional piercing at the middle signature station. I believe these were used as supplementary sewing stations for security and strength, and helped keep the quires cinched onto the support so they would not slide off. (fig. 3)

THE COVER

The leather cover with foredge flap is tooled in blind. The pattern of the tooling replicates samples of roll tooled designs from 1530 to 1630, leading me to believe that the binding was made during this time, almost 200 years after the Bruts creation in 1430. There are three over bands with decorative

alum tawed lacing. Paper paste downs extend the width of the cover which gave the limp leather a bit more rigidity at the time of its fabrication. A brass metal clasp is crudely sewn to a leather strap at the foredge flap, with no sign of a catch plate. (fig. 4)

CONDITION

The condition of the binding reflected its age as evidenced with various damages throughout. The leather cover was worn especially at the spine, exposing the backs of the quires. Previous repairs of machine made paper and leather had been glued over the interior of the lower cover and flap to strengthen it and a thin thread was used as reinforcement sewing. The nature of the repairs suggests that they were done in the 1950s. (fig. 5)

The parchment leaves were highly soiled and had some distortion, especially the title page which had contracted from moisture damage. The media appeared to be in stable condition and did not show evidence of flaking or powdering. A number of pages were torn and had losses. The exterior folios were weak and damaged, and the gutters were filled with dirt and debris. The front joint was almost completely detached, and the sewing was broken and loose throughout. With each viewing this sewing became weaker and more insubstantial resulting in potential damage to individual pages, essentially the binding was mechanically self-destructing.

My challenge as conservator was to treat the Brut so that it could be used and studied as a physical object in an active special collections reading room. Dartmouth Special Collections Librarian, Jay Satterfield, wanted the text scanned to make the contents accessible through our digital library collection. As an option to outsourcing the digitizing and possible conservation work, I contacted the Northeast Document and Conservation Center which recommend that after digitizing, the binding be stabilized to the best degree possible and have limited use, a common conservation action. While this is a viable conservation approach this was not an option for us. The manuscript was a major investment and was intended to be used for regular teaching instruction. Stabilizing the binding as best as possible would not ensure the protection needed, therefore an alternative solution was desirable.

PRETREATMENT AND DIGITIZING

Digitizing the manuscript was our first priority. As we were not going to retain the current binding, the first step was to disbind the manuscript, to facilitate the scanning process. First, I released the tackets to allow the case to detach from the textblock.

The exposed quires revealed another set of sewing holes and remains of old adhesive, indicating that there was a previous binding, most likely the original one. This evidence explained the incongruity of the binding with the text-block,

Fig. 5. Inside cover, previous modern repair: machine-made paper and leather patches to reinforce cover.

Fig. 6. The cover released from the tackets, reveals sewing holes from original sewing.

an observation that had perplexed me from the beginning: the worn and damaged stationers binding was historical but was neither completely contemporary with the text-block nor congruent with its subject matter. (fig. 6)

Based on the date the manuscript was written, the original binding might have been bound in wooden or heavy boards covered in an alum tawed skin. This could also explain the clasp that was stitched to the foredge flap; perhaps a remnant of the original binding. Once the textblock was dis-bound, I mechanically cleaned the pages using vulcanized rubber sponges avoiding the manuscript area and brushed out the large amount of debris. The outer folds of the broken folios and the tears were mended as necessary with a lightweight Japanese tissue and cooked wheat starch paste. In this unbound condition the pages were stable enough to be digitized. Each of the 16 quires was placed in a paper folder and put into a temporary box during the digitizing process. Each folio was scanned on an Epson Expression 10000 flatbed scanner, with 600 ppi resolution and 48-bit color. Later, the

image files were sequenced in proper order and integrated into the Dartmouth College Digital Collections. http://www.dartmouth.edu/~library/digital/collections/manuscripts/ocn312771386/.

REBINDING OPTIONS

Given that the manuscript was bound in a stationers binding, I concluded after discussions with colleagues that perhaps the Brut had been rebound by a merchant in the sixteenth century, who could have taken it to his binder who bound his account books. Nicholas Pickwoad references this suggestion about a printed text he found in a stationers binding (Pickwoad, N. 2000). This idea was later validated by then student Emily Ulrich who surmised the manuscript belonged to a sheep merchant based on evidence from the marginalia of readers' annotations that she transcribed as part of her senior thesis. This shows a direct relationship of the owner to the method he chose to bind his valuable book. When the time came to rebind the manuscript I faced a dilemma. In instances where rebinding happens on a parchment manuscript it usually entails taking it out of a terrible 19th century inflexible binding. This was a manuscript that had been historically rebound and still retained that significance. As a general approach we try to use and retain the original binding to maintain historical accuracy. Reusing the original cover was out of the question as the leather and overall condition was too far degraded. To think through the option of rebinding back into a stationers binding, I fabricated a facsimile in order to evaluate this option with the Special Collections Librarian. Upon completion of the facsimile it seemed clear that this would probably not be the best option. I felt this style would be too mechanically demanding for the old and weakened quire folds and it also seemed as though this treatment choice was trying to make the Brut fit back into something it no longer belonged to and the Special Collections Librarian agreed. (fig. 7)

The second option was to rebind it in an historical replica similar to the possible original wooden board style. In book conservation we are often rebinding our books into historical replicas in order to preserve historical context and provide a pleasant viewing experience. In current practice we approach our work with the ideals of what conservation means, such as reversibility and less intervention. Going back to the early 1950's, Roger Powell emphasized the importance of keeping adhesive off the back of manuscripts, parchment manuscripts in particular and established the idea of reversibility and openability. Following this line of thinking conservation re-bindings like the Elsmere Chaucer at Huntington by Anthony Cains, and Robert Espinoza's Rigid Board Specifications all stem from a traditional concept of conservation rebinding. So rebinding the manuscript in an historical replica was a viable consideration.

Fig. 7. Facsimile stationers binding with toggle closures.

Because the Special Collections Librarian wanted to start using the text in classes I decided as an initial step to re-sew the quires onto tanned leather supports using the sewing holes from the previous stationers binding. To attach the handmade double folio flax endsheets, I used the same sewing method of the centered pierced sewing supports. Resewing in this fashion seemed the most practical as it was in keeping with the previous sewing of the stationers binding and put minimal stress on the quires. In this manner, the manuscript could be used in the classroom, a supported non-adhesive binding, without covers. The Librarian remarked on how wonderfully it opened and implied he wouldn't mind if it stayed like that, but I knew that was not a responsible option and a protective cover was essential. (fig. 8)

COLLABORATION

The process of rebinding the manuscript coincided with the conference *From Medieval Britain to Dartmouth: Situating the English Brut Tradition* which took place on campus and I was invited to present a short summary of the binding and the conservation work I had completed to a group of Brut scholars participating at the conference. At the conclusion of my talk, there was a thought-provoking discussion about what should happen with the binding. Some scholars favored the

Fig. 8. Completed sewing of text block on tanned leather supports.

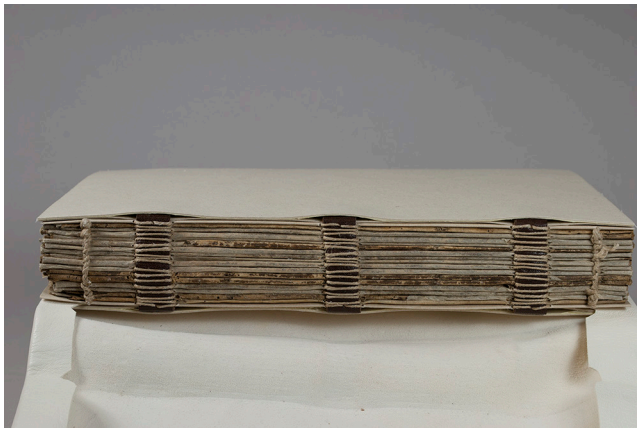


Fig. 9. Binding with attached slotted covers.

Fig. 10. Opening at back with leather supports inserted into the cover boards.

potential original binding, in wooden boards covered in an alum tawed skin, while others leaned toward the facsimile stationers binding style, and as we talked a consensus developed that a third option would be best. The Brut appeared to have been bound in the 16th or 17th century by a merchant in such a fashion that made sense to him. Now in the 21st century, the book's context is quite different, with new considerations and requirements. It was agreed that some sort of hybrid would be appropriate for the binding, something that would suit our needs today but would reflect and pay respect to its history. The opportunity to work collaboratively and receive input gave me the chance to hear different perspectives and helped me to develop an alternative solution.

TREATMENT

Left with the task of creating the new binding, I knew I wanted to maintain the sewing that I had already completed, since it was functioning well. The idea to fabricate pasteboard or cartonage for the cover boards was inspired from a workshop I had taken with Maria Fredricks, head conservator at the Morgan Library. In the workshop on historical paper bindings, I was reacquainted with the beautiful cover weight flax paper made by Tim Barrett from the Paper Research and Production Facility at the University of Iowa. Layering this paper would produce boards that were protective but not overly heavy or stiff—a middle ground between wood boards and flexible leather.

Using multiple layers of the handmade paper with two inner boards of forty point board, I fashioned the boards with 3 small openings along the spine edge where the corresponding leather supports slip in. In order to keep the boards in place and provide a covering, I created a chemise of alum tawed goatskin, to reference its possible original binding. This assembly allows the boards to be removed to show the sewing structure and the original sewing holes which can be used as a teaching tool. To facilitate the insertion of the supports into the slots of the board I reinforced the ends with an inner layer of parchment. (figs. 9–10)

The over cover, or chemise, of the conservation binding, offers a protective exterior to the boards, akin to a medieval dust jacket. It provides support and a cohesive finish to the binding, at the same time allowing for ease in opening and is non adhesive. The finished binding has a glimpse of what it may have looked like in its original form before the surviving stationers binding, and is flexible and stable for reading purposes. In the end, this simple design has met all goals of the Brut's current use while at the same time maintains reference to its past life and respect to its history. (figs. 11–12)

To augment the Brut's value for teaching and create a research archive, I saved all the material that was removed from the binding during the conservation process. The debris from the sections is encapsulated in a small pocket and all

Fig. 11. Outside of binding with alum tawed chemise.

Fig. 12. Open manuscript illustrating flexible opening.

tackets, sewing thread and repair thread are kept with the manuscript. The surviving cover is housed in a simple folder lined with Volara foam and covered with the same handmade paper used for the paste boards and all are housed together in a custom box. (figs. 13–14)

This practical treatment solution takes into account the bindings' historical provenance and its contemporary situation: which is that of an object people use and study. In the end the importance of most books is not as museum pieces to be cherished on a shelf, but in their ability to convey intellectual ideas to further the human project. A book has the ability to shape people's lives and change them. The conservation decisions made had to take into consideration that the book was a teaching tool, not just a trophy. It is now in a climate controlled facility with caretakers, here to be used and appreciated reflecting the idea of making conservation work.

ACKNOWLEDGEMENTS

I would like to acknowledge the extensive help I had along the way in preparing for the talk, writing this article and in the development of the conservation treatment outcome. Many thanks go to; Chela Metzger, Head Conservator; UCLA, Tessa Gadomski, Kress Fellow; Dartmouth College Library, Michelle Warren, Professor Comparative Literature;

Fig. 13. Preserved fragments: six large tackets made from parchment, debris brushed from the gutters of the quires (dirt and hair), thin thread used for repair, leather sewing supports, and sewing threads.

Fig. 14. The Brut in its box: the bound codex, a folder containing the stationers binding cover, a sleeve preserving sewing fragments and debris, and a sleeve with provenance documents.

Dartmouth College, Maria Fredricks, Head Conservator; Morgan Library, Walter Neuman, Paper Conservator, Stephanie Wolff, Assistant Conservator; Dartmouth College Library, Joshua Lascell, Manuscript Supervisor, Rauner Library; Dartmouth College Library, Jay Satterfield, Special Collections Librarian, Rauner Library; Dartmouth College Library.

All photographs taken by Deborah Howe.

REFERENCES

Bryan, E. 2009. Rauner Codex MS 003183: The Beeleigh Abbey Brut at Dartmouth College, vol. 12. *The Journal of the Early Book Society for the Study of Manuscripts and Printing History*. Pace University Press. 207–243.

Pearson, D. 2005. *English Bookbinding Styles, 1450–1800: a Handbook.* London: British Library, New Castle, DE. Oak Knoll Press.

Pickwoad, N. 2000. Tacketed Bindings: A Hundred Years of European Book-binding. In *For the Love of the Binding: Studies in Bookbinding History Presented to Mirjam Foot*. Edited by D. Pearson. 119–167. London: British Library and Oak Knoll.

Repp M. March 8, 2012. The Conveyor: Research in Special Collections at the Bodleian Libraries. 2012 Seminar on the History of the Book. Morgan G. 2012. Bookbinding in Oxford in the long sixteenth century. Accessed June 20, 2015. http://blogs.bodleian.ox.ac.uk/theconveyor/author/theconveyor/page/3/

Szirmai, J.A. 1999. *The Archaeology of Medieval Bookbinding*. Brookfield, Vt: Aldershot, Hants.

Ulrich, E. *Echoes in the Margins: Reading the Dartmouth Brut in Early Modern England.*

Senior honors thesis, Dartmouth College. 2011.

Wikipedia. Accessed June 20, 2015. http://en.wikipedia.org/wiki/Brutus_of_Troy/

DEBORAH HOWE
Collections Conservator
Dartmouth College Library
Hanover, NH
Deborah.howe@dartmouth.edu

EVAN KNIGHT

Understanding and Preserving the Print Culture of the Confederacy

ABSTRACT

The Civil War, America's defining event of the 19th century, is exceptionally well documented in the collections of the Boston Athenæum. Of particular significance is the Confederate Imprints collection, broad in scope and rich in content, consisting of over four thousand books, documents, and prints that witness Southern experiences during the devastating war. This paper will consider three aspects of a recently completed two-year project to digitize the Confederate Imprints collection: preservation activities, particularly the leading role of the conservation staff in coordinating the imaging workflow; conservation treatment methodologies for a large collection with limited resources; and technical analysis of printed objects from this period.

The Athenæum's record of Confederate Imprints begins in December, 1860, with the bound journals of South Carolina's Secession Convention, and ends in the spring of 1865, with ephemera from the surrender of the Army of Northern Virginia at Appomattox. Print materials within this period were collected from every Southern state and territory, and were included in this project, in every format except newspapers. The most common were pamphlets, bound volumes in leather, cloth, and paper, sheet music, broadsides, maps, periodicals, almanacs, oversized administrative records, and handbills. Some highlights of particular rarity that illustrate the variety of formats encountered in this project are an unbound early draft of the Confederate Constitution, a rare hand-colored railroad map of the South, an illustrated manual of field surgery bound in cloth, a number of Army broadsides printed in the field, and the official voting record for secession in a district in Norfolk County, Virginia.

A Project Conservator selected objects for inclusion in the digitization workflow, performed treatment as necessary, coordinated the object's delivery to imaging technicians (communicating handling strategies as necessary), performed quality assurance checks after imaging, and coordinated the object's return to its long-term storage environment. In this model, an object could be selected for preservation, conservation, and imaging in a single step, which proved successful in minimizing bottlenecks and maximizing efficiencies.

Representative methods and techniques that were successfully used to stabilize and conserve the collection will be presented. These include variations on repairing torn text leaves, aqueous treatments, re-attachments of original pamphlet cover papers to texts, covers for pocket-sized cloth volumes, housings for folded maps in original covers, and book repairs for publisher's and bespoke bindings. Technical aspects of printing and bookmaking in the Southern Confederacy will also be examined. Common paper fibers, sheet-formation quality, and some common watermarks will be described. Books bound in leather, particularly in Richmond, Virginia, will be compared by their structural and decorative differences. Patterns of bookmaking practices unique to certain large publishers will be discussed, such as wallpaper coverings from S.H. Goetzel in Alabama, and die-stamped covers repurposed for military manuals in Richmond.

INTRODUCTION

The Athenæum has among the strongest collections of print materials from the short-lived Confederate States of America. But how can interpreters of this great collection of the South reconcile that fact that it is held at a bona fide Yankee institution like the Athenæum?

A key factor is that the Athenæum was one of the boldest and most organized collecting institutions in the United States for much of the 19th century. Since its founding in 1807, the Athenæum developed collections of artistic, literary, and documentary merit with acquisitions of works by Gilbert Stuart, Goya, George Washington, and a great deal more.[1] So in 1865, what started out as a drive to collect Southern newspapers soon became a systematic, comprehensive, and sustained mission to acquire anything printed in the South during the rebellion. In his correspondence, Librarian William

Presented at the Book and Paper Group Session, AIC's 43rd Annual Meeting, May 13–16, 2015, Miami, Florida

Poole repeatedly expressed progressive and inclusive motives behind the development of the collection. His stated desire was to preserve "[e]verything printed at the South during the war that goes to illustrate the state and action of the Southern mind," and he also wrote that "[w]e already have a fine collection, and desire to increase it for the benefit of the future historian of this eventful period of our nation's history.… The object we have in view is not a selfish one, but is broad and national. Whatever we collect will be at the service of the historical student […] whether he be a resident of Massachusetts or Tennessee [...] and our collection now is probably the largest in the country, except that of the War Department."[2]

Over the ensuing 150 years, the Confederate Imprints collection at the Boston Athenæum has steadily grown with acquisitions and donations. The first bibliography of Confederate Imprints, published in 1955, was based primarily on the Athenæum's collection. Confederate Imprints are frequently requested in our Special Collections Reading Room, and in total now number over 4500 bound and unbound objects.

PROJECT PLANNING

In 2011, Associate Director of Digital Programs and Preservation Jim Reid-Cunningham began planning the comprehensive digitization of these Confederate Imprints (excluding newspapers) and their dissemination on the internet. Every object would be imaged, page by page; their images and metadata uploaded to a 3rd party host, ContentDM; and then the digital surrogate would be linked directly to its listing in our online public access catalog.

The project was funded by Trustee Emeritus Caleb Loring, Jr. for three years and included my hiring in 2012 as the Project Conservator. Digitization practices, and best practices of conservation in support of digitization, were adopted from the literature where possible, including: having an experienced conservator (Jim Reid-Cunningham) involved in the project planning; estimating treatment needs and costs (in our case with a pilot program in 2011); maintaining open formal and informal communications between conservation and imaging staffs; having close proximity between conservation and imaging labs; and focusing the majority of conservation treatment time on stabilization.[3, 4]

CONSERVATION IN SUPPORT OF DIGITIZATION

Systematically digitizing a library collection with unknown condition issues has its challenges. In this project, we attempted to maximize preservation impact while supporting aggressive digitization milestones through three goals of preservation action: mitigate risks associated with increased handling from the imaging process; minimize disruptions to the imaging workflow; and selectively pursue conservation treatments beyond basic stabilization, where appropriate.

These principles are commonly found in most conservation programs that support digitization. Our program departed from the others in the respect that I, as Project Conservator, was also tasked with coordinating the movement of objects throughout the entire workflow. The main intention of which was to reduce inefficiencies or slowdowns in the imaging process.

After retrieval of a selected object from storage I performed condition assessment, immediate stabilization treatment, if possible, and simple documentation, before inserting it into the imaging workflow. This approach is not common with the possible exception of the Qatar Digital Library project at the British Library,[5] yet the approach worked well in this case. The project was completed under-time, and under-budget. However, managing my time and output was my constant concern.

ADVANTAGES TO WORKFLOW COORDINATION

The coordinating role in the workflow also helped develop my bench practice in a couple of key ways. One of the most important was a direct result of comprehensively approaching the collection instead of working only on a subset. I developed my "eye" or the awareness of an object's material manufacture and its cultural meanings across time, which enhanced my conservation related interpretations, responses, and treatment planning. Another result of our workflow was the improved efficiency of treatment execution in order to keep up with the rapid pace of digitization while at the same time maintaining high standards for treatment.

For example, as my eye became more discerning, my condition assessments became much quicker. Objects that required similar treatments were batched, particularly bookwork and oversized maps or broadsides. I was able to adapt my working methods and materials for many tasks, some of which are discussed in the next section. I rarely got on a computer, except when preparing written and photographic documentation for objects of unique interest. Finally, I kept track of condition assessments and treatments by hand, which were compiled and transferred every few days to a spreadsheet I created. The end result of these practices was the elimination of impediments to the digitization process due to condition issues, without delaying, or bottlenecking, the project's rate of digitization.

TYPICAL CONSERVATION TREATMENTS

The Confederate Imprints collection included various bound and unbound formats, such as pamphlets, in-boards bindings, case bindings, and unbound broadsides, maps, administrative records, and ephemera, all in various sizes. Conservation treatments obviously varied according to format, condition problems, size, and preferred storage.

The majority of the collection was unbound 12mo leaves or stab-sewn pamphlets usually housed in sub-optimal

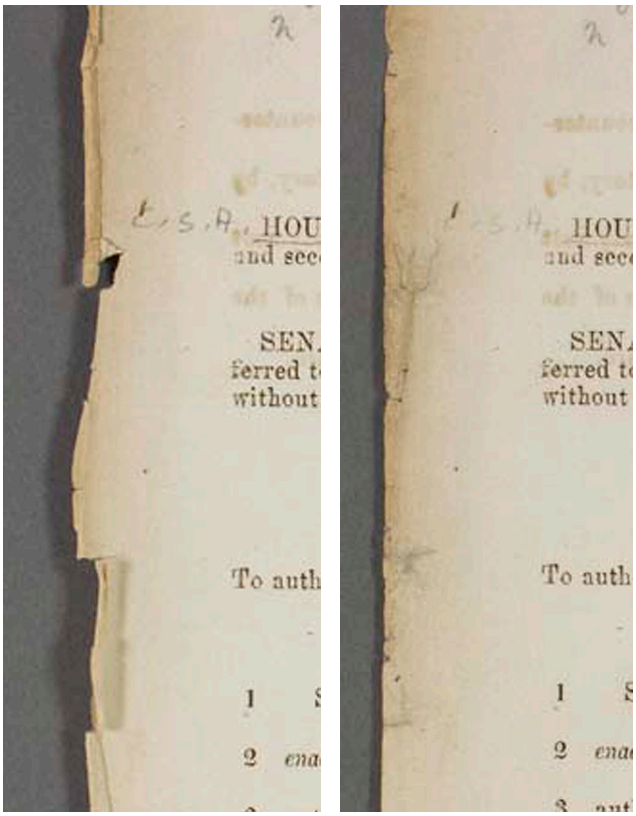
enclosures, such as in an envelope that was way too big and without a cardstock support. Multiple leaves could sometimes be in the same envelope; and some pamphlets wouldn't have any enclosure at all. These objects would be rehoused individually in an appropriately sized slightly buffered cardstock folder and slightly buffered envelope. Larger format flat paper objects such as broadsides and maps were typically encapsulated between inert polyester sheets and stored flat in a pH-neutral folder.

Acute edge damage, as well as more isolated tearing, was typical of unbound leaves and pamphlets (fig. 1). After surface cleaning, my initial approach was to open folds and creases by applying a thin line of dry-ish paste on the verso of the fold or crease and let it open a bit before flattening under pressure. The paste has a slight pull against crushed fibers which helps the crease open up. All the chamfered or overlapping tears were stabilized with an application of dry-ish paste on each edge of the overlapping tears, followed by pressure. Tears requiring further stabilization were repaired with one of four types of supporting tissue: 3 gram per square meter (gsm) Tengujo, 5 gsm Tengujo, 9 gsm Usu Mino, or 12 gsm Usu Mino. (fig. 2) The thinnest 3 gram Kozo was my consistent favorite for a discreet and light repair, but all of these are strong and tend to blend in very beautifully. This entire process can be executed quickly and elegantly but it is essential to work with a relatively dry wheat starch paste; and in my experience it is faster than with working with pre-coated materials.

Pamphlet cover-papers were often detached from the text block (fig. 3) and repaired with untoned 9 gsm or 12 gsm Usu Mino guards. (figs. 4–5) Significant losses in the cover-papers were typically filled with toned tissues, and smaller edge damage would be stabilized with untoned tissues. Perhaps surprisingly, pamphlet leaves in this collection did not show much damage from their stab-sewings. Text leaves usually had nice drape with good leaf action so there was not much associated damage, except some tearing of the first and last few leaves at the stabbed holes. These would be repaired in-situ by working an Usu Mino tissue repair around and under the thread. For broken threads in pamphlets, I would resew them though the original sewing holes, after reinforcement, with toned linen thread, sometimes leaving a little slack.

In addition to leaf repairs, bound texts would occasionally require further mechanical or adhesive consolidation. If there was no spine access, mechanical consolidation would be performed by inserting new toned thread through the recessed channels of loose sections that would be hitched to stable nearby sections.

In-boards bindings in the collection were for the most part intact and functioning; although a small number of them were degraded to a point that required rebacking or more minimal board-to-text reattachments. Tenuous and partially broken hinges were not uncommon either, and often stabilized with 12 gsm Usu Mino reinforcement (which, in my



LEFT TO RIGHT

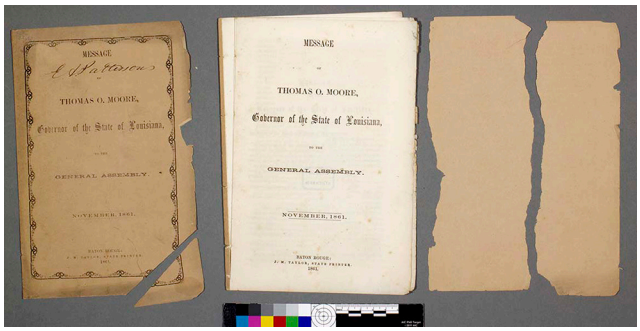
Fig. 1. Before treatment. Detail. Confederate States of America, Laws, etc. *A bill to authorize the issue of certificates for interest on the "Fifteen million loan."* [Richmond : s.n., 1864]. P&W 654.

Fig. 2. After treatment. Detail. P&W 654.

experience, is an ideal tissue for this repair). Case bindings were often worn, requiring consolidation of the covering material, often with broken joints or a loose spine piece, both of which were typically repaired with toned Hanji tissue or airplane cotton. (figs. 6–7)

Tape removal and backing removals were not particularly common, nor were aqueous treatments, but when they were carried out we typically blotter washed so as not to agitate brittle and fragile materials (there were a few instances of immersion).

In total, 3337 objects were assessed by the Project Conservator; 1566 (47%) objects were rehoused; 1365 (40%) required leaf repair or guarding; 549 (16%) objects had folds opened and creases flattened; 360 (11%) pamphlet cover-papers were repaired or reattached; 305 (9%) sewing, forwarding, or binding repairs; 117 (3.5%) objects required tape-removal or backing-removal; 14 (0.4%) were treated aqueously. All but three objects were safely imaged, two of which were bound volumes in good condition with unopened pages; and the third had significant mold-damage and was set aside for leaf casting sometime down the road.

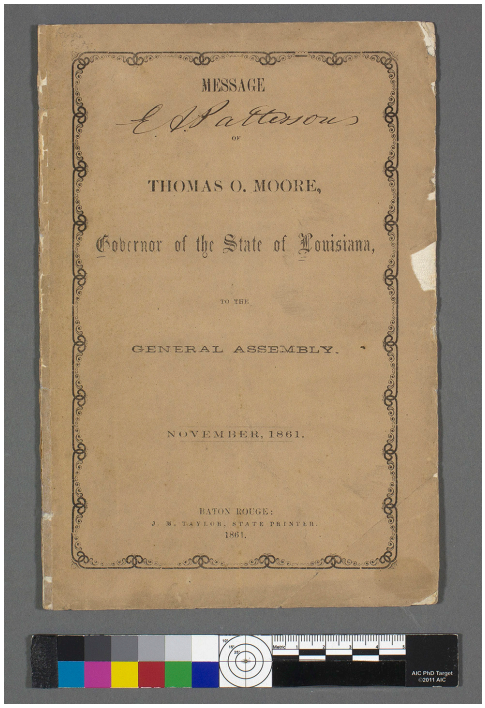


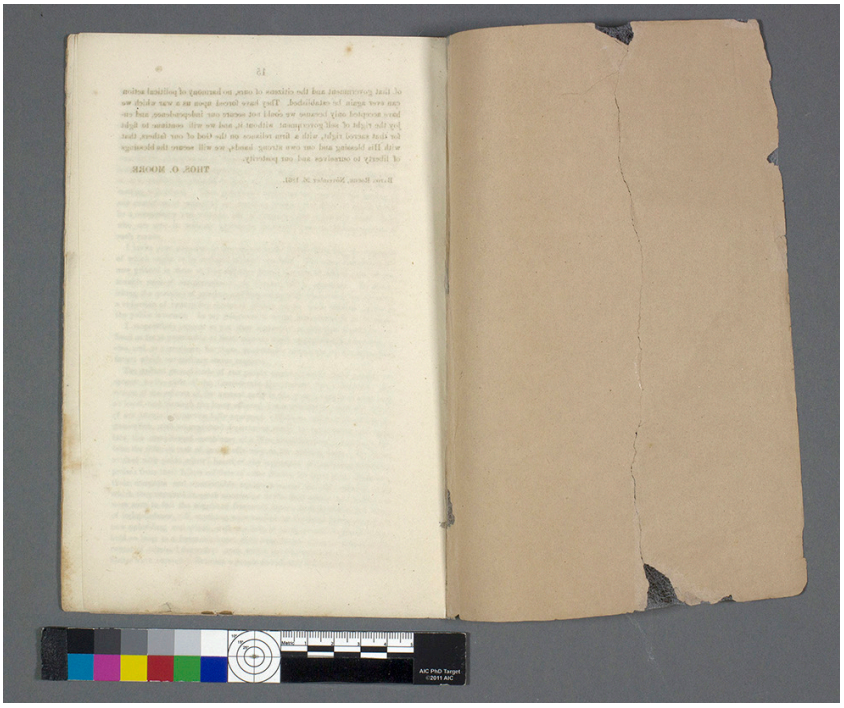
LEFT

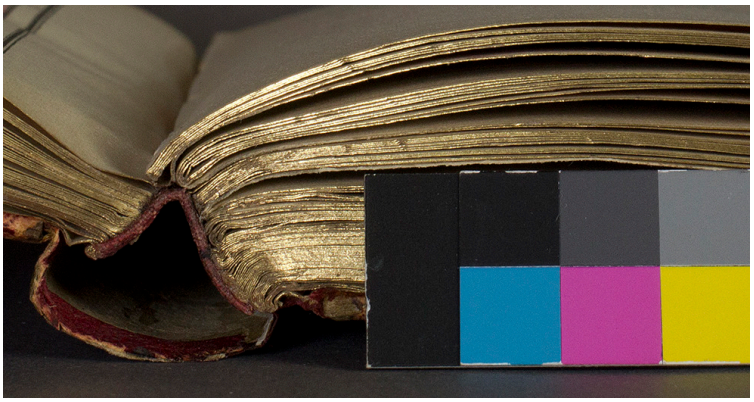
Fig. 3. Before treatment. Louisiana, Governor. *Message of Thomas O. Moore, Governor of the State of Louisiana, to the General Assembly, November, 1861.* Baton Rouge [La.] J. M. Taylor, State Printer, 1861. P&W 3035.

BELOW

Figs. 4–5. After treatment. P&W 3035.







LEFT TO RIGHT

Fig. 6. During treatment. Detail. Colby, Charles Galusha. *The world in miniature*. New Orleans : William F. Stuart, 1861. P&W 7696.

Fig. 7. After treatment. P&W 7696.

SELECTED ASPECTS OF SOUTHERN PRINT CULTURE

TRADE BINDINGS FROM RICHMOND, CHARLESTON, AND BEYOND

In addition to pamphlets and publisher's bindings, there are a lot of books in trade bindings that follow some patterns that I will attempt to identify. Some covering materials, especially decorated papers, can be associated with particular printers or cities. For example, the blue Spanish-wave marble with yellow and red veins (fig. 8) is common all over America in the 19th century. But in our collection they are only found on books printed in Richmond. Charleston covering papers are different, and tend to be a splattered pattern; (fig. 9) and books from North Carolina are associated with a thick, unfinished greenish-blue cloth at their spine.

Richmond bindings, cased or in-boards, are almost always sewn three-on over four sewing supports that are pasted to the insides of their boards. (fig. 10) Books from Charleston and Columbia, South Carolina, whether cased or in-boards, are almost always two-on over three sewing supports, also pasted to the insides of their boards. (fig. 11) While in North Carolina we usually only see two-on sewing over two supports.

There are two decorative tools for leather that I found repeatedly. A lozenge shaped tool is associated with the printer Evans & Cogswell in Charleston, (and later, Columbia) South Carolina. (fig. 12) A vine with a leaf and dimpled flower, found on a number of volumes from Richmond, is

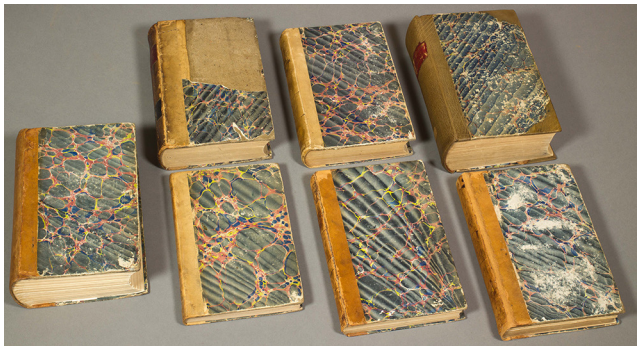


Fig. 8. Books printed by Richmond publisher William F. Ritchie between 1861–1863. Clockwise from top left: P&W 4396; 4616; 4499; 4385; 4615; 4386; 4395.

Fig. 9. Front covers. At right: Porcher, Francis Peyre. *Resources of the southern fields and forests*. Charleston : Evans & Cogswell, 1863. P&W 6132. At left: Lee, Charles Henry. *The judge advocate's vade mecum*. Richmond : West and Johnston, printed by Evans & Cogswell, Charleston, S.C, 1863. P&W 4904.

LEFT TO RIGHT

Fig. 10. Back hinge. Virginia, General Assembly. *Documents 1862 & 1863*. [Richmond, Va.: William F. Ritchie, public printer, 1863]. P&W 4398.

Fig. 11. Back hinge. Lee, Charles Henry. *The judge advocate's vade mecum*. 2d ed. Richmond : West and Johnston, printed by Evans & Cogswell, Charleston, S.C, 1864. P&W 4905.

LEFT TO RIGHT

Fig. 12. Detail. P&W 6132.

Fig. 13. Detail. Virginia, General Assembly, House. *Journal of the House of Delegates of the state of Virginia*. Richmond : Williams F. Ritchie, 1862. P&W 4616.

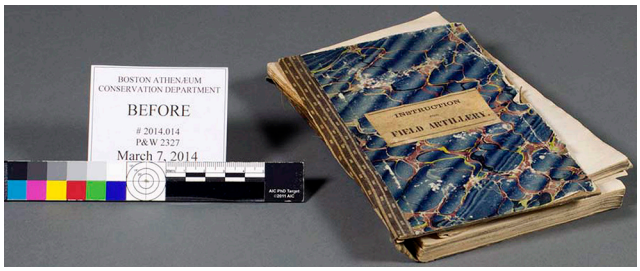


Fig. 14. Stark, A. W. *Instruction for field artillery*. Richmond : A. Morris, printed by C.H. Wynne, 1864. P&W 2327. Before treatment.

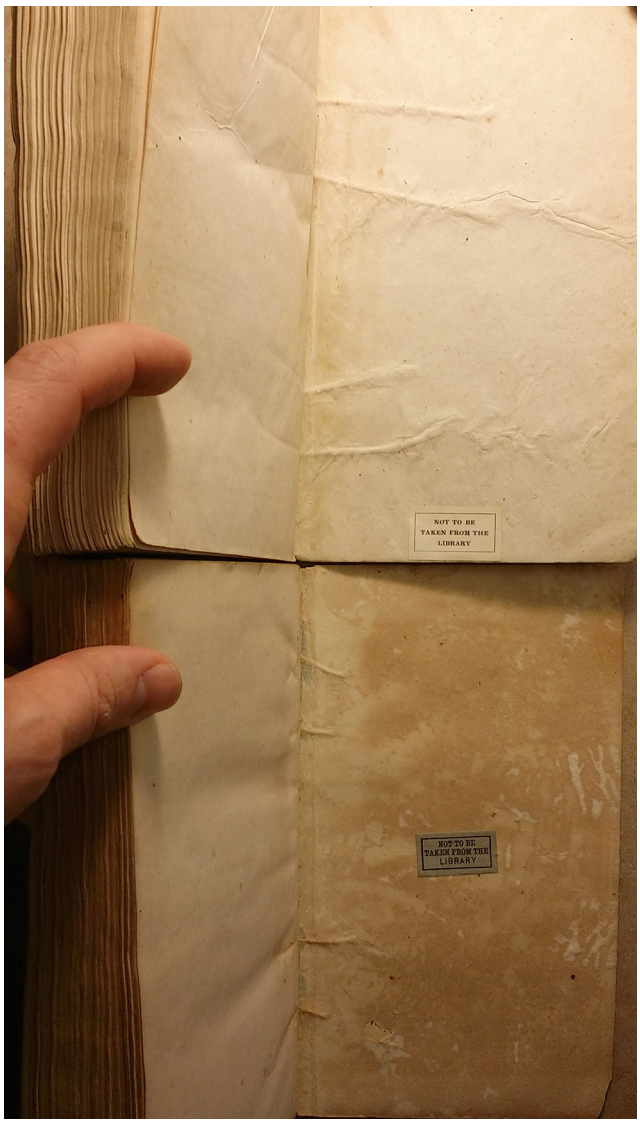


Fig. 15. Back hinges. At top: Confederate States of America, War Department. *Regulations for the army of the Confederate States, 1864*. Richmond: J.W. Randolph, 1864. P&W 2369. At bottom: Confederate States of America, War Department. *Regulations for the army of the Confederate States, 1863*. Richmond: J.W. Randolph, 1863. P&W 2369.

associated with the printer William Ritchie and possibly the publisher and bookseller J.W. Randolph. (fig. 13)

The size of the volume mattered a great deal. The following describes 16mo books and smaller. (fig. 14) They are usually stab-sewn, with plain single folio endpapers tipped-on, and a flat spine. Occasionally they would be sewn through the fold over sewing supports. (fig. 15) Boards were then slapped onto the text block, set off from the shoulder—up to 5 mm—at front and back. The boards were very thin, approximately 1 mm thick, and were sometimes made from printed waste or used stationery. The volume would typically be covered in full paper, full cloth, or more often, ¼ cloth; tight-back without linings, and then the text edges cut flush along with the boards. In other words, no squares, the boards are flush with the text with their edges exposed, and no turn-ins. Finally, a paper label is adhered on the front cover or at spine. These books are are simply bound, but they don't lack charm, and it should be noted that small pocket volumes are almost always about military topics.

Volumes 12mo and bigger (fig. 16) would be forwarded with abbreviated sewing over cords that are pasted onto the insides of their boards, according to the regional pattern described earlier (figs. 10–11, 15). The endpapers are plain and sewn all-along with the thread exposed in the hinge. There are never any spine linings or head bands, and usually the text-blocks are moderately rounded and backed. The text edges are guillotined or chopped (not ploughed) before being put in-boards. There is no gap in the joint and boards ranged from approximately 2.5 mm thick to 3.6 mm (as the War progressed, the boards are noticeably less dense). Volumes were covered in ¼ cloth or ¼ leather. Endcaps are simple and unrefined. Over the course of the War, there is greater prevalence for cloth at the spine.

If the books were from Richmond and had paper sides, 12mo (or larger) trade bindings, had extra covering material at their corner turn-ins. (fig. 17) I am unsure if there is an existing name for this type of corner but I call it a

Fig. 16. Left to right: Compilation of three pamphlets bound in Richmond for Confederate Congressional Representative from Texas Louis T. Wigfall, P&W 20, 27 c.1, and 28 c.1; M'Gill, John. *Faith, the victory*. Richmond, J. W. Randolph, 1865. P&W 8904; Confederate States of America, War Department. *Regulations for the army of the Confederate States, for the Quartermaster's Department, including the pay branch thereof*. Richmond, Ritchie & Dunnavant, 1862. P&W 2377, bound with ruled paper for J. Johns.

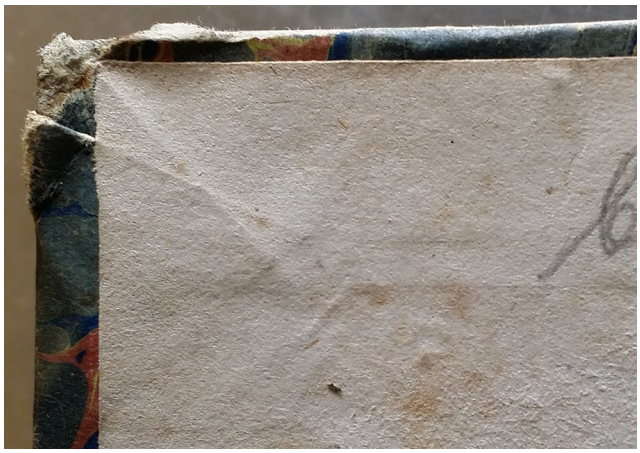


Fig. 17. Detail. Virginia, General Assembly. *Report of the Treasurer of Virginia, 1860 & 1861*. [Richmond, Va.: William F. Ritchie, public printer, 1862]. P&W 4396.

Fig. 18. Detail. Transmitted light. Confederate States of America, Congress, House of Representatives, Committee on Foreign Affairs. *The report of the Committee on Foreign Affairs on the President's message : relating to the affairs between the Confederate and the United States*. [Montgomery, Ala.: s.n., 1861]. P&W 254.

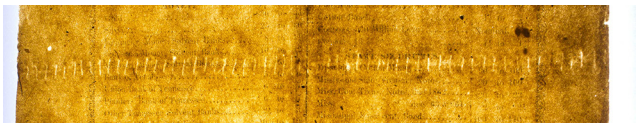


Fig. 19. Detail. Transmitted light. *Money, bond, and stock market : corrected weekly by Petty, Sawyers & Terry, State Bank Building, corner of Royal and St. Francis Streets, Banking House, Mobile, Ala., January 2, 1865*. [Mobile, Ala. : s.n., 1865]. Black printing ink on paper, 39 x 25 cm. P&W 5714.

doubled-over corner because the paper at the corner would be creased where it might otherwise be trimmed. Then the head or tail edge is turned-in, and the doubled-over corner made by folding that extra material back, over the turned-in edge. And then the fore edge would be turned-in.[6]

PAPER

The common narrative for Southern paper during the War is that it initially was of decent quality, and as the War progressed it degraded further and further so that by the end most papers were brown, clumpy, full of debris and shive, unfilled, unsized and unfinished. That's not entirely untrue but from my experience there are many exceptions. There are papers from Richmond as late as 1865 that are white, filled, sized, and finished, and on the other hand there are degraded sheets from 1861 and 1862. Papers were wove only, and could be coated, sized, pigmented, or calendared. Over time, the formation became increasingly cloudy, and indeed there is more shive and debris, likely from cotton, hemp, straw. Shortages of bleaching agents and papermaker's alum also make it common to find brown sheets.

A discussion of the Confederacy's paper, or even the products of a single paper mill, could be presentations or papers on their own, so I will leave that to later scholarship. However, I must point out recent technical studies of Confederate Stamps in which various local fillers used in the production of Southern papers were characterized and identified, including a locally-sourced White Georgia Clay. Additionally, 7 varieties of ink formulations used in South Carolina and Richmond were characterized and identified, and it is pointed out that certain absorbance signatures can be removed in washing.[7]

It's interesting to see impressions in paper from the stitching of the wire mesh used in their manufacture. (figs. 18–19) Cylinder or Fourdrinier papermaking machines required significant attention to remain functioning—parts had to be imported through a blockade, or repaired locally like some of the haphazard patches we can occasionally see from the impressions they have left. I think perhaps we could eventually attribute stitching patterns to their particular manufacturers, considering there were probably fewer than 15 paper mills in the South during the war, but again, I leave that to later scholarship.[8]

REPURPOSED CASES

In 19th century American case bindings it is not uncommon to see a stamping die repeated across multiple titles. We see this in the Confederate Imprints collection every now and then, however, there is an additional aspect here of recycling in evidence that is quite unusual in my experience. There are a number of cases that were removed from one published volume and then repurposed, updated with a new label, to cover a completely unrelated text.

For most instances in this collection, original blind titling on the spine was covered up with covered up with a glossy black paper label with metallic powder printing; and original paste-downs remain underneath newer ones. Local notes for each of the volumes indicate the original cases were taken from books published in Richmond before 1861. In Figure

Fig. 20. Left to right: Confederate States of America, War Department. *Regulations for the army of the Confederate States, 1864*. Richmond : J. W. Randolph, 1864. P&W 2369; Confederate States of America, War Department. *Regulations for the army of the Confederate States, 1862*. Richmond : J. W. Randolph, 1862. P&W 2361; Confederate States of America, War Department. *Regulations for the army of the Confederate States, 1862*. Richmond : West & Johnston, 1862. P&W 2362.

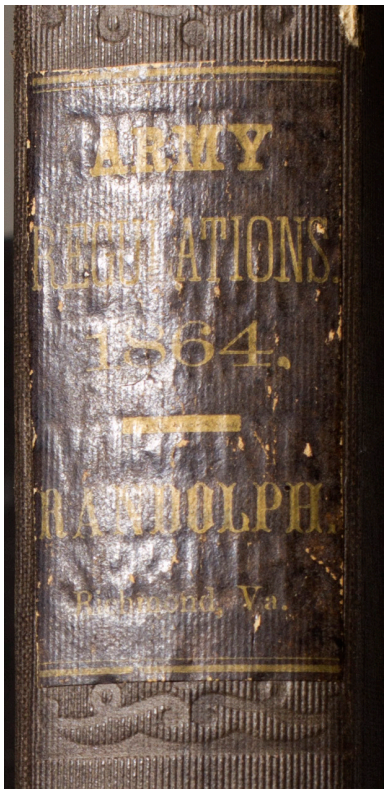


Fig. 21. Detail. Raking light. P&W 2369.

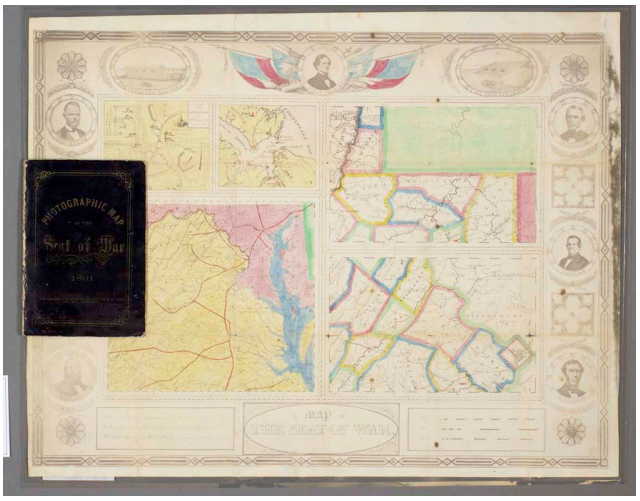


Fig. 22. After treatment. *A map of the seat of war, 1861*. Photographed by Tucker & Perkins, Augusta, Ga. P&W 6188.

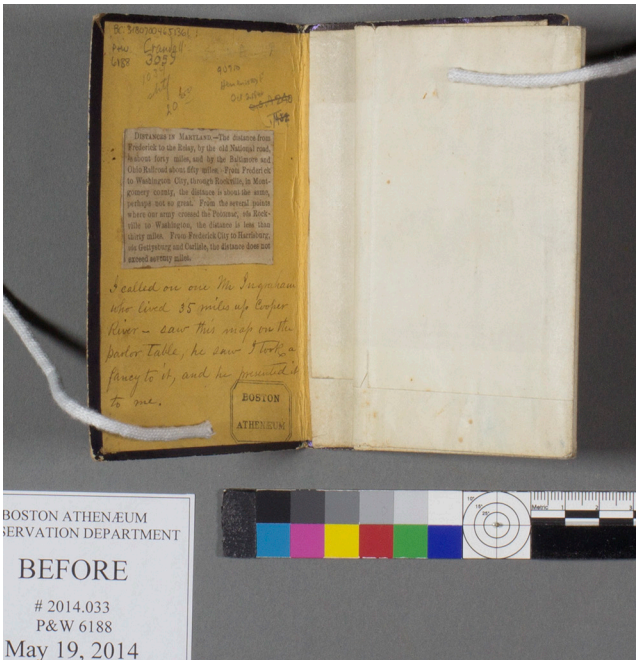


Fig. 23. Before treatment. P&W 6188.

20, the volume on the left is even stamped with the date 1851. (fig. 20) Perhaps the volume was lying around the shop for fourteen years before getting repurposed. On its spine, its glossy black label with metallic powder printing is in great condition, and in Figure 21, is distorted from the original stamped title underneath. (fig. 21) All the repurposed cases I saw were for military books. The volume in the middle of Figure 20, with a green cover, was previously rebacked with a few incongruous elements like stuck-on head bands, new unsupported sewing all along, French joints, and a white leather label on the spine.

MAPS IN WRAPS

There were about a dozen maps in the collection that remained folded within their original boards or cover, including two photographic reproductions. (fig. 22) Most of these boards are covered in a similar glossy black or dark blue paper, with metallic powder printing, that we have just seen used for labels.

The folds of the maps were typically flattened mechanically, or with humidification if necessary, followed by repair and encapsulation. However, many of the covers did not open easily. (fig. 23) Instead of looking into removing the map from the cover, this piece and a few others were encapsulated with an

Fig. 24. Mühlbach, L. *Henry VIII and his court : or, Catharine Parr : a historical novel.* Mobile : S.H. Goetzel, 1865. 2 volumes. P&W 6436 c.1.

Fig. 25. Decoration on versos of cover-papers. Volumes 1 and 2, P&W 6436 c.1.

Fig. 26. Decoration on versos of cover-papers. Volumes 1 and 2, P&W 6436 c.2.

Fig. 27. Mühlbach, L. *Joseph II and his court; an historical novel.* Mobile : S.H. Goetzel, printed by Farrow & Dennett. 1864. 4 volumes. P&W 6437 c.1.

Fig. 28. Decoration on versos of cover-papers. Volumes 1–4, P&W 6437 c.1.

Fig. 29. Decoration on versos of cover-papers. Volumes 1–4, P&W 6437 c.2.

opening that left the cover free to open and close. This method worked fine, but it is probably only necessary for objects from this era whose boards do not open without cracking.

WALLPAPER PAMPHLETS OF S.H. GOETZEL, PUBLISHER

Wallpaper covers from the Confederacy are most often associated with a single publisher out of Mobile Alabama, S.H. Goetzel, who published them from 1863 to 1865. Of the twenty titles we have in wallpaper, the one in Figures 24–26, from 1865, is probably among Goetzel's last. Like the nearly all the others, they are stab sewn without endpapers and the wallpaper cover is adhered at the spine and slightly over the shoulder. The wallpaper pattern is on the verso of the cover-paper at front and back.

Figures 27–29 show a title printed in four parts in late 1864. Figure 30 shows two copies of a title also printed in 1864. Many folks point to Goetzel's wallpaper books as examples of the deprivations in the South during the War, and while I'm sure that's true to some extent, it appears that this style was deliberately chosen again and again, predictably, for over two years by a single publishing house for books of literary fiction, not those in different genres.

There are some exceptions from 1863 which I think could be Goetzel's first attempts at using decorated papers for literary fiction. The cover-paper decoration of Figure 31 is a simple brushed pattern that is a paste paper, not wallpaper, and it is lined on verso with a stiff brown card stock. In Figure 32, the cover-paper is lined with the same card stock

Fig. 30. Decoration on versos of cover-papers. Two copies of: Ford, Sallie Rochester. *Raids and romance of Morgan and his men*. Mobile : S.H. Goetzel, 1864. P&W 6318 c1 & c2.

Fig. 31. Fane, Julian Henry Charles. *Tannhäuser; or, The battle of the bards. A poem*. Mobile : S. H. Goetzel & co., 1863. P&W 6313.

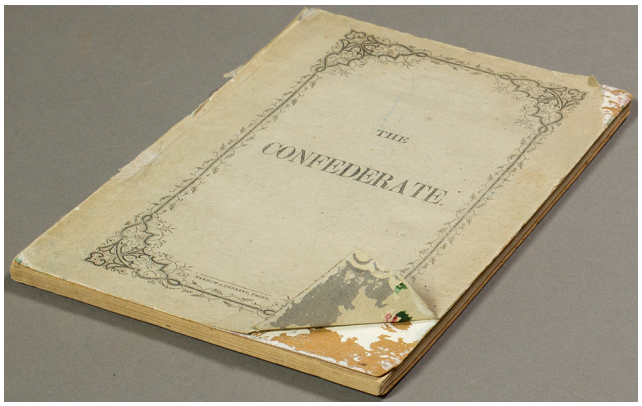


Fig. 32. Bobo, William M. *The Confederate*. Mobile : S.H. Goetzel, 1863. P&W 5876.

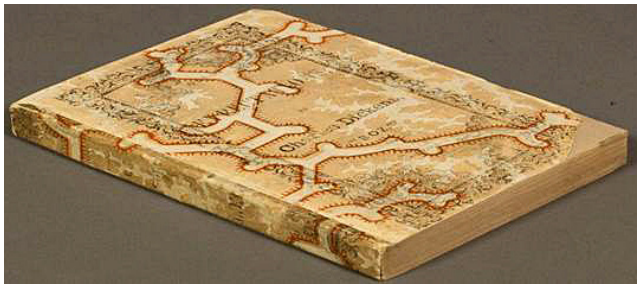


Fig. 33. Dickens, Charles. *Great expectations*. Mobile : S.H. Goetzel, 1863. P&W 6301.

on the verso; and the recto is printed with a more familiar title and border on recto. Yet in between those layers, which are delaminating at the corners and the spine, we can see a hidden, bright, chalky wallpaper design.

Finally, there is a volume from 1863 that is very strange. (fig. 33) The decorative wallpaper pattern is on the recto, not the verso, of the cover-paper. The decoration is actually printed over the border and title information, which means the sheet was printed before being decorated. Also, the cover-paper is not one contiguous piece but in three—the spine piece, which has darkened slightly, and the front and back cover-leaves tipped-on. The copy was in fact "previously restored," which may explain why the volume's cover is in pieces but does not resolve the incongruous decorative elements.

CONCLUSION

Preservation and conservation of the Confederate Imprints collection in support of their digitization was a significant investment that resulted in a number of benefits to the Boston Athenæum. The role of Project Conservator supported and streamlined the digitization process while enhancing the interpretive value and stability of the collection. The content of the collection is a rich source of information about Southern life during the Civil War; and technical analyses of some of printed materials provide the conservator and scholar with additional insight into the material aspects of the Southern experience.

THANKS

Thanks to Fletcher Durant, Eliza Gilligan, and everyone involved in programming the AIC Annual and publishing its proceedings. Project Supervisors Jim Reid-Cunningham and Dawn Walus. Colleagues, former Interns, and former Fellows Marianna Brotherton, Kristin Cook, Fionnuala Hart Gerrity, Jeanne Goodman, Henry Hebert, and Jennifer Hunt Johnson. All my other colleagues at the Athenæum particularly Pat Boulos, Stanley Cushing, Lena Denis, Will Evans, Sarah Levine, Daniel Ness, and Graham Skinner. Caleb Loring, Jr., and the Proprietors and Trustees of the Boston Athenæum. And Nealia House and Zachary Montz.

NOTES

1. The movements of the later 19th century to specialize collections and to more publicly share "culture" led to the very fast and expansive growth of competing Public Libraries, Museums, and University Special Collections.
2. As quoted in Whitehill, Walter Muir. 1955. (xvi–xvii)
3. Each institution has its own process for digitization, preservation, and preservation in support of digitization. As such, case studies are among the most useful resources to consult when researching "best practices" in the field. A good place to start is at Archives Conservation Discussion Group. 2011. (115–127)
4. "Fit for purpose" is a term in favor at the British Library and elsewhere that is used to guide conservation treatment planning. For example, in digitization projects, the "purpose" of treatment to support the digitization process, i.e., to mitigate risks in from handling and stabilize acute condition issues, such that any treatment action beyond those specific goals would not "fit" the purpose.
5. Marzo, Flavio, et. Al. 2013. and Marzo, Flavio, et. Al. 2013.
6. A video how these corners might have been made is available on the BPG Wiki at http://www.conservation-wiki.com/wiki/User:Ev-knight.
7. See Brittian's four-part series in *The Confederate Philatelist,* 58 (2) through 59(1).
8. For more information, see Baker, Cathleen A. 2004.; Cheape, Kathleen Sophia Hambrough. 1960.; and Snowden, Yates. [1903].

BIBLIOGRAPHY

Adams, Morgan Simms, Cathleen A. Baker, and Shannon Zachary. 2009. "Sizing in Nineteenth-Century Book Papers." *The Book and Paper Group Annual* 28 (2009): 1–6.

Appelbaum, Barbara. 2007. *Conservation Treatment Methodology*. Amsterdam: Elsevier.

Archives Conservation Discussion Group. 2011. Digitization and its Effect on Conservation Treatment Decisions: How has Wide-Spread Digitizing of Collections Changed our Approach to Treatment?" Edited by Laura O'Brien Miller and Melissa Tedone. *The Book and Paper Group Annual* 30 (2011): 115–127.

Baker, Cathleen A. 2010. *From the Hand to the Machine*. Ann Arbor: Legacy Press.

Baker, Cathleen A. 2004. "The Press that Cotton Built: Printing in Mobile, Alabama, 1850–1865." Ph.D. diss., University of Alabama.

Baker, Cathleen A. 2010 (rev.). "The Enterprising S. H. Goetzel: Antebellum and Civil War Publisher in Mobile, Alabama." Last modified 2010. http://www.thelegacypress.com/assets/s_h_goetzel.pdf/.

Bell, Robert. 1969. "S. H. Goetzel Publisher; Mobile, Alabama, 1857–1865." *The Book Club of California Quarterly News-Letter* XXXIV (2): 27–32.

Boal, Gillian. 2014. "Conservation for Digitization at the Wellcome Library." *The Book and Paper Group Annual* 33 (2014): 9–16.

Brittain, Harry G. 2013. "Forensic Studies of Stamps Issued by the CSA. Part I. The Typographed 5-cent Blue Jefferson Davis Issues." *The Confederate Philatelist* 58 (2): 5–15.

Brittain, Harry G. 2013. "Forensic Studies of Stamps Issued by the Confederate States of America Part II. The Engraved 2-cent Andrew Jackson Issue." *The Confederate Philatelist* 58 (3): 5–13.

Brittain, Harry G, and Patricia A. Kaufmann. 2013. "Forensic Studies of Stamps Issued by the Confederate States of America, Part III, The Copper-Plate Engraved 10-Cent Jefferson Davis Issues." *The Confederate Philatelist* 58 (4): 5–12.

Brittain, Harry G. 2014. "Forensic Studies of Stamps Issued by the Confederate States of America, Part IV, The Steel-Plate Engraved 10-Cent Jefferson Davis Type I Issue." *The Confederate Philatelist* 59 (1): 5–11.

Bűlow, Anna E., and Ahmon, Jess. 2011. *Preparing Collections for Digitization*. London: Facet Publishing.

Cheape, Kathleen Sophia Hambrough. 1960. "Confederate Book Publishing with Emphasis on Richmond, Virginia." M.S. thesis, University of North Carolina.

Crandall, Marjorie Lyle. 1955. *Confederate Imprints, A Check List Based Principally on the Collection of the Boston Athenæum.* [Boston]: Boston Athenæum.

Duffy, Christina. 2013. "Fail to prepare for digitisation, prepare to fail at digitisation!" *British Library Collections Care blog*. 19 November. http://britishlibrary.typepad.co.uk/collectioncare/2013/11/fail-to-prepare-for-digitisation-prepare-to-fail-at-digitising.html/.

Dietz, August. 1929. *The Postal Service of the Confederate States of America*. Richmond, Va: Press of the Dietz Print Co.

Frellsen, Ann, Kim Norman, and Brian Methot. 2014. "Scraps of Memories, Shards of Time: Preserving the African American Scrapbook Collection of Emory University Libraries, a *Save America's Treasures* grant project." *The Book and Paper Group Annual* 33 (2014): 26–34.

Harwell, Richard B. 1957. *The Confederate Reader*. New York: Longmans, Green and Co.

Heartman, Charles F. 1939. What Constitutes a Confederate Imprint? Preliminary Suggestions for Bibliographers and Catalogers. Hattiesburg, Miss.: The Book Farm.

Hoogerwerf, Frank W. 1984. *Confederate Sheet-Music Imprints.* Brooklyn, NY: Institute for Studies in American Music.

Kelly, Katherine, and Anna Friedman. 2014. "Conserving the Iraqi Jewish Archive for Digitization." *The Book and Paper Group Annual* 33 (2014): 18–25.

Lockyer, Louise. 2009. "Capturing a Collection." *ICON News* 21 (March): 18–21.

Library Collections Conservation Discussion Group. 2008. Digitization Project Case Studies. Edited by Sarah Reidell and Laura McCann. *The Book and Paper Group Annual* 27 (2008): 115–117.

Library Collections Conservation Discussion Group. 2007. Digitization and the Role of the Conservator. Edited by Sarah Reidell and Christine McCarthy. *The Book and Paper Group Annual* 26 (2007): 141–144.

Library of Congress. 2015. "Preservation Guidelines for Digitizing Library Materials." Accessed March 26. http://www.loc.gov/preservation/care/scan.html/.

Library of Congress National Digital Library Program and the Conservation Division. 1999. "Conservation Implications of Digitization Projects." Accessed March 27. http://memory.loc.gov/ammem/techdocs/conserv83199a.pdf/.

Marzo, Flavio. 2013. "Digitisation as a preservation tool; some considerations." *British Library Collections Care blog*. 13 December. http://britishlibrary.typepad.co.uk/collectioncare/2013/12/digitisation-as-a-preservation-tool-some-considerations.html/.

Marzo, Flavio, Anna Hoffman, and Barbara Borghese. 2013. "The British Library/Qatar Foundation Partnership behind the scenes - an interview with NiC." *IIC News in Conservation* 38 (October): 11–16.

McCann, Laura, Georgia Southworth, and Melitte Buchman. 2010. "Afghanistan Digital Library: Conservation Challenges." *The Book and Paper Group Annual* 29 (2010): 61–67.

Parrish, T. Michael, and Robert M. Willingham, Jr. 1987. Confederate imprints : a bibliography of southern publications from secession to surrender : expanding and revising the earlier works of Marjorie Crandall & Richard Harwell. Austin, TX: Jenkins Publishing Co; Katonah, NY: Gary A. Foster.

Silverman, Randy. 1987. "Small, Not Insignificant: a Specification for a Conservation Pamphlet Binding

Structure." The Book and Paper Group Annual 6 (1987). Last modified August 3, 2011. http://cool.conservation-us.org/coolaic/sg/bpg/annual/v06/bp06-13.html/.

Snowden, Yates. [1903]. *Confederate Books: The Titles of Many of Them and How They Were Made.* [Charleston, SC]: [Daggett Printing Co.].

Whitehill, Walter Muir. 1955. Introduction to *Confederate Imprints, A Check List Based Principally on the Collection of the Boston Athenæum,* by Marjorie Lyle Crandall, xi–xxviii. [Boston]: The Boston Athenæum.

EVAN KNIGHT
Associate Conservator
Boston Athenæum
Boston, MA
knight@bostonathenaeum.org

ANNE F. MAHEUX

Cross-Disciplinary Uses for Gellan Gum in Conservation

ABSTRACT

Gellan gum gel, a high molecular weight polysaccharide, was first introduced to the North American conservation community by Italian conservators Iannuccelli and Sotgiu (Central Institute for the Restoration and Conservation of Archival and Library Patrimony (ICPAL) Laboratory for the Conservation of Library Materials, Rome) at the Book and Paper Session of the AIC Meeting in 2010. Their search for an alternative method of wet- cleaning graphic art that would not alter topographical features—like surface texture, platemarks, and etched/engraved lines—led to early experiments with gellan gum at ICPAL in 2003–2004. The product is used as a thickening or gelling agent in food, pharmacology and personal care product industries. For conservation purposes, gellan gum gradually releases moisture into an adjacent substrate in a controlled way and leaves no residue. When used for cleaning or stain reduction, soluble deterioration components are transferred to the gel through osmosis. Iannuccelli and Sotgiu reported on various treatments carried out with gellan gum, including backing removal, enzyme delivery, deacidification, and reductive bleaching. Inspired by their findings, conservators at Library and Archives Canada (LAC) first attempted to incorporate the use of gellan gum as part of the protocol for the treatment of a large collection of Audubon prints on wood pulp backings. This paper reports on the results of experiments with gellan gum for backing removal, as well its use in a variety of treatments on objects ranging from a book, a three-dimensional map and globe, to a vintage paper dress.

INTRODUCTION

In 2010, paper conservators at Library and Archives Canada (LAC) commenced a long term project that has stretched over several years: the conservation of a dis-bound set of Audubon's *Birds of America*. The majority of the hand-coloured Audubon sheets had been solidly adhered to acidic wood pulp board. The challenge lay in finding the safest, most efficient way of removing the auxiliary supports as a first step in the treatment protocol.

That same year paper conservators Simonetta Iannuccelli and Silvia Sotgiu, from ICPAL, Laboratory for the Conservation of Library Materials in Rome, introduced the use of a rigid polysaccharide gel for wet conservation treatments of works on paper at the AIC meeting in Madison Wisconsin, and at the ICOM-CC Graphic Documents Working Group interim meeting in Copenhagen. (Iannuccelli and Sottgiu 2010).

Sottgiu became interested in exploring agarose gel applications for paper conservation treatments after having attended a cleaning workshop given by Richard Wolbers in Italy in 2003. The search for a more economical alternative to agarose gel led to ICPAL experiments with gellan gum. Results of thorough physical and chemical analysis at ICPAL proved its safety and effectiveness (Botti et al 2011).

Gellan gum, it seemed, might be worth investigating: here was a material that could deliver moisture in a highly controllable way with minimal impact on the paper substrate, and had been successfully used for lining removal, cleaning, deacidification and reductive bleach and enzyme delivery.

The Canadian Conservation Institute (CCI) organized an advanced professional development workshop in Toronto, Ontario in March, 2014 on the wet treatment of graphic art on paper with gellan gum, delivered by Sottgiu and Iannuccelli. A summary session organized by workshop participants from CCI and LAC was held at CCI a few months later for conservators in the Ottawa region to disseminate information about gellan gum. Since then, LAC conservators have found many applications for gellan gum in the course of treating a wide range of objects and continue to experiment with it.

The use of polysaccharide-based rigid gels as the basis for highly controlled cleaning systems for painted surfaces was first introduced by Richard Wolbers in 2000. Altering pH and incorporating a range of other ingredients, like surfactants, chelators and enzymes can produce tailor-made rigid

Presented at the Book and Paper Group Session, AIC's 43rd Annual Meeting, May 13–16, 2015, Miami, Florida

gels for specific cleaning applications. Paper conservators have customarily used gels based on cellulosic thickening agents, like methyl cellulose, ethyl cellulose, hydroxy methyl cellulose, sodium carboxy methyl cellulose over the last 40 years as poultices for cleaning, or for mixing with other active ingredients, like bleaches and enzymes. The application of rigid gel treatment systems to paper artifacts is of great interest to paper conservators, permitting a superior degree of control by limiting capillary action and the movement of cleaning agents held within the gel matrix during the course of treatment.

OVERVIEW OF GELLAN GUM

Gellan gum is a high molecular weight polysaccharide (i.e.: complex sugar) produced by the fermentation of the microbe *Sphingomonas elodea*. It finds application as a thickening or gelling agent in the biomedical, pharmacology and food industries, and is biodegradable and non-hazardous. Recently gellan gum has found new applications for molecular gastronomy and modernist cooking applications.

The general chemical structure is a straight chain of four linked monosaccharides (i.e.: simple sugars), including one molecule of rhamnose (plant-derived sugar), one molecule of glucuronic acid, and 2 molecules of glucose (fig. 1).

Studies conducted by Sottgiu and Iannuccelli of various rigid gellan gels (Phytagel gellan, Gelrite and Gelzan CM) concluded that Kelco gellan gum was the most effective and economical product. Gellan gum also compared favorably in tests to agarose gel, with higher transparency and greater water retention properties (Iannuccelli and Sotgiu 2010).

Gel formation is influenced by temperature, concentration, thickness of the cast layer and by the presence or absence of mono or bivalent cations. Gellan gum is available in two grades: high and low acyl content, which form soft and hard gels respectively.

Deacylated gellan gum is used for conservation applications. It forms a stronger gel, and sets at a much lower temperature range—between 30 and 50 degrees Celsius—while high acyl gels set at much higher temperatures. It is the acyl groups that have a significant influence on gel characteristics. The high acyl form produces soft, elastic non-brittle gels, while the absence of acyl groups in the low acyl form produces firm, non-elastic brittle gels.

The ability of gellan gum to gradually release water molecules into the paper, and in turn absorb soluble degradation products is one of its most advantageous qualities. Because of the slow, constant introduction of moisture via gellan gum, the effects of aqueous swelling are minimized, a consideration that is critical when treating works with distinct dimensional qualities, like platemarks, embossings and surface texture. The ideal concentration of gellan gum will depend on the hydrophilic nature of the paper.

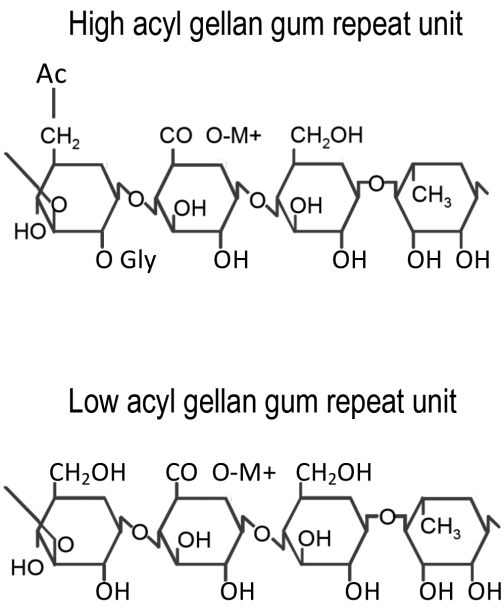


Fig. 1. Gellan gum structure.

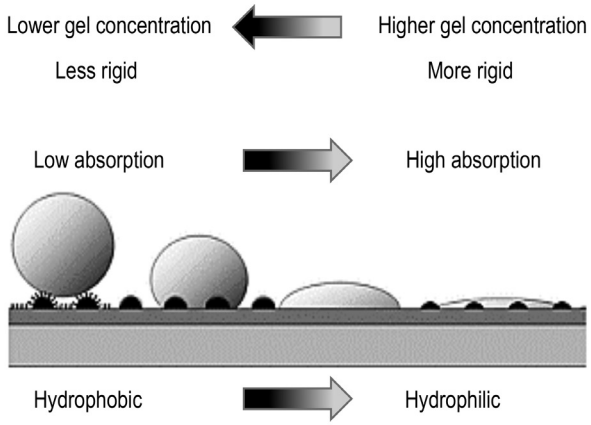


Fig. 2. Calculation of gel concentration.

In order to choose the appropriate gel percentage, the conservator must subjectively assess the wettability of the paper support. This is affected by the porosity of the paper, fiber type, sizings and coatings, and the state of preservation of the paper. The more absorbent (hydrophilic) the paper is, the higher the concentration of gellan gum used, as it will give off less moisture. (fig. 2)

GELLAN GUM PREPARATION

For use with paper artifacts, the gellan gum is normally prepared in the range of 2–4% concentration to make a semi-rigid layer. A saline solution with calcium acetate is prepared, (0.4 g/L calcium acetate), to which the gellan gum powder is added. The gel powder is quickly whisked into the

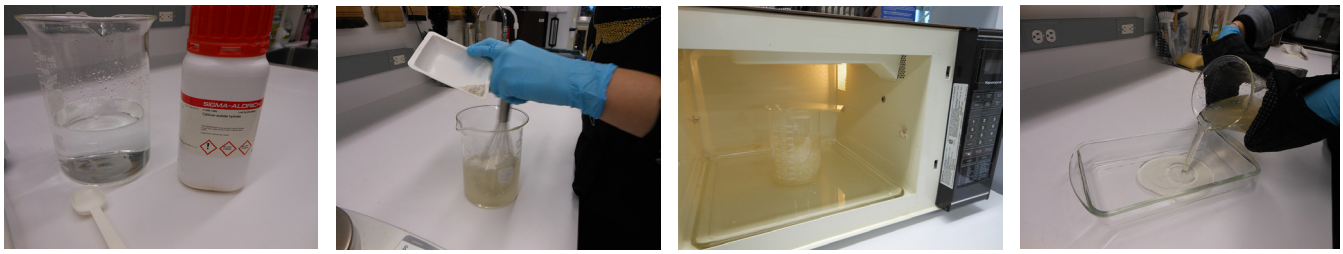


Fig. 3. Preparation of gellan gum gel.

LEFT TO RIGHT

a. A saline solution is prepared with 0.4g/l calcium acetate in reverse-osmosis water.
b. Gellan gum powder is measured according to desired gel concentration and quickly whisked into the saline solution.
c. Gellan gum solution is heated in a microwave until hydrated (allow to boil for a few minutes).
d. Gellan gum solution is immediately poured into heat proof pan to desired thickness.

saline solution to create a colloidal dispersion. It is covered and heated in the microwave until the dispersion turns into a slightly yellow, transparent solution. Complete hydration of the gel occurs at 75–100 degrees Celsius. The solution is poured into a heat resistant tray while it is still hot and runny, and the rigid hydrogel film forms as the solution cools to room temperature. (figs. 3a–d) Gellan gum is susceptible to mold, and can be can be covered and refrigerated for approximately 2 weeks before becoming unusable.

Gellan gum can also be prepared without a saline solution, which reduces the degree of rigidity. The absence of calcium ions in lower gel concentrations, however, may render the cast film too mushy and crumbly to handle. The calcium ions stabilize the gel structure, rendering it more firm and easily manipulated. Similarly, the degree of water purity will also affect the ability of the gellan gum to achieve an adequately rigid form. Depending on the intended use of the gel, a lower concentration of less rigidity may be desired. In early experiments at LAC, gellan gum was prepared with water purified by reverse- osmosis, sometimes made alkaline with the addition of saturated calcium hydroxide, resulting in an easily pliable, semi rigid film.

The range of gel flexibility is illustrated in this image of different gellan gum samples prepared with calcium acetate solution in increasing concentrations. (fig. 4)

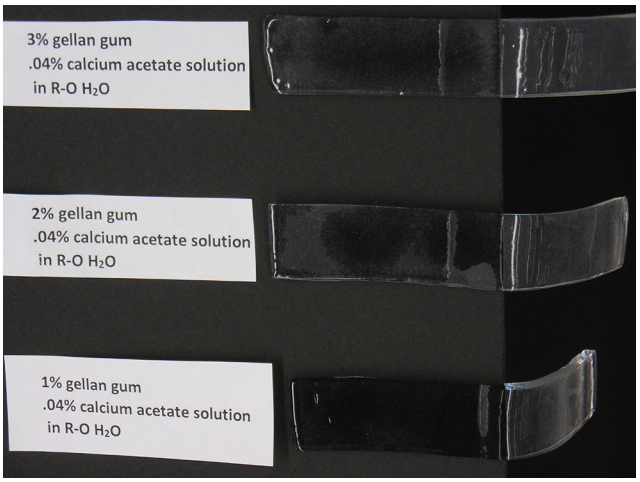


Fig. 4. Comparison of rigidity of gellan gum concentrations incorporating calcium acetate.

GELLAN GUM TREATMENT EXAMPLES

AUDUBON PRINT BACKING REMOVAL

Each Audubon plate had been solidly adhered to wood pulp cardboard. (fig. 5a) Experiments were conducted with different concentrations and thicknesses of gellan gum to try and find the optimal moisture content that would sufficiently release the cardboard secondary supports. The following points were noted:

- Gellan gum works best for backing removals if the object can be thoroughly humidified first.
- Thinner paper and card backings are most easily removed with gellan gum.
- The dense outer cardboard layer impedes the penetration of moisture from the gellan gum.
- Gellan gum was most effective in removing adhesive from the object verso once the cardboard had been removed. (fig. 5b)

In the case of the Audubons, gellan gum did not make the backing removal operation more efficient or less labor intensive.

LOCAL STAIN REMOVAL WITH GELLAN GUM

STAIN REDUCTION ON A VINTAGE PAPER DRESS

A paper dress, with a photographic image of Canadian Prime Minister Pierre Trudeau on both recto and verso, was produced for hostesses at the 1968 Liberal convention. (figs. 6a, b) The highly textured, poor quality wove paper is similar to

Fig. 5.

TOP TO BOTTOM

a. Audubon prints: mechanical backing removal and subsequent treatment takes total of 40 hours per print.

b. Gellan gum cast sheets are used to remove adhesive residue from print verso.

the waffle-like texture of paper towel. The neckline is edged with black broadcloth bias tape. At one time the top of the dress was folded on to the back, leaving a stain on the face of Trudeau that mirrors the black trim along the neckline and along the slit on the verso. The stain has also penetrated through to the recto, where it is visible to a lesser extent. In

Fig. 6. (Untitled) Trudeau Paper Dress, 1968, photomechanical print on wove textured paper, 84.0 x 49.9 cm, Library and Archives Canada, MIKAN 3000168

LEFT TO RIGHT

a. Overall view before treatment.

b. Overall view after treatment.

preparation for removing the stain, a 4% concentration of gellan gum dissolved in alkaline water, with the addition of saturated calcium hydroxide to pH 8.0 was prepared and cast into a 1 cm thick layer.

Initial tests with paper towel, then at the back hem of the dress affirmed that the textured surface was not lost after contact with gellan gum under light weight. Blotting paper and mat board were inserted inside the dress under the stained area.

One of the great advantages of working with gellan gum is the fact that it can be easily trimmed with a scalpel into precise shapes for local stain removal, alleviating the need for producing masks to shield sensitive media. In the instance with the paper dress, the stain was traced onto Mylar and the gellan gum was trimmed to size. The gel was covered with Mylar and lightly weighted for 3 minutes then removed. The paper was highly absorbent, and soluble degradation components were drawn up into the gel, and also moved into the blotter placed beneath the treated area. The surface texture was unchanged. (figs. 7a–d) The process was repeated on the stains until they were almost completely reduced. (figs. 8a, b)

STAIN REDUCTION ON A COLLAGE

A collage suffered damage in a flood. (figs. 9a, b) The main substrate is corrugated cardboard solidly adhered to Masonite, with poor quality paper elements arranged in an overlapping pattern tacked to the surface of the cardboard. Water soaked the bottom of the work, moving soluble degradation components up to the tideline, and leaving the lower portion lighter (and cleaner) than the rest of the support, with no adverse effects on the acrylic paint layer. Since the

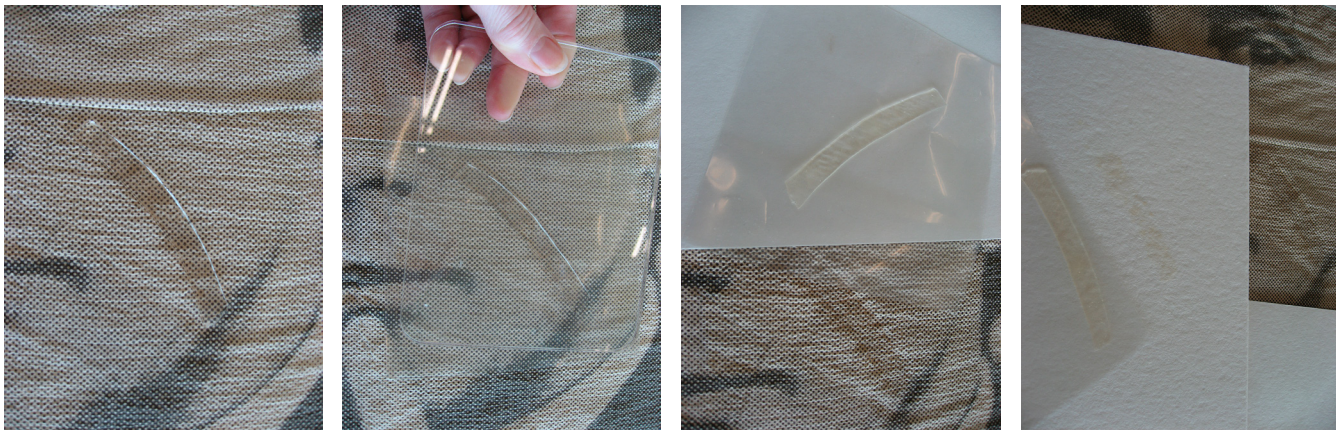


Fig. 7.

LEFT TO RIGHT
a. Trimmed gellan gum gel is placed over stain.
b. Plexiglas weight placed over gellan gum.
c. Removed gellan gum: minimal moisture penetration into paper.
d. Yellowed gellan gum removed from stained area and transfer of stains to underlying blotter.

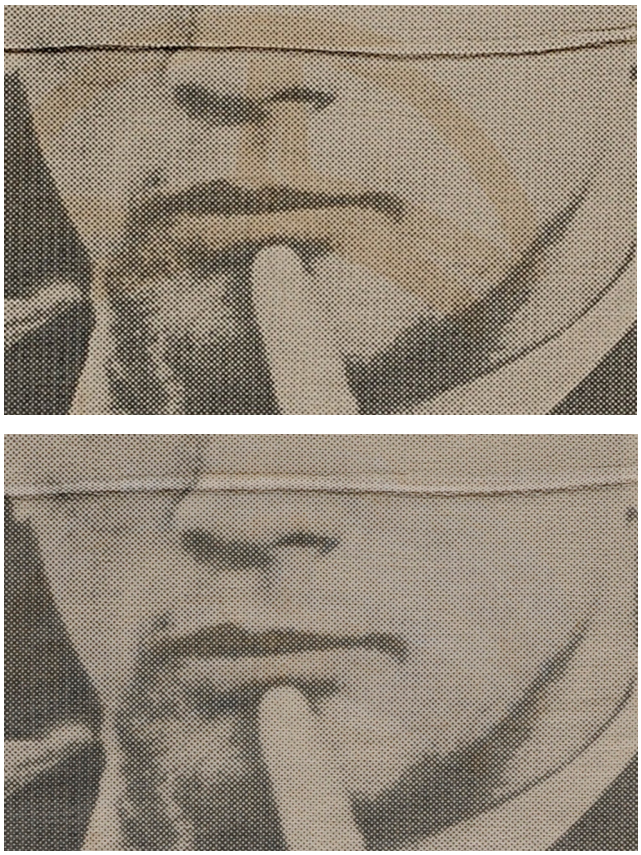


Fig. 8.

TOP TO BOTTOM
a. Trudeau Paper Dress. Stained area before treatment.
b. Right, stained area after treatment.

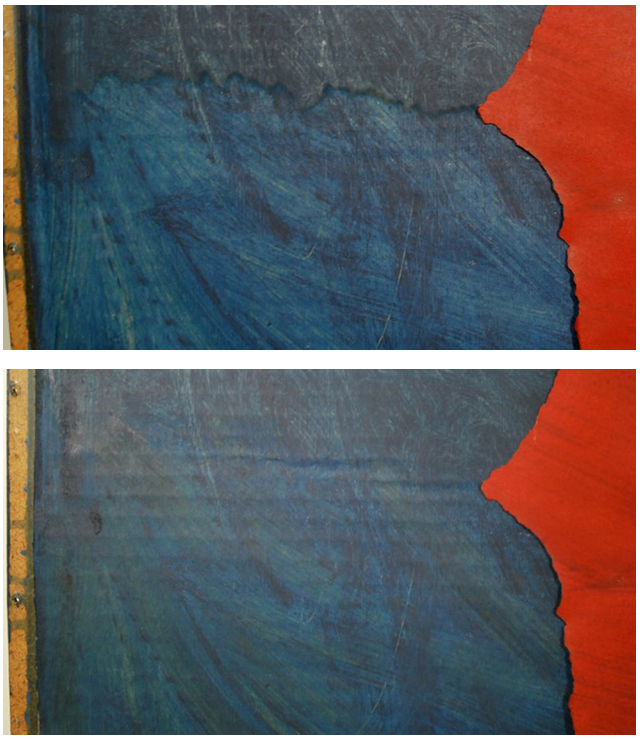


Fig. 9. Detail of water damage to a mixed media collage on corrugated cardboard.

TOP TO BOTTOM
a. Detail before treatment.
b. Detail after treatment.

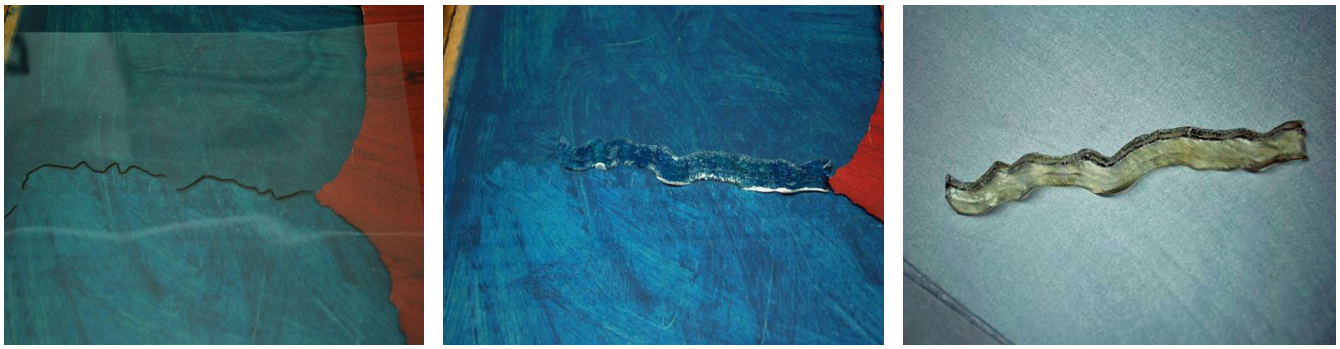


Fig. 10.

LEFT TO RIGHT
a. Stain tideline is traced onto Mylar.
b. Gellan gum is trimmed to the shape of the tideline.
c. Discolored gellan gum after stain reduction.

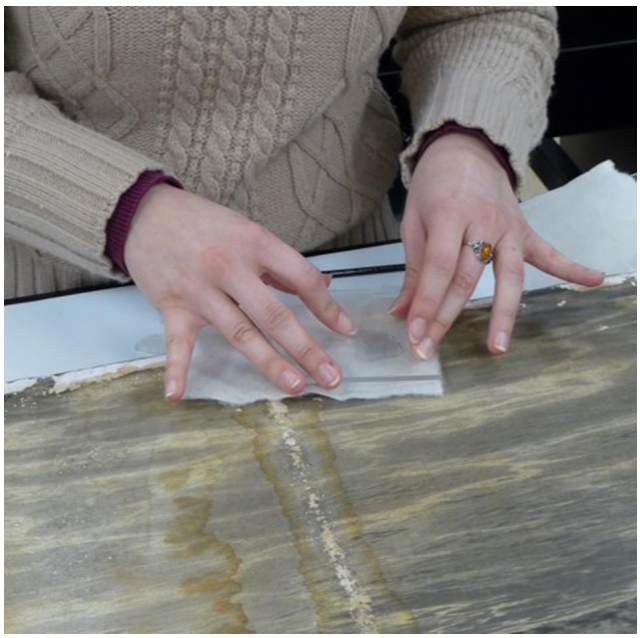


Fig. 11. William Thompson Freeland Panoramas, 1913, silver gelatin on paper, 68.5 x 570.0cm, 1913, Ontario Archives, RG49 243.

TOP TO BOTTOM
(Photographs courtesy of the Canadian Conservation Institute)
a. Conservators working on stain removal with gellan gum.
b. Detail of gellan gum being applied through Japanese paper.

corrugated cardboard was firmly attached to the Masonite, a poulticing method had to be used to reduce the stain. A 3% concentration of gellan gum dissolved in alkaline water (pH 8 with the addition of saturated calcium hydroxide) was prepared. The irregular border of the stain was traced onto Mylar, and gellan gum was trimmed to match. It was placed over the stain, covered with Mylar and light weight and left for ten minutes. The process was repeated several times until the stain was sufficiently reduced. A light wash of watercolour was applied over the cleaned area to restore visual balance. (figs. 10a–c)

STAIN REDUCTION ON A SILVER GELATIN PHOTOGRAPH

Gellan gum has also successfully been used to reduce staining on silver gelatin photographs. Two 570 cm long panoramas of Niagara Falls are currently being treated at CCI. (figs. 11a, b) The images are believed to be the largest single sheet, single exposure photographs produced at that time. Because of the solubility of the deteriorated emulsion, a more rigid 3% gellan gum was prepared in a calcium acetate solution, and an interleaf of thin Japanese paper was used between the surface of the photograph and the gellan gum. The gel was trimmed into circular shapes to avoid leaving hard-edged tide lines. Stains were drastically reduced as a result (figs. 12a, b).

LOCAL REMOVAL OF PAPER LAYERS

REMOVAL OF A PAPER LABEL FROM THE VERSO OF AN OIL PAINTING

Gellan gum works well as a poultice for humidifying and removing paper layers from various substrates. High gel concentrations afford a slow, constant, highly controllable release of moisture. Adding weights to the gellan gum can also increase the rate of moisture release. A paper label was successfully removed from the verso of a painting, with minimal wetting of the canvas. The controlled release of moisture

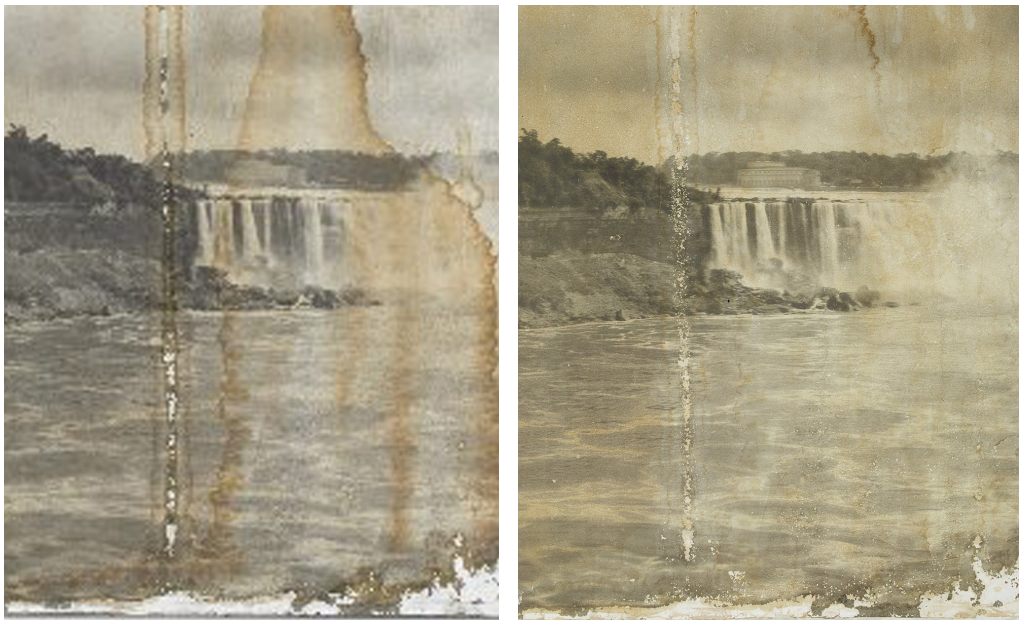


Fig. 12.

LEFT TO RIGHT

a. Detail of panorama before treatment.
b. Detail, of panorama after stain reduction with gellan gum.

Fig. 13. Removal of a paper label from the verso of an oil painting.

LEFT TO RIGHT

a. Gellan gum is trimmed to shape of label, with Mylar barrier beneath the gel to protect canvas surface.
b. After 5 minutes, the gellan gum was removed, and the label was lifted with microspatula.

prevented over-wetting of the substrate, which could have led to serious planar deformations and complications with the paint layer and ground. (figs. 13a, b)

REMOVING LINING FROM BOOK SPINE

In the process of examining the first Bible published and printed in Canada, the conservator discovered that the blue paper covering the spine is a fragment of an advertisement for the Bible. The treatment objective was to remove the fragment and underlying white paper layer in one piece, without over-exposing the spine to moisture, and running the risk of creating tidelines and staining in the text block. 2% gellan gum prepared with RO water was gently pressed into contact with the curve of the blue paper-lined spine, then covered with Mylar and soft weights. After five minutes, the gel was removed and the paper layers were slowly peeled off with the aid of a microspatula (figs.14a–c). The blue printed text was successfully removed in one piece, and the textblock was not affected by moisture. Gellan gum delivered the adequate humidity needed to soften adhesive layers in order to release the paper.

Fig. 14. Henry John White (Printer), The Holy Bible, (King James Version), 1832 or 1833, 28.0 x 22.0 x 6.0 cm, Library and Archives Canada, AMICUS 23024642.

LEFT TO RIGHT
a–c. Removal of paper covering the book spine.

Fig. 15. Relief Map of Canada, Atlas School Supply Co., Chicago, 1909, 80.0 x 114.0 cm., LAC R14016 vol. 2. Cleaning map with gellan gum.

LEFT TO RIGHT
a, b. Cleaning the map with thin cast of gellan gum.
c. Detail of map during cleaning with gellan gum.

TREATMENT OF THREE-DIMENSIONAL OBJECTS

CLEANING THE SURFACE OF A TOPOGRAPHICAL RELIEF MAP

For maximum flexibility, gellan gum can be prepared at a low concentration without a calcium salt solution, and cast into thin layers. 3% gellan gum gel prepared with RO water was used to clean a severely discolored relief school map by pressing it into contact with the irregular surface (figs. 15a, b). To discourage tidelines, gel applications were overlapped as cleaning progressed. Tidelines were subsequently removed by applying 3% gellan gum that was brush coated with ethanol (fig. 15c).

CLEANING A TERRESTRIAL GLOBE

A large terrestrial globe recently underwent extensive treatment at CCI, including varnish and adhesive removal, and overall cleaning and stain reduction. After varnish removal, 5% gellan gum cast in thin layers was applied to selected areas of the paper gores to reduce brown stains and overall discolouration. As with the relief map, the gel was prepared without the addition of a calcium salt in order to produce a more flexible gel layer that would conform to the spherical shape. It was applied in small sections, covered with thin Mylar and removed after several minutes. The number of gellan gum applications varied according to the area and degree of discolouration. In this case, tidelines were avoided by overlapping the wet areas as the treatment progressed (figs. 16a, b).

Gellan gum was also used to reduce degradative soluble copper (II) salts from the greenish brown pigments at the perimeter of the land masses, thus preventing their migration into the surrounding paper. Pieces of gellan gum tested before and after treatment with Ink Cor non-bleeding indicator paper confirmed removal of the copper (II) ions. (McMann 2013).

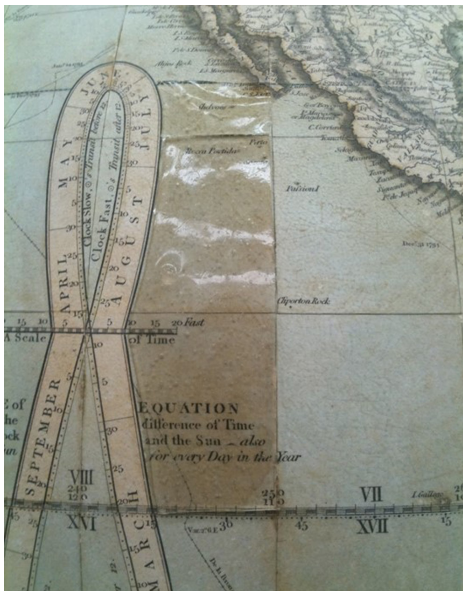


Fig. 16. Cary Terrestrial Globe, 1835.

LEFT TO RIGHT

a, b. Gellan gum used to reduce staining on globe. (Photographs courtesy of the Canadian Conservation Institute)

Fig. 17. Sarony, Major and Knapp, Lithographers, City of Ottawa, Canada West, 1858–61, lithograph on wove paper, 74.2 x 99.7 cm, Library and Archives Canada, R3133-3997894.

LEFT TO RIGHT

a. Stain reduction using gellan gum and Borane reductive bleach.

b. Comparison of map sections: left, before stain reduction, right, after treatment with gellan gum and borane reductive bleach.

REDUCTIVE BLEACHING WITH GELLAN GUM

Sottgiu et al. (2010) reported on the possibility of incorporating reductive solutions into gellan gum gel to expand the range of stain reduction treatments. Borane, a tert butylamine complex ($(CH_3)_3 CNH_2 . BH_3$) (7g/L) is added to a calcium acetate solution (0.4g/L) *after* the gellan gum is added and the colloidal suspension is heated in the microwave. Note that proper personal protective equipment must be used when handling borane tert-butylamine complex, including appropriate gloves, goggles and respirators. Preparation of the solution and treatment should take place under adequate extraction, and the gel must be disposed of as hazardous waste.

A severely deteriorated lithograph of a bird's eye view of Ottawa underwent extensive treatment. After backing removal, bathing and several light bleaching campaigns failed to satisfactorily reduce staining, further bleaching with gellan gum mixed with Borane was considered. A 2% reductive bleaching gel was prepared in calcium acetate solution, to which 7g/L of borane tert-butylamine complex was added. The lithograph was sandwiched between the cast gel sheets for two periods of 60 minutes, with impressive results. Note that the reductive bleaching gel has a milky white, opaque appearance, compared to the more transparent stock gellan gum gel (figs. 17a, b).

Fig. 18. Robert Hood, Cross Fox Catching a Mouse, 1820, watercolor with pen and black ink over graphite on wove paper, 13.4 x 25.0 cm, Library and Archives Canada, R13133–440. Deacidification of a watercolor with gellan gum and calcium propionate.

LEFT TO RIGHT

a. Humidified watercolor is placed on cast sheet of gellan gum with calcium propionate.
b. A second cast gel sheet is placed on the recto of the watercolor.
c. A hole is cut in the gel sheet to avoid contact with soluble areas in the watercolor.

APPLICATION	GELLAN GUM FORMULATION	COMMENTS
Overall cleaning **Local stain removal**	Less rigid gel: 2-4g/L gellan gum powder in H_2O* More rigid gel: 2-4g/L gellan gum powder in saline solution (0.4g/L calcium acetate)	* Quality of water affects rigidity: the lower (or absence of cations), the less rigid the gel
Bleaching	2-4g/L gellan gum powder in saline solution (0.4g/L calcium acetate) AFTER heating gellan gum in microwave, quickly whisk in 7g/L borane tert-butylamine complex	Cast gel layer is milky and more opaque in appearance PPE must be used when preparing borane solution Requires proper disposal as hazardous waste (refer to MSDS)
Deacidification	2-4g/L gellan gum powder in saline solution (0.4g/L calcium acetate) Add 3.5-5g/L calcium propionate* to saline solution BEFORE heating in microwave	*Quantity of calcium propionate dependent on desired alkaline reserve Cast gel layer is milky and more opaque in appearance

Fig. 19. Gellan Gum Applications and Solutions

DEACIDIFICATION WITH GELLAN GUM

Preparation of gellan gum for deacidification is similar to the procedure for reductive bleaching. Calcium propionate (3.5–5g/L is added to a calcium acetate saline solution (0.4g/L), before whisking in the gellan gum and heating it in the microwave. A small watercolour with soluble ink additions to the face of the fox was washed and de-acidified using 3% gellan gum mixed with 3.5g/L calcium propionate. The support was sandwiched between two layers of gellan gum, covered with polyethylene, Plexiglas and light weights for 45 minutes. The soluble media in the fox's face was easily isolated by cutting a triangle out of the gellan gum. Washing and deacidification solutions were effectively delivered from both sides without any compromise to the soluble media. (figs. 18a–c)

CONCLUSION

The table lists the gellan gum applications and solutions that have been described in this article (fig. 19).

Gellan gum has proven to be a valuable addition to the arsenal of materials used in the conservation labs at LAC. The following advantages have been noted:

- Gellan gum is safe; easy preparation and disposal (note exception for Borane gel);
- Provides an even, highly controlled delivery of moisture;
- Retains dimensional qualities, textures and topographical qualities of the object being treated;
- Has variable flexibility, so is effective in cleaning uneven or multi-dimensional surfaces;
- Is transparent to permit observation of object during treatment;
- Does not leave a residue;
- Can be used for local application or overall treatments, and
- Can be used to deliver a variety of chemical treatments.

The preceding examples illustrate the versatility of gellan gum, and the author hopes that the conservation community will use these treatments as a stepping stone and inspiration for continued investigation.

ACKNOWLEDGEMENTS

The author would like to thank Maria Bedynski, Mary Piper Hough, Susannah Kendall, Genevieve Samson, Doris St-Jacques, and Jayme Vallieres at Library and Archives Canada, and Sherry Guild and Greg Hill at the Canadian Conservation Institute for sharing their gellan gum expertise and treatments.

MATERIALS

Ink Cor Non-Bleeding Indicator Paper
http://www.universityproducts.com/cart.php?m=product_list&c=598

Gellan Gum
http://www.talasonline.com/
http://cpkelco.com/products/gellan-gum/

REFERENCES

Botti, L. et al, 2011. "Evaluation of cleaning and chemical stabilization of paper treated with a rigid hydrogel of gellan gum by means of chemical and physical analysis", ICOM-CC, 16th Triennial Congress, Lisbon, 19–23 September 2011, pp. 1–10.

CP Kelco. KELCOGEL Gellan Gum Book, 5th edition, www.cpkelco.com.

CP Kelco Product Data Sheet for Kelcogel CG-LA gellan gum, www.cpkelco.com.

Cremonesi, P.2014. "Rigid Gels and Enzyme Cleaning", Smithsonian Contributions to Museum Conservation, Vol 3, 2014, pp.179–183.

Iannuccelli, S. and S. Sotgiu 2010. "A new methodology for wet conservation treatments of graphic art on paper with a rigid polysaccharide gel of gellan gum," Graphic Documents Working Group Interim Meeting ICOM-CC, Choices in Conservation Practice versus Research, 6–8 October 2010, ed. L. Watteeuw, (Copenhagen: Copenhagen Royal Library), pp. 47–51.

Iannuccelli, S. and S. Sotgiu 2010. "Wet Treatments of Works of Art on Paper with Rigid Gellan Gels," The Book and Paper Group Annual, American Institute for Conservation, Volume 29, 2010, pp. 25–39.

McCann, J. 2013. Gellan Gum: A New Frontier, Poster at Canadian Association for the Conservation of Cultural Property Conference, 2013.

Sullivan, S., S. Brogdon-Grantham, K. Taira. 2014. New Approaches to Cleaning Works of Art on Paper and Photographs, Association for North American Graduate Programs in Conservation) ANAGPIC 2014.

Vallieres, J. 2013. Gellan Gum: Investigating Applications as a Solvent Gel, Research Project, Master of Art Conservation Program, Queen's University, Kingston, 2013.

Wolbers, R. 2000. Cleaning painted surfaces: aqueous methods. London: Archetype Publications.

ANNE F. MAHEUX
Head, Conservation of works on Paper, Maps and Manuscripts
Library and Archives Canada
Gatineau, Quebec, Canada
anne.maheux@canada.ca

16th–17th Century Italian Chiaroscuro Woodcuts: Instrumental Analysis, Degradation, and Conservation

ABSTRACT

Italian chiaroscuro woodcuts are among the most technically innovative of Renaissance prints for being printed in color. A woodcut is made from a wooden plank that is carved in relief, inked, and impressed on paper. Chiaroscuro woodcut prints—named from the Italian term for contrasting light and dark tones—involve printing an image from two or more woodblocks, with each block printed in a different color, to create transitional passages of shading. With two to five superimposed layers of colored, oil-based inks printed onto a paper support, the chiaroscuro woodcut is an object of complex stratigraphy. Several centuries of aging and deterioration of both the inks and paper can cause visual changes that affect a print's legibility, thereby distorting the historical and aesthetic interpretation of the work. Sometimes inappropriate restoration or conservation treatment can also obscure or obliterate information imparted by the chiaroscuro woodcut printing process. A correct assessment of the physical characteristics of the printing process, the visual qualitites of the colored inks, as well as the condition of the individual impressions, is therefore fundamental not only to the art historical evaluation of prints, but equally to the application of appropriate preservation and conservation measures. It is the characterization of the printing ink pigments, ink degradation, and associated damage to the print paper support that form the object of this study.

A technical survey of over 2000 Italian chiaroscuro woodcuts of the 16th and 17th centuries conducted in international collections revealed trends in deterioration of colored inks such as discoloration, fading, blanching and micro-fissures. Seventy-two prints from the Library of Congress, Los Angeles County Museum of Art, and Grunwald Center for the Graphic Arts were examined further using instrumental analysis. The seventy-two prints analyzed were selected according to the following criteria. First, to the extent that the holdings of the three collections allowed, the prints selected represent six major practitioners of the Italian chiaroscuro woodcut and provide a chronological overview of the period in which the technique flourished. Second, although the majority of prints selected are early impressions, some later or posthumous impressions also were analyzed. Moreover, while many of the prints chosen are in an excellent state of preservation, others exhibit a range of aforementioned condition problems.

The results of this joint study demonstrate the use of unstable colorants such as lead white, verdigris, vermilion, orpiment and organic pigments. Based on the documented behavior of unstable colorants in oil paint, it is possible to infer how the visual appearance of prints containing such colorants is likely to have changed. The combined evidence is here analyzed in order to establish recommendations for conservation treatment, storage and parameters for display and equally to inform art historical interpretation.

LINDA STIBER MORENUS
Library of Congress
Washington, DC
lindamorenus@yahoo.com

CHARLOTTE ENG
Los Angeles County Museum of Art
Los Angeles, CA
ceng@lacma.org

NAOKO TAKAHATAKE
Los Angeles County Museum of Art
Los Angeles, CA
ntakahatake@lacma.org

DIANA RAMBALDI
Los Angeles County Museum of Art
Los Angeles, CA
diana.rambaldi@gmail.com

Presented at the Book and Paper Group Session, AIC's 43rd Annual Meeting, May 13–16, 2015, Miami, Florida. The paper has since been published in the Journal of the American Institute for Conservation, Vol. 54, No. 4, in November 2015

Confidence in the Bath

ABSTRACT

"I don't know, I've just always done it this way," is often the explanation of why water is prepared a certain way for aqueous treatment of paper. Water is the paper conservator's most ubiquitous solvent; so why do we not know more about the specific quality of our solutions? Even conditioned with calcium, traditional wash water for paper conservation has low ionic strength (conductivity) and does not allow for accurate measurement of pH. This paper presents the practical considerations for preparing aqueous solutions for washing, including accurate measurement of pH, the relationship of pH and ionic strength, and the implications of ionic strength within solutions. Practical tutorials will show the use of affordable and accurate hand-held digital meters for measuring solution pH and conductivity. Finally, there will be a discussion of how the use of these meters can improve and refine wash water preparation. A mini-survey of wash water measurements collected before and after treatment by practicing conservators indicates the direction of future research and demonstrates the potential of these meters to improve our understanding and control of washing practices.

ADAM NOVAK
Private Practice
New York, NY
adamrnovak@gmail.com

Presented at the Book and Paper Group Session, AIC's 43rd Annual Meeting, May 13–16, 2015, Miami, Florida

TODD PATTISON

The Book as Art: Conserving the Bible from Edward Kienholz's *The Minister*

ABSTRACT

The most successful conservation treatments are developed with meaningful discussions between the stewards of objects and the conservators charged with treatment. It is the combination of the curator's and conservator's point of view and expertise that makes conservation work. The greatest challenge for me in accomplishing this goal is recognizing the personal bias that I bring to conservation. Bias can be defined as an inclination or outlook, one-sided, lacking a neutral viewpoint, not having an open mind. In conservation this often means an initial preference for treatment that is based on a partial perspective. Conservators often focus on the physical characteristics of objects when proposing treatment but it is imperative that as a profession we have the flexibility to include the perspectives and expectations of curators, librarians and other stewards of objects when developing treatment proposals. The conservation treatment of a Bible from an art assemblage by Edward Kienholz illustrates how bias can easily affect our treatment proposals. In this paper I'll briefly describe the artwork and condition of the Bible, look next at potential bias using two other bound objects, pointing out how a conservator and a curator might have differing viewpoints on treatment, and in conclusion, look at the final treatment of the Bible.

INTRODUCTION

In May 2014 the Albright-Knox Art Gallery in Buffalo New York contacted the Northeast Document Conservation Center (NEDCC) with a project to conserve a 20th century Bible that is part of an artwork by Edward Kienholz in the Museum's collection. (Fig. 1) An American artist, Kienholz first began constructing art assemblages in the late 1950's while living and working in Los Angeles. He was involved in the avant-garde art scene and a pioneer in what would later be

Fig. 1. Edward Kienholz. *The Minister*, 1961, collage, 149 x 67 x 96.5 cm. Collection Albright-Knox Art Gallery Buffalo, New York. Charles W. Goodyear Fund, by exchange and Gift of Mrs. George A. Forman, by exchange, 2013. #2013:10a–c

Presented at the Book and Paper Group Session, AIC's 43rd Annual Meeting, May 13–16, 2015, Miami, Florida

termed “installation art”. Kienholz used found objects in his complex sculptures and assemblages, which served as harsh and sometimes disturbing commentary on the dark side of contemporary life. (Hopps, 1996, 33–35)

THE BIBLE

The Minister, a freestanding piece completed in 1961, is an early Kienholz assemblage. It was a gift from the artist to his physician and friend, Dr. Milton Uhley, and was acquired by the Albright Knox Art Gallery in 2013. (Fleischmann 2015) In the artwork, the Bible is placed open on a religious lectern, resting on a slanted surface looked over by a minister's head, represented by a butcher's scale, an object used to literally weigh flesh. The windows through which the scale's measures were to be read, the ministers eyes, were removed by Kienholz and replaced with Biblical passages.

The Bible appears to have been displayed at a particular page spread for a significant amount of time, as there is distinct discoloration to the pages and a preferential opening in the text at this location. (Fig. 2) This page opening is central to the meaning of the artwork. Born into a family of devout Protestant farmers in Washington State, Kienholz is pointing out the hypocrisy of religious self-righteousness. The underlined passages warn about the danger of judging others, lest

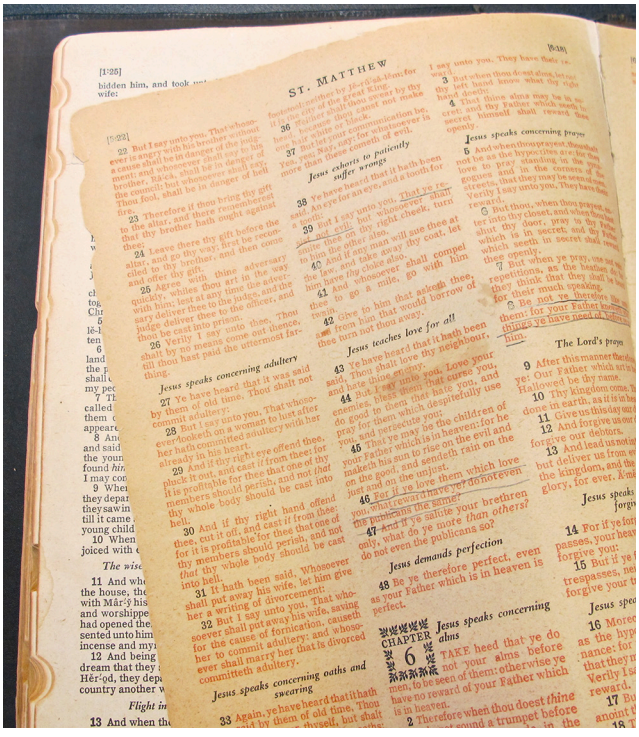


Fig. 2. Detail of page opening of Bible. Edward Kienholz. *The Minister*, 1961. Collection Albright-Knox Art Gallery Buffalo, New York. Charles W. Goodyear Fund, by exchange and Gift of Mrs. George A. Forman, by exchange, 2013. #2013:10a–c

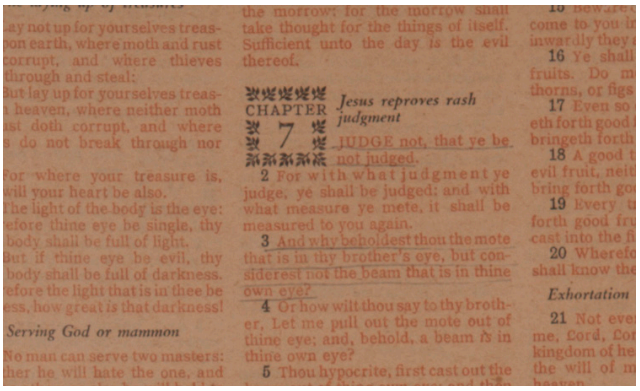


Fig. 3. Detail of page opening of Bible. Edward Kienholz. *The Minister*, 1961. Collection Albright-Knox Art Gallery Buffalo, New York. Charles W. Goodyear Fund, by exchange and Gift of Mrs. George A. Forman, by exchange, 2013. #2013:10a–c

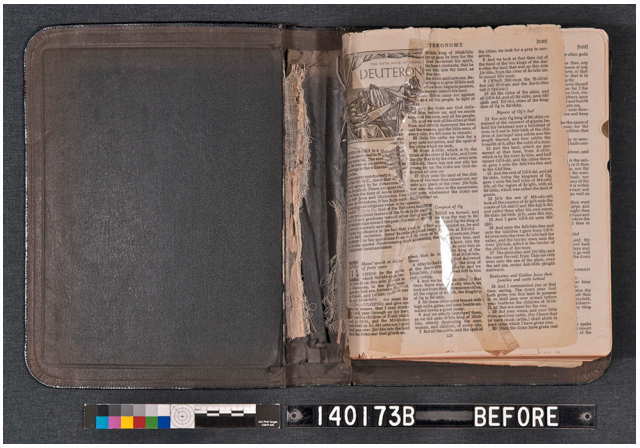


Fig. 4. Before treatment documentation of front interior hinge of Bible. Edward Kienholz. *The Minister*, 1961. Collection Albright-Knox Art Gallery Buffalo, New York. Charles W. Goodyear Fund, by exchange and Gift of Mrs. George A. Forman, by exchange, 2013. #2013:10a–c

you be judged—the folly of pointing out a small object in another’s eye while ignoring a large beam of wood in your own. The passage in between, talking about measuring, references the butcher’s scale. (Fig. 3)

The Bible is missing the title page and approximately the first 130 pages of text. Kienholz often used found objects in his artwork that showed use; it is possible that he was responsible for the pressure-sensitive tape used to hold the first few pages to the rest of the text block. (Fig. 4) Although the work was displayed behind a barrier, the need for treatment arose from an incident with an overzealous visitor to the Museum. The individual picked up the Bible, resulting in the text separating from the binding. Because the Bible was missing pages at the front, the text block was most likely only connected to the cover along the back hinge.

TREATMENT PROPOSAL

Following initial discussions among the book conservation staff of NEDCC, a very minimal treatment was proposed using fittings that could be placed loose on the binding to hold the text block in position. Since the Bible rests on a slanted surface, the text block would slide down against the lectern ledge and out of position relative to the cover unless a spacer was placed against the lectern ledge. While some polyester film strapping might need to be used to hold the text block in place, the fittings would be toned to be as unobtrusive as possible. This seemed to be an ideal approach that would involve little, if no, intervention to the Bible itself.

When this treatment was proposed to staff at the Albright-Knox Art Gallery Holly E. Hughes, the Godin-Spaulding Curator and Curator of Collection and Laura Fleischmann, the Senior Registrar for the Collection both pushed back against this proposal. They did not want any additions to the artwork that would be visible to viewers, no matter how discreet or unobtrusive. Their preference was for a treatment strategy that would reattach the text block to the cover allowing the Bible to sit on the podium as before with no change in appearance. Discussions amongst the book conservation staff at NEDCC showed that there was some hesitation against what was perceived as a more invasive treatment proposal. Some conservators felt that the Bible was part of an artwork and so needed to be treated differently from other bound volumes, that the Bible was somehow special simply because it could be defined as "art."

TREATMENT BIAS

This is one type of bias that can easily creep into our conservation approach. It is important to remember that the Bible from Edward Kienholz's art assemblage is an object that has context and needs treatment. It is no more or less important than other bound objects that book conservators work on. The context, or story of the object, as well as the physical condition, should both be critical components in determining the conservation treatment. In this instance, the aesthetics of the piece are a critical part of the context, and therefore, the treatment. The fittings might be less invasive to the Bible but potentially more invasive to the artwork.

Barbara Appelbaum has made this same point. "A treatment that serves the interests of multiple parties at the same time is a better treatment than one that follows only the initial preferences of the conservator." She goes on to say "There is, of course, no such thing as a single 'ideal' treatment because there is no one ideal post-treatment state for any given object." (Appelbaum 2015, 5) I think it is significant that Ms. Appelbaum points out "the initial preferences of the conservator" because this is the potential bias I'm speaking about. Our initial conservation preferences are usually based on examination of the physical characteristics of objects, in combination with our experience, interests and even our skill set as conservators. However, without considering a "post-treatment state" we cannot come up with the most informed conservation treatment. Objects do not exist in a vacuum; in some ways they are living things with a story or stories to tell. Curators, librarians and other custodians of bound objects are entrusted with telling these stories. The conservator can help focus the lens so objects can be seen clearly in their context. We want objects to be seen for what they are but we cannot always know what they are from physical examination alone.

JONSON FIRST FOLIO

While the Kienholz Bible may be a complicated book example because the volume is part of an art assemblage, almost any treatment proposal can be influenced by bias or preference. Recently, NEDCC treated a First Folio of The Works of Ben Jonson printed in London in 1616. The Jonson First Folio was a crucial development in the publication of English literature and drama and served as a precedent for the publication of other works including the First Folio of Shakespeare's plays in 1623. (Meskill 2008, 178) Unfortunately, the volume was rebound at some point in the late 19th or early 20th century by Riviere, a large English trade bindery. The red morocco leather cover was a standard binding style produced by Riviere, which would have been used on texts from a wide range of time periods and printing locations. Although not very visible in Fig. 5, both boards were detached at the joints, which is why the volume was initially sent to NEDCC for treatment.

The text block was oversewn during the Riviere rebinding and the volume did not open well. More significantly, there

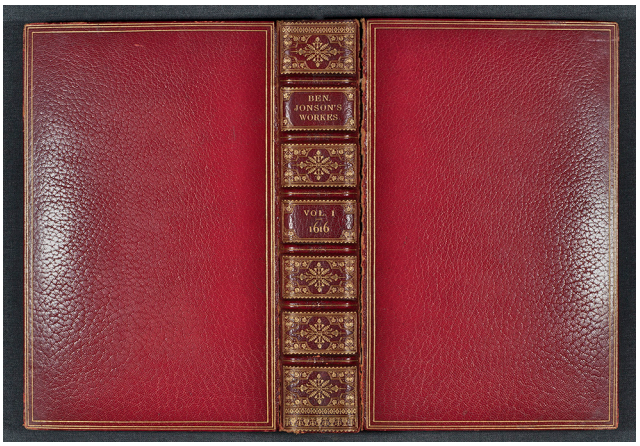


Fig. 5. Before treatment documentation of binding. Jonson, Ben. The Workes of Beniamin Jonson. London: W. Stansby, 1616. Catherine Pelton Durrell '25 Archives and Special Collections Library, Vassar College

was evidence that the pages had been bleached; there was a slightly gray cast to the paper, the leaves were very flat with no type impression and the pH of the tested pages measured 3.5. For this reason the treatment proposal included disbinding the volume to wash, alkalize and size the paper. The initial preference for the binding would be a period-appropriate binding in dark or medium brown leather with simple blind-tooled decoration and the title tooled in gold.

The volume is part of the collections at The Catherine Pelton Durrell '25 Archives and Special Collections Library of Vassar College and is used in class instruction. The teaching context is not only the production and distribution of Jonson's works in the 17th century, but also the attitudes towards rare books in the late 19th and early 20th centuries. It was not uncommon for collectors at this time to have their books rebound in a binding that looked expensive but might not have been consistent with the time period of the text production. In addition, a major donor to the library, Rebecca Lawrence Lowrie, gave the book to Vassar in honor of Fanny Borden, an early and distinguished Vassar librarian, so the Riviere binding is part of the College and library's stories as well. (Patkus 2015) By reusing the binding, the volume can be placed in three different contexts, while a period style rebinding would remove two of those, at least in direct connection to the text. One of the goals of the comprehensive conservation treatment agreed upon by all parties was to retain the Riviere binding with an emphasis on having it look consistent with the time period in which it was produced.

The binding was rebacked with unbleached airplane linen and Japanese paper toned to match the original leather color. The rounded spine of the rebacked volume is slightly flatter than the spine of the Riviere binding to improve the page opening. (Fig. 6)

Fig. 6. Before and after detail of front hinge attachment. Jonson, Ben. The Workes of Beniamin Jonson. London: W. Stansby, 1616. Catherine Pelton Durrell '25 Archives and Special Collections Library, Vassar College

TREATMENT PREFERENCES

Just as book collectors and bookbinders at the turn of the 20th century had preferences, or bias, in how rare books should look, most conservators make assumptions when it comes to conservation treatments. Conservators have preferences or biases based upon background, training, and the fact that they are interested in things like bookbinding structure and history. This can affect not only what they expect to see but also the treatments that they propose. Another important and often overlooked factor that can influence the types of treatment conservators propose is their level of skill or expertise in carrying out one treatment versus another. It is only natural that conservators might have a preference for proposing treatments that they are more comfortable performing, or that they feel they have more skill or expertise performing and will therefore result in what they would consider a more satisfactory outcome. It is important to understand the difference between an initial treatment preference and a comprehensive treatment proposal that takes into account not only the preference of the conservator but the expectations for treatment on the part of the steward of the object.

A VIEW OF ANTIQUITY

The second treatment proposal that I'd like to discuss is more likely to be affected by bias on the part of the conservator as compared with the example of the Jonson First Folio. This copy of the 1677 edition of John Howe's *A View of Antiquity* has extensive damage. The leather covering material is completely detached from the front board and text while the pastedowns are detached from the boards. The original sewing supports are adhered to the leather and no sewing thread is present.

Fig. 7. Front board and pastedown. A View of Antiquity. London: Thomas Parkhurst and Jonathan Robinson, 1677. Yale College Library of 1742, General Collection, Beinecke Rare Book and Manuscript Library, Yale University.

Fig. 8. Exterior of binding. A View of Antiquity. London: Thomas Parkhurst and Jonathan Robinson, 1677. Yale College Library of 1742, General Collection, Beinecke Rare Book and Manuscript Library, Yale University.

Pages are missing from the back of the volume, as is the back board of the binding. There is considerable staining to the last leaf of text demonstrating that it has been in contact with the covering leather for quite some time. Despite the extensive damage, the leather is quite pliable and the turn-ins, for the most part, are still attached.

The present condition of this book reveals the structure and materials; it would make a wonderful teaching piece. From my initial examination and preference, I would propose to construct a loose filler piece for the missing text and put the volume in a box. This would be non-invasive and allow access to the spine folds of the printed sheets, the board lacing and the flesh side of the leather, all elements that would normally be hidden from view in an intact binding. (Fig. 8) While that would be my initial preference, this volume has a different context within its university—a different story to tell. The book is part of the first documented library of Yale University, accurately recorded in 1742. The collection is shelved prominently in the Beinecke Rare Book and Manuscript Library as a reminder of the central role of the library in the institution. As with a founding building or other element of historic importance, the collection symbolically fulfills an identity role. For these reasons, the comprehensive conservation proposal calls for the volume to be reconstructed, with blank paper filling in for missing pages. The missing board will be replaced and the leather binding reassembled and attached to the text. This will allow the book to sit on the shelf with the rest of the collection and look the part of an 18th century library. It will still be accessible to researchers while being allowed to tell its story. Although this was not my initial preference for treatment I find the comprehensive treatment plan to be perfectly aligned with the object's context.

Some conservators might find the proposed treatment controversial but it is guided by the post-treatment state most useful for the collection and takes into account the perspective of the curator. Salvador Munoz Vinaz, in his book *Contemporary Theory of Conservation*, points out the need to include the stewards of objects when making treatment decisions. "It is the affected people who best know what meanings the object possesses, and how it will be best to convey those meanings; it would not be ethically correct to impose a different point of view just because someone has some expertise in art history, in organic chemistry, or in stone conservation techniques." (Viñas 2011, 201–202) We cannot treat materials based on their physical condition alone, or our own preferences, we need the context as well. Our treatment goals need to include telling the story, and that is not always possible by simply preserving the object in the state we find it. The best treatment is not always the least invasive one.

EVIDENCE OF USE

Please don't misunderstand me, I'm not arguing for more or less treatment, just the appropriate treatment. For instance, I believe strongly in the evidence of use, you can also think of this as purposeful "damage", as Jana Dambrogio has touched on in her research on *Unlocking the Secrets of Letterlocking*. (Dambrogio 2015) Preserving evidence of production or use; folds, tears, cuts, stubs or dirt that conservators might flatten, mend, or otherwise alter during treatment can be vital to understanding an object. As conservators, treating this damage is often our first thought when examining materials and it can be difficult to leave this "damage" alone. Shelley Smith pointed out this type of "action bias" during the AIC Annual Meeting in 2013. (Smith 2013)

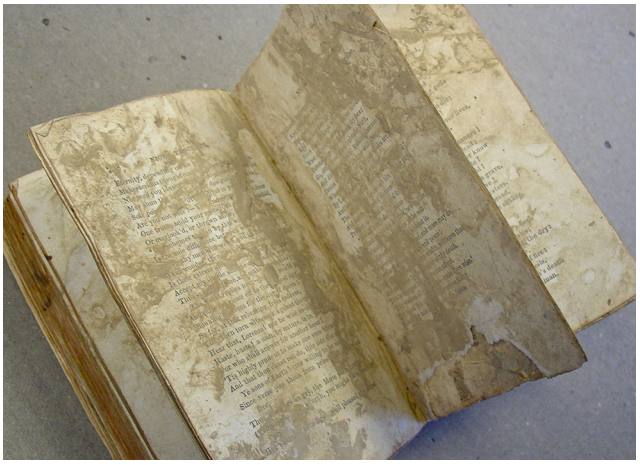


Fig. 9. Mud on text pages. Young, Edward. Night Thoughts on Life and Immortality. Philadelphia: John B. Perry, 1855. National Park Service, Gettysburg National Military Park, GETT 4490. Photo by Julie Martin.

For example, the book shown in Figure 9 has extensive dirt on many pages and an initial treatment preference would most likely include removal or reduction of this dirt. However, if we understand the context, the dirt is an integral part of the object, arguably the most important part. This particular book was found on a battlefield two days after a major Civil War engagement, dropped during the fighting by a soldier who had carried it in battle. The text is a long poem dealing with death, human frailties and how quickly life and opportunities can slip away. If we remove the dirt the book becomes just another copy of that printed edition. The dirt embeds meaning and witness. While there are many possible post-treatment states for the volume it is imperative to arrive at one that involves less treatment than an initial preference might entail, one where preserving the evidence demonstrating that it was left on the battlefield is a priority. Protecting this evidence of use can make the difference between preserving an object's "story" and just preserving the object itself.

THE CONSERVATION TREATMENT OF THE BIBLE

To return to the conservation treatment of the Kienholz Bible, our initial treatment preference proposed using fittings to hold the text in place in relation to the cover. The comprehensive treatment agreed upon with the staff at the Albright-Knox Art Gallery called for the cover to be reattached to the text block. Pressure-sensitive tape was removed only where absolutely necessary as Kienholz might possibly have applied the tape himself. The tape did have to be removed at the spine area so the text block could be released and repositioned during the conservation treatment. (Fig. 10) Two Japanese paper hinges were attached to the spine of the text block with starch paste, toned to match the pastedowns. These were both left extended at the back interior hinge, as this is the only area of connection to the binding.

After the preparation of the text some areas of the binding were lifted to allow for the insertion of repair materials. The original spine linings that were still adhered to the cover were removed and retained. The pastedowns were lifted at the spine edge of the front and back covers. As the Bible has a semi-limp binding there is no board in this area, the pastedowns are adhered directly to the heavy binding covering material. (Fig. 11) The front hinge was put down with Jade 403. Since the text is only attached at the back hinge the Japanese paper was adhered across the spine of the binding providing greater strength while preserving the attachment of the text as it was before the visitor damage. The spine of the text is lightly lined with Japanese paper so the Bible will open on the podium as before conservation treatment. The back hinge was put down with Jade 403 with the text held at an angle to allow for proper adhesion in the hinge area. The pastedown and previous spine linings were readhered with Jade 403. Although most of this material will be hidden when the book is open on the lectern small amounts at the spine ends will be visible as before treatment. A fitting of binder's board covered with MacGregor handmade paper was constructed to compensate for the missing pages during storage of the Bible. A sheet of Permalife was inserted at the exhibit opening to aid in locating the page opening for future display of the artwork. A drop-spine box was constructed to safely house the Bible when the artwork is not on display. (Fig. 12)

Fig. 10. The Bible during treatment. Edward Kienholz. *The Minister*, 1961. Collection Albright-Knox Art Gallery Buffalo, New York. Charles W. Goodyear Fund, by exchange and Gift of Mrs. George A. Forman, by exchange, 2013. #2013:10a–c

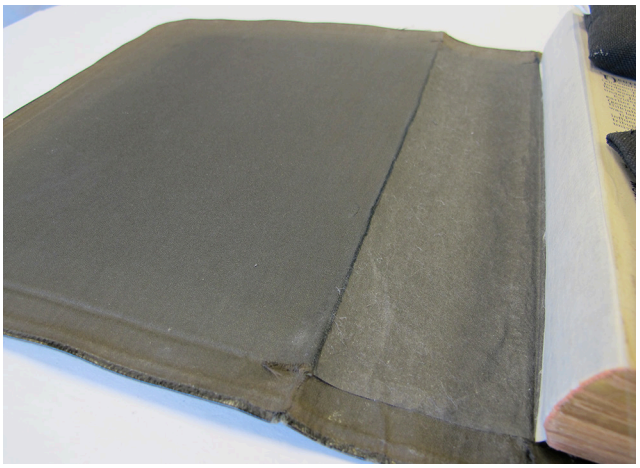


Fig. 11. Detail of the hinge across the interior of the spine of the cover. Edward Kienholz. *The Minister*, 1961. Collection Albright-Knox Art Gallery Buffalo, New York. Charles W. Goodyear Fund, by exchange and Gift of Mrs. George A. Forman, by exchange, 2013. #2013:10a–c

Fig. 12. The Bible in its custom-fitted enclosure. Edward Kienholz. *The Minister*, 1961. Collection Albright-Knox Art Gallery Buffalo, New York. Charles W. Goodyear Fund, by exchange and Gift of Mrs. George A. Forman, by exchange, 2013. #2013:10a–c

The after documentation of the Bible shows minimal visible change as a result of the treatment, even at the front hinge, which is not visible during exhibition. (Figs. 13–14)

CONCLUSION

In order for conservation to work, we need to have meaningful conversations with the curators, librarians, registrars, preservation specialists and other stakeholders of objects. It is imperative that we understand the expectation that these groups have for conservation treatment and the outcomes that they hope intervention will achieve. While we may have conservation treatment preferences we have to be mindful of our own bias when developing treatment proposals. Each of the objects that we work on has context—tells a story—and the goal of conservation should be to help tell that story in a responsible manner. If we aren't able to listen to the perspective of the custodians of objects and collaborate successfully, they might search out someone else who will.

ACKNOWLEDGEMENTS

The author would like to express his appreciation to the Northeast Document Conservation Center for all their support in the preparation of the presentation and article. A special thank you to Mary Bogan, Jessica Henze, Kiyoshi Imai, Athena Moore and Kristi Westberg. For allowing me to use their objects in this article, I would like to thank Ron Patkus of Vasser College, Rebecca Hatcher of Beinecke Rare Book and Manuscript Library, Yale University, Greg Goodell of National Park Service, Gettysburg National Military Park, and especially Holly E. Hughes, the Godin-Spaulding Curator and Curator of Collection and Laura Fleischmann, the Senior Registrar for the Collection of the Albright-Knox Art Gallery. Thank you also to Laura Bedford for helpful guidance on the presentation.

Fig. 13. After treatment documentation of the front hinge area of Bible. Edward Kienholz. *The Minister*, 1961. Collection Albright-Knox Art Gallery Buffalo, New York. Charles W. Goodyear Fund, by exchange and Gift of Mrs. George A. Forman, by exchange, 2013. #2013:10a–c

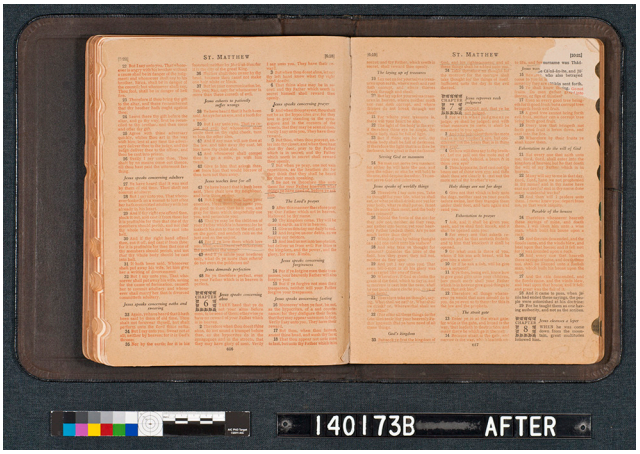


Fig. 14. After treatment documentation of the page opening of Bible. Edward Kienholz. *The Minister*, 1961. Collection Albright-Knox Art Gallery Buffalo, New York. Charles W. Goodyear Fund, by exchange and Gift of Mrs. George A. Forman, by exchange, 2013. #2013:10a–c

REFERENCES

Appelbaum, B. 2015. The False Dichotomy of 'Ideal' versus 'Practical' Conservation Treatments. In *AIC Preprints. American Institute for Conservation 43rd Annual Meeting, Miami*. Washington, DC: AIC. 5.

Dambrogio, J., D. Smith, and H. Wolfe. 2015. Unlocking the Secrets of Letterlocking to Reseal the Letters of John

Donne and Other Early Modern Letter Writers. Paper presented at the American Institute for Conservation 43rd Annual Meeting, Miami, Florida.
Fleischmann, L. 2015. Personal communication. Albright-Knox Art Gallery, Buffalo, New York.
Hopps, Walter. 1996. *Kienholz: A Retrospective.* New York: Whitney Museum of American Art.
Meskill, L. 2008. Ben Jonson's First Folio: A Revolution in Print? *Études Épistémè* 14 (Automne): 177–191.
Patkus, R. 2015. Personal communication. Vassar College Libraries Special Collections, Poughkeepsie, New York.
Smith, S. Tip: Action Bias. *Book and Paper Group Annual* 32: 88.
Viñas, Salvador Muñoz. 2011. *Contemporary Theory of Conservation.* London and New York: Routledge.

TODD PATTISON
Senior Book Conservator
Northeast Document Conservation Center
Andover, MA
tpattison@nedcc.org

TESSA THOMAS AND JOAN WEIR

Affichomanie: Retracing the History and Practice of Lining Belle Époque Posters with Fabric

INTRODUCTION

An 1881 Parisian freedom of the press law forever changed public notions regarding the placement of graphic artists and illustrators within the hierarchy of art. The law allowed for the liberal pasting of bills, or posters, throughout the city of Paris, where previously one had to be authorized to do so. Further, the law also extended to other forms of media and created an overall expansion of the mass media market within Paris.[1] Almost overnight the streets of Paris became an open-air gallery exhibiting the now famous images of bold color, design and celebrity depicted by skilled artists of the time; it was the birth of modern advertising. For artists, such as Jules Chéret (1836–1932), considered the "father of the poster", this environment provided an opportunity to share colorful and playful imagery with the masses amongst the hustle and din of busy Parisian streets.

In 2010 and 2013 the gifts of Ross R. Scott and Donald R. Muller were acquired into the collection of the Art Gallery of Ontario. Consisting of more than 80 artworks by Henri de Toulouse-Lautrec (1864–1901), Théophile Alexandre Steinlen (1859–1923), and other Belle Époque artists, the Ross R. Scott and Donald R. Muller Collection is a remarkable compilation of posters, rare prints, drawings, archival materials, and illustrated books.

An initial survey of the Ross R. Scott and Donald R. Muller Collection revealed that many of the posters had been lined with fabric. The fabric linings varied in age, type and method of application. The universal demand for works by Lautrec and other Belle Époque artists remains high and often provides opportunities for conservation treatments to be performed, however, simultaneous research opportunities are rare. A fellowship funded by the Samuel H. Kress Foundation opened the door to explore the history and practice of lining Belle Époque posters with fabric. The objectives of the 2013–2014 Samuel H. Kress Fellowship in Paper Conservation at the Art Gallery of Ontario were as follows:

1. Organization and condition survey of the Ross R. Scott and Donald R. Muller Collection
2. Research
3. Testing and analysis
4. Treatment
5. Exhibition preparation
6. Storage

These objectives guided a year of research and conservation practice, the results of which are presented in this paper.

AFFICHEURS

For Lautrec, Steinlen and artists of the Belle Époque new posters were eagerly anticipated, each new poster gave the public rare glimpses into the dancehalls, clubs and cabarets of Montmartre and avant-garde Paris; each day presented a new opportunity for the flames of "affichomanie" or "postermania" to be fanned. The public obsession with posters and the freedom of the press law also contributed to the growth of related trades, such as the rise of affiche urs or poster pasters, as seen in figure 1.[2] In the image it is possible to see a female poster paster in the process of adhering a poster to an outdoor wall, she is equipped with a pasting brush, paste bucket and satchel containing folded copies of the poster. It is noted that Belle Époque posters typically exhibit creases from prior folding for this reason; it is also believed that posters were often stored folded as collectors' notations are frequently found adjacent to folding creases, as seen in figure 2 (Romand, N., 2014). The man in the image could be a tax officer surveying the wall to ensure that all of the posters have acquired the necessary tax stamp for public display. An example of a tax stamp can be seen in figure 3, these stamps are frequently found on surviving Belle Époque posters.

Presented at the Book and Paper Group Session, AIC's 43rd Annual Meeting, May 13–16, 2015, Miami, Florida

Fig. 1. A female afficheur adhering a poster to an outdoor wall.

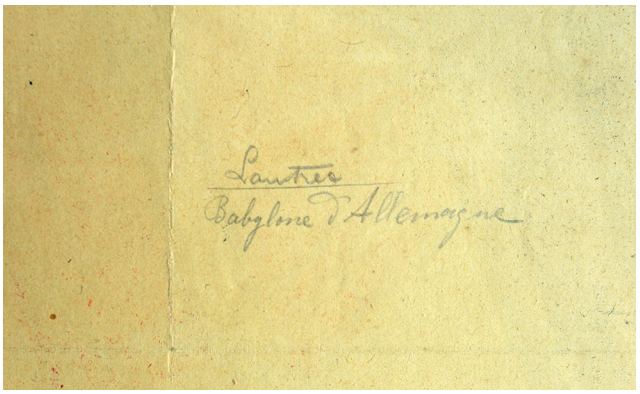


Fig. 2. A collector's notation adjacent to central folds on the verso of a poster.

Fig. 3. A typical tax stamp found on Belle Époque posters.

COLLECTORS

Literature often states that at the peak of the "affichomanie" those compelled to do so were able to seek out and obtain instructions outlining how to remove freshly pasted posters in the middle of the night.[3] However, further research revealed that the original reference had a much more satirical tone. In an April 1893 letter that he wrote for *Le Père peinard*, described as an anarchist newspaper, Félix Fénéon illustrates the fervor for the work of the poster artists and encourages those as enamored as him to help themselves to the posters. Fénéon writes:

> One (poster artist) who has guts is Lautrec: his designs and his use of color are by no means pretentious. Use of white, black and red over large surfaces and simplified forms: that's his thing. LA GOULUE, REINE DE JOIE, le DIVAN JAPONAIS in a café: these are examples of the creative poster art of Lautrec: and these few examples are full of drive, audacity and cheekiness...
>
> Furthermore, I have an idea in the back of my mind which I am going to share with you right away. These posters are really fine…why not take advantage of them? If they've only been pasted for a short time or while it's raining, or when the posters have been slapped over a thick layer and become like cardboard—it's quite easy to get them off the wall: but watch out for the cops...Once you're back home—what to do? Wash them well, then dry them on the line, patch up the tears and voilà! Pin your booty on the walls of your apartment—your apartment where, of course, your landlord lets the wallpaper hang in ribbons. A Lautrec or Chéret at home: that's the thing that will make it gleam! Your place will light up with a riot of color and fun. These posters are really class (Halperin 1988, 229–31).[4]

It is clear that Fénéon is truly an admirer of Lautrec and the poster artists, however, considering that this article was written in a small, independent, niche newspaper, it is difficult to believe that more than a select few individuals would have taken Fénéon's advice literally. Imagine for a moment peeling a three or four foot poster off of a wall in one piece and then attempting to carry it home without it folding into a wet, sticky, crumpled heap. Although it is likely that a handful of enthusiastic and determined individuals would have attempted such a feat, it is also equally, if not more so, likely

that many affícheurs were paid-off by enterprising collectors, and that Fénéon-like behavior was less common. Accusing eager collectors of peeling posters off of walls in the middle of the night provided an ideal cover for the affícheurs.

One question that arises is the conundrum of the tax stamp, many believe that if a surviving Belle Époque poster has a tax stamp that it must have been displayed outdoors, and therefore removed from a wall by an eager collector. This may not be the case, it is possible that posters were stamped in large volumes once received in the tax office from the printer. It would have been significantly easier, and more efficient, to stamp a large run of posters in succession than to complete the task on-site at various locations throughout Paris. Consequently, a collector could have acquired a stamped poster from an affícheur prior to the poster being pasted onto a wall.

POSTER DEALERS

For those less inclined to remove Lautrec posters directly from walls, or pay off affícheurs, there was soon a third option, the poster dealer. The most widely known poster dealer in the 1890s was Edmond Sagot, a postcard advertising his shop can be seen in figure 4. Nicolas and Mireille Romand, descendants of Edmond Sagot, continue to operate two commercial galleries in Paris, Galerie Sagot—Le Garrec, and Galerie Documents. Throughout the 1890s and into the 20th century Edmond Sagot sold posters directly from the printers to private collectors and institutions in Paris and around the world. The original Sagot poster archive is comprised of index cards listing the name of the poster, who the poster was sold to and the cost, it is a truly remarkable resource. Even with the aid of poster dealing and private collecting it is still extraordinary that so many Belle Époque posters have survived into the 21st century, especially considering their ephemeral nature and the use of poor quality paper; certainly, the practice of lining the posters with fabric has saved many of them from ruin.

Fig. 4. A postcard advertising Edmond Sagot's shop.

SURVEY AND RESEARCH QUESTIONS

A detailed survey of the Ross R. Scott and Donald R. Muller Collection uncovered that many of the Lautrec posters had indeed been lined with fabric supports, including: *Le Pendu* (1892), *Aristide Bruant* (1893), *La Vache Enragée* (1893), *Au Pied de l'Echafaud* (1893), *Babylone d'Allemagne* (1894), *Le Photographe Sescau* (1896), *L'Aube* (1896). Research questions regarding the fabric linings included:

- Were the posters originally lined with fabric in the 1890s or were the linings a later addition?
- Who lined the posters?
- What materials were used to line the posters?
- How have the fabric linings affected the conditions of the posters?
- How has the practice of lining Belle Époque posters with fabric changed, or remained the same, over the last century?

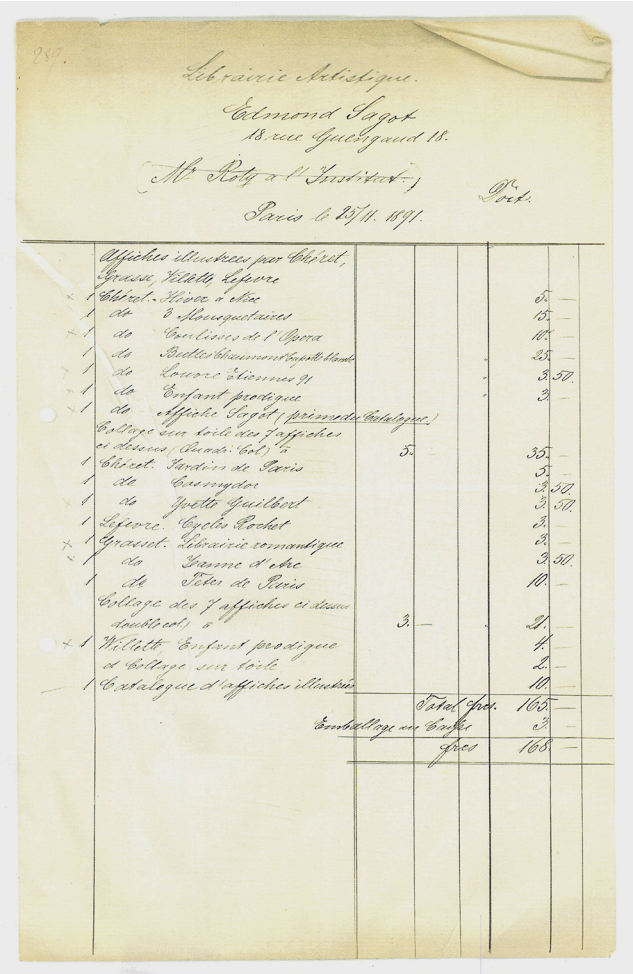


Fig. 5. An 1891 transcript from Designmuseum Danmark outlining the costs to have posters lined with fabric.


COMMERCE
DE L'INDUSTRIE
DE LA MAGISTRATURE ET DE L'ADMINISTRATION
OU
ALMANACH 1,500,000 ADRESSES
DE PARIS, DES DÉPARTEMENTS, DES COLONIES ET DES PAYS ÉTRANGERS
DIDOT-BOTTIN
101E ANNÉE DE LA PUBLICATION
1898
PREMIÈRE PARTIE
PARIS
DÉPARTEMENT DE LA SEINE (ARROND., CANTONS ET COMMUNES)
L'avis de tout changement de domicile pour le DÉPARTEMENT DE LA SEINE doit nous parvenir franc de port avant le 1er SEPTEMBRE.
L'avis de toute rectification pour la PROVINCE doit nous parvenir franc de port avant le 1er OCTOBRE.
Nous accueillerons avec empressement, pour l'édition 1899, tous les renseignements qui nous seront adressés jusqu'aux dates indiquées ci-dessus.
SIÈGE SOCIAL : PARIS, 54, Rue Jacob
RAMBUZ, Directeur d'émaillerie, r. du Temple, 172. PLAQUES en tous genres. LETTRES brevetées s. g. d. g. (S)
REGNARD frères (P. Regnard, succ.). LETTRES MONSTRES en tôle découpé pour enseignes aériennes. Soudge de tous métaux, r. Bayen, 53. TELEPH. 509-83.
BRIGNIER, r. J. J. Rousseau, 20.
Richomme-Deparis, 8 méd. ⊕ ⊕ 1851, 1878 et 1879, 82, 89, 90; fabr. d'enseignes en tôle vernies, écussons, chapeaux, gants, ombrelles, lettres en zinc et en cuivre, r. des Gravilliers, 72.
Rivaux, r. de Buci, 13.
Roy, r. du Cherche-Midi, 108 bis.
Ruelle, r. Mademoiselle, 10.
SARREGUEMINES & DIGOIN (S. et L.), UTZSCHNEIDER & Cie, Tableaux et Enseignes en FAIENCE DÉCORATIVE, r. Paradis, 28.
Sillars, pass. des Panoramas, 36 (Voir Étiquettes à la main).
Sire (Louis), Faub.-du-Temple, 115.
SLOAN (J. G.), enseignes inattaquables en marbrite noire et blanche, r. de la Voûte, 14.
Spinola, boul. Richard-Lenoir, 120.
Tonnelier-Haudoine, boul. Barbès, 32.
TRIER (EUGÈNE), enseignes lumineuses dites LETTRES-PHARES bte s. g. d. g., seul fournisseur des motifs des grands bonbonnés, rue de Château-Landon, 4 et 6. TELEPH. 503-30.
Vallée, rue Rambuteau, 63.
VALLÉE (Charles), MH ⊕ 1879, 1889, 1890, ENSEIGNES et STORES, fabr. de LETTRES EN RELIEF en zinc doré, spécialité d'ÉCUSSONS en tôle vernie au four. DORURE SOUS VERRE, attributs, etc., 12, RUE RÉAUMUR, 12.
Vallet (Jules), r. d'Aboukir, 103.
Vandenbroucque, r. des Lom-
ENTOILAGE DE CARTES ET PLANS
CAILLOL, ancien employé de l'école Polytechnique, gérant de la maison Chevalier, r. Galande, 39.
Cailloi (ancienne maison) (DHARDIVILLIERS succ.), entoilage de plans et cartes géographiques, calques, dessins, etc., quai des Grands-Augustins, 37.
Charpentier, r. N.-D.-des-Champs, 8.
Corlon (ancienne maison) (Ch. GEFFROY gendre et succ.), spécialité d'entoilage et vernissage de plans et cartes géographiques, fournisseur de la ville de Paris, des ministères, chemins de fer, etc., quai des Grands-Augustins, 43 (près le Pont-Neuf).
DENCÈDE (A.), fournisseur des écoles Polytechnique, des Ponts-et-Chaussées, spéciale d'architecture, des Beaux-Arts, des Ministères, de la Préfecture de la Seine, des compagnies de chemin de fer et grandes administrations. Collage, entoilage et vernissage d'aquarelles. Lavis, Cartes géographiques et plans de tous formats, r. de Rennes, 121.
Dhardivilliers (A.), quai des Grands-Augustins, 37.
Dupuis, r. Pierre-Sarrazin, 7.
Forest, r. de Buci, 17.
Iiédouin, r. Percval, 28.
Pigeon (F.), boul. Bonne-Nouvelle, 7 bis.
☞ Wilckes (Jos.), fab. de baguettes métalliques à profils, brev. s. g. d. g., r. de Bondy, 74, cité Riverin, 2 et 4.
ENTOURAGE D'ARBRES (dits CORSETS EN FER)
CHOUZET (P.), fournisseur de la Ville de Paris, USINE A VAPEUR ET BUREAUX, cours de Vincennes, 30, 32, 34.
ENTREPOSITAIRES (Voir aussi WARRANTS)
Bastide (G.) et Cie, r. d'Hauteville, 35.
BRASSERIE DE TANTONVILLE, TOURTEL, rue Albouy, 37

LEFT TO RIGHT

Fig. 6a. Records from the Archives de Paris showing registered businesses for the service of entoilage as early as 1898.

Fig. 6b. Records from the Archives de Paris showing registered businesses for the service of entoilage as early as 1898, detail of entoilage listings.

At the advice of Edmond Sagot, collectors purchasing posters from him were encouraged to have them lined with fabric for the purposes of transport, display, and preservation (Romand, N., 2014). Sagot himself would have had only a few lined posters on hand in his shop for display purposes, posters were typically lined on an as needed basis once purchased by collectors (Romand, N., 2014). It cost between three to five Francs to have the posters lined with fabric as outlined in transcripts from Designmuseum Danmark, formerly the Danish Museum of Decorative Arts (fig. 5). An excerpt from the transcript reads, "collage sur toile des affiches ci dessus", translating to, "line with canvas the above posters". At five Francs each the total is thirty-five Francs for the seven Chéret posters listed at the top.

There is little evidence to suggest that Edmond Sagot himself lined the posters. Investigation into the Edmond Sagot archive at the Institut national d'histoire de l'art (INHA) in Paris revealed early 20th century invoices for the service of entoilage or lining. Further, records from the Archives de Paris show that specific entoilage businesses were registered within Paris as early as 1898 (figs. 6a, 6b). Prior to 1898 it is probable that the poster lining practice was carried out by professionals in related fields such as bookbinders or professionals in the wallpaper industry (Romand, M., 2014).

ANALYSIS AND RESULTS

The original poster linings of the late 19th century were described as a loose, gauze-like fabric called "toile à beurre", translating to "butter or cheese cloth". They were typically composed of cotton and adhered with wheat paste or possibly fish glue (Romand, M., 2014).

Samples of a select group of linings from the Ross R. Scott and Donald R. Muller Collection were analyzed by Kate Helwig, Senior Conservation Scientist at the Canadian Conservation Institute and Dr. Daniel Kirby, Associate Conservation Scientist at the Harvard Art Museums Straus Center for Conservation and Technical Studies. The results of the material analysis were not unexpected. The fiber and adhesive analysis, as seen in table 1, identified all fibers as cotton and adhesives composed of both starch and protein, with traces of ruminant animal fat, paraffin wax, *Pinaceae* resin, gypsum, talc and magnesite.[5] The presence of fish glue was not detected for any of the samples.[6] However, based on personal examination of fabric lined Belle Époque poster collections at Les Arts Decoratifs in Paris, and the Victoria and Albert Museum, it was determined that all of the linings in the Ross R. Scott and Donald R. Muller Collection post-date the earliest "toile à beurre" linings.

CONTEMPORARY PRACTICES

The practice of lining Belle Époque posters with fabric continues today by conservators and private restorers. The Ross R. Scott and Donald R. Muller Collection presents a range of lining types, including conservation and commercial linings. An example of a commercially restored poster within the Ross R. Scott and Donald R. Muller Collection can be seen in figure 7. Contemporary commercial practice often includes first stretching a thick, tightly woven canvas around a stretcher then facing the canvas with cartridge or masa paper. The poster is then adhered to the paper-faced fabric with wheat starch paste and dried under tension. Extensive restorations

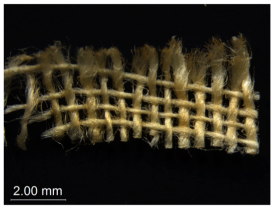
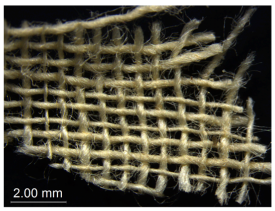
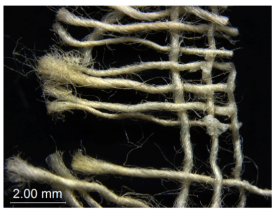
ADHESIVE	FIBRES	SAMPLE
starch protein (collagen type) minor ruminant animal fat trace paraffin wax trace *Pinaceae* resin	vertical: cotton horizontal: cotton	 ©Government of Canada, Canadian Conservation Institute *Babylone d'Allemagne*, Henri de Toulouse-Lautrec, 1894
starch protein (collagen type) gypsum ($CaSO_4 \cdot 2H_2O$) minor ruminant animal fat trace *Pinaceae* resin	vertical: cotton horizontal: cotton	 ©Government of Canada, Canadian Conservation Institute *Le Photograph Sescau*, Henri de Toulouse-Lautrec, 1896
Transparent Material: protein (collagen type) minor ruminant animal fat trace *Pinaceae* resin **White Material:** starch protein talc ($Mg_3Si_4O_{10}(OH)_2$) magnesite ($MgCO_3$)	vertical: cotton horizontal: cotton	 ©Government of Canada, Canadian Conservation Institute *L'Aube*, Henri de Toulouse-Lautrec, 1896

Table 1. The analysis of three poster lining fabrics and adhesives.

including toning, paper in-fills, and in-painting are completed once the poster is dry. Prior to these steps, posters are often separated from older linings or backing boards with aqueous treatments. While this type of commercial practice has been partially informed by concepts used in conservation, it is very difficult to reverse. It remains unclear as to when these more rigid, heavier, fabric linings came into almost universal practice and where the practice and techniques originated.

Unfortunately, condition issues resulting from the inherent vices of the poster papers, unsuitable paste mixtures, and improper framing still remain and require attention, as seen in figure 8. For these reasons seven fabric-lined Lautrec posters were selected as a representative group from the Ross R. Scott and Donald R. Muller Collection to provide experience with variant treatment approaches and methods, as seen in table 2.

Fig. 7. A commercially restored poster from the Ross R. Scott and Donald R. Muller Collection, *Au Pied de l'Echafaud*, Henri de Toulouse-Lautrec, 1893, lithograph on paper, 83.4 x 61cm, Collection of the Art Gallery of Ontario, 2010/92.

Fig. 8. A poster with visible distortion due to improper framing, *Babylone d'Allemagne*, Henri de Toulouse-Lautrec, 1894, lithograph on paper, 125.5 x 89cm, Collection of the Art Gallery of Ontario, 2010/93.

POSTER	LINING TYPE	CONDITION ISSUES
Le Pendu (1892)	Tightly woven, impregnated fabric	Planar distortions, overall discoloration, restored
Aristide Bruant (1893)	Loosely woven fabric	Planar distortions, discoloration, possibly exposure to moisture
La Vache Enragée (1893)	Tightly woven fabric	Adhesive residues and staining, restored
Au Pied de l'Echafaud (1893)	Tightly woven fabric	Adhesive residues, restored
Babylone d'Allemagne (1894)	Loosely woven fabric	Planar distortions, cockling, delaminating from fabric lining
Le Photographe Sescau (1896)	Loosely woven fabric	Surface grime, planar distortions, losses along bottom edge, lining wrapped around recto edges
L'Aube (1896)	Loosely woven fabric	Planar distortions, overall discoloration

Table 2. Fabric-lined Henri de Toulouse-Lautrec posters from the Ross R. Scott and Donald R. Muller Collection

Fig. 9. Jeff Peachey's Carbon Fiber Lifter used to remove a fabric lining from a poster.

Fig. 10. The thread-by-thread fabric lining removal process.

TREATMENT

Condition reports, dry cleaning and aqueous solubility tests were completed. Of the seven posters, three had previously undergone extensive restoration, *Le Pendu* (1892), *La Vache Enragée* (1893), and *Au Pied de l'Echafaud* (1893); it was decided that for these three posters further treatments, apart from dry cleaning, would not improve their appearance. For the remaining four posters, *Aristide Bruant* (1893), *Babylone d'Allemagne* (1894), *Le Photographe Sescau* (1896), and *L'Aube* (1896), although previously believed to be stable, various inks demonstrated sensitivity to repeated aqueous spot tests. The red inks of Belle Époque posters can be particularly sensitive and have a propensity to bleed through to the verso of the poster when lining (Catcher, 2014). For this reason it was determined that, where possible, mechanical removal of unstable linings would be fitting.

Linings were mechanically removed using two methods, the first with the use of a flat *Carbon Fiber Lifter* designed by Jeff Peachey (fig. 9). The *Carbon Fiber Lifter*[7] worked very well on poster linings with a noticeably dry and brittle adhesive layer. The second method of lining removal involved removing the lining thread-by-thread (fig. 10). This method was used for posters where the *Carbon Fiber Lifter* could not successfully get between the adhesive layer and the lining. For a 2 x 3 ft. poster, the thread-by-thread method was completed in approximately two full working days. Remaining adhesive residues on the versos of the posters were removed to the extent possible first mechanically, and second with the use of a methylcellulose poultice. For posters with media sensitivity these two lining removal techniques proved effective.

Often the condition issues present when examining fabric lined Belle Époque posters are not caused by the fabric linings themselves, but the result of close-framing, exposure to humid environments or loss of adhesion due to the embrittlement of pastes. If fabric linings were widely used in the late 19th century and provided adequate support to prolong the life of so many Belle Époque posters, could fabric linings continue to be used today in conservation practice?

To determine if the use of fabric linings could be a viable conservation treatment for Belle Époque posters two fabrics, one natural in color and one white, were sourced from France for their potential use as lining materials.[8] Referred to as "étamine", the fabrics are often used in a culinary setting, and, with a looser weave, they are similar to both the original "toile à beurre" linings previously mentioned as well as older linings examined at the Victoria and Albert Museum. Both fabrics were tested for their suitability as conservation materials by the Canadian Conservation Institute, and both fabrics demonstrated stability with a neutral pH and cotton composition, as seen in table 3.[9]

Newsprint mock-ups were created using each of the French fabrics and wheat starch paste to see how the fabrics would interact with paper of similar age and condition to the posters (fig. 11). While the process of creating the mock-ups was informative and demonstrated that the fabrics can be used to line posters, the process also brought forth more points for discussion. The fabric linings do create a different type of object, similar to a wall hanging or a piece that can be wrapped around a tertiary support, these are factors that must be considered when determining future display, or future display can inform the relining process. If the poster is likely to be matted and framed a Japanese paper lining might be more suitable as it is thinner. For these reasons it makes sense that Belle Époque posters were originally lined with fabric supports, as it is unlikely that early collectors had the posters matted and framed, as Fénéon illustrated when describing the ideal form of display, pinning posters to the walls of one's apartment.

The relining of posters within the Ross R. Scott and Donald R. Muller Collection is an on-going process. As each poster is unique and presents varying challenges, determining a suitable relining material will continue to be done on an individual basis. To provide a sampling, the results of two lining removal and relining treatments from the Ross R. Scott and Donald R. Muller Collection can be found in the

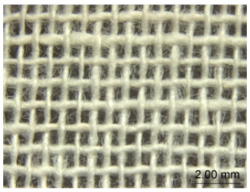
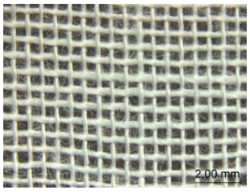
ELEMENTS	pH	SAMPLE
major: carbon minor: oxygen **Results:** cotton trace tallow fatty acids	vertical: cotton horizontal: cotton	 ©Government of Canada, Canadian Conservation Institute Natural Étamine
major: carbon minor: oxygen **Results:** cotton trace tallow fatty acids	vertical: cotton horizontal: cotton	 ©Government of Canada, Canadian Conservation Institute White Étamine

Table 3. The analysis of two fabrics (étamine) considered for use as poster lining materials.

Fig. 11. Newsprint mock-up using wheat starch paste and white étamine

Appendix. The relining treatment for *Le Photographe Sescau* (1896) was completed using Japanese paper, and the relining treatment for *L'Aube* was completed using "étamine". Equivalent techniques, outlined in the Appendix, were used to line both posters. Due to time constraints, and the postponement of a major exhibition to showcase the Ross R. Scott and Donald R. Muller Collection, only *Le Photographe Sescau* (1896) and *L'Aube* (1896) were conserved using these methods. The two remaining posters to be treated, *Aristide Bruant* (1893) and *Babylone d'Allemagne* (1894) are stable and will undergo further conservation treatments as time permits.

STORAGE

It is often difficult to find workable storage solutions for larger poster collections due to both the volume and oversized nature of many artworks. The popularity of Belle Époque posters requires that storage solutions provide long-term stability, ease of access, and a low storage footprint. In collaboration with Art Gallery of Ontario Collections Care Specialists, large, custom, Mylar© L-sleeves were created to house all posters in Ross R. Scott and Donald R. Muller Collection prior to storing them in large map cabinets or enclosed trays. The custom Mylar© enclosures can also easily be clipped to rigid boards for temporary display, such as for curatorial talks or behind the scenes tours.

Fig. 12. *The Wrinkles of a City, La Havana, Leda Antonia Machado, Cuba*, JR, 2012, wheatpasted print, unknown dimensions.

CONCLUSIONS

The search for more information regarding the history and practice of lining Belle Époque posters with fabric revealed a fascinating narrative including affiicheurs, poster dealers, clandestine purchases, and entoilage businesses. Over time the practice of lining Belle Époque posters with fabric has changed significantly. The evolution of both conservation and commercial practices has produced a range of varied lining methods and materials. Although diverse, the use of fabric linings to support Belle Époque posters has aided tremendously in their ability to outlast other ephemera of the late 19th century. "Étamine" can be added to the list of viable relining materials for use in the conservation of Belle Époque posters.

While the practice of lining Belle Époque posters has changed over the last century, the occasion for artists to exhibit their artwork globally as an international phenomenon on city streets has become commonplace. Contemporary street art in the form of wheatpasting is thriving as a direct descendant of the poster revolution. Artists continue to share their artwork with the masses, and on an even larger scale, such as the artwork of French artist JR (fig. 12). Either overnight, or occasionally taking days for larger projects, wheatpasting artists continue the tradition of using conventional spaces to encourage unconventional social dialogue. But, who is collecting their work, and what will it look like a hundred years into the future?

ACKNOWLEDGMENTS

We would like to thank the Samuel H. Kress Foundation for funding this fellowship and research. We would also like to thank the Art Gallery of Ontario Conservation Department, for their support and guidance throughout the fellowship and beyond. Special thanks to Nicolas and Mireille Romand, Dalila Druesne, Susan Catcher, Christina Collet Hvolgaard, and the many archivists and curators at institutions in France who were very gracious with their time; as well as Kate Helwig and Dr. Daniel Kirby for their scientific research and analysis." This represents only a few minor changes in the text of the acknowledgement, but it seemed easier to copy out the whole section than mark up the document.

APPENDIX

2010/100—*Le Photograph Sescau*The poster depicts a woman cloaked in red, wearing a half-mask and carrying a lorgnette and fan. She is being photographed by Paul Sescau, who is only visible by his checkered pant legs. There is also a small drawing in the top right corner of a girl and a pig. The poster has been printed in five colors, black, dark blue, red, yellow and olive green.

ARTIST
Henri de Toulouse-Lautrec

DIMENSIONS
62cm x 80cm

TECHNIQUE
Lithograph

SIGNATURE
In the printed image, HTL elephant monogram

SUPPORT TYPE
Wove paper

PRINTER
None

SUPPORT FIBRE TYPE
Wood

INSCRIPTIONS
Stamp, recto, red ink, HTL circular monogram

SECONDARY SUPPORT
Loosely woven textile support, cotton

PREVIOUS TREATMENT
No visible previous treatment

SUPPORT CONDITION
An overall color shift is visible, as seen in the exposed area beneath the overlapping lining in the bottom right corner. There is a heavier deposit of surface grime along the right side of the paper sheet. Significant planar distortions and creases are present, as well as numerous image and support losses along the bottom edge. A few small tears are also visible along

LEFT TO RIGHT
Fig. 13a. Before treatment. *Le Photograph Sescau*, Henri de Toulouse-Lautrec, 1896, lithograph on paper, 62.5 x 80cm, Collection of the Art Gallery of Ontario, 2010/100.

Fig. 13b. After treatment.

the left and top edges. There is a small area of surface damage present in the "e" of "Pigalle" and there are also small biological accretions present throughout the paper sheet.

IMAGE CONDITION
The media appears to be stable, the ink rests nicely on the paper sheet and has an even tone of application. See Testing below.

TESTING
The media was tested for solubility with distilled water and all colors exhibited some sensitivity to moisture at the surface, especially red, yellow and dark blue. The area of surface grime along the right side of the paper sheet responded well to a dry surface cleaning test. The secondary support may undergo fiber analysis to determine the fiber type.

SECONDARY SUPPORT CONDITION
The secondary support is unstable and aiding planar distortions, with the left and right edges of the lining folding over and adhered to the recto of the work. The secondary support is very noticeably torn and frayed along the bottom edge. The adhesive binding the secondary support to the paper sheet is quite dry and the adhesion is not very strong.

PROPOSED TREATMENT
Overall dry surface cleaning, possible consolidation along the bottom edge, mechanical or aqueous removal of secondary support depending on the results of further testing, adherence of new secondary support (to be determined), appropriate drying, assess any losses for fill and/or toning requirements, especially along the bottom edge.

TREATMENT
The poster underwent dry surface cleaning, visibly reducing surface grime particularly along the right edge. The fabric lining was removed using the Carbon Fiber Lifter. The remaining adhesive residue was removed using a methylcellulose poultice and spatula.

The poster was humidified in a humidification chamber and then lined with Tosa Ushi Japanese paper and wheat starch paste. Paste was first applied to the lining paper using a Japanese brush, the humidified poster was then placed on the pasted lining paper. With a Mylar© sheet on the recto the poster was then smoothed out from the center using light hand pressure. Using this method the red inks on the recto did not bleed through to the verso of the poster. The lined poster was placed between Hollytex and blotters in a blotter stack to dry. Final decisions regarding the toning of losses along the bottom edge are pending as well as the possibility of relining the poster again with a thicker Japanese paper. Before and after treatment images can be seen in figures 13a and 13b.

2010/101— *L'Aube*
This poster was produced for *L'Aube*, a journal at the time; it depicts a man in a wagon being pulled by a horse and women following behind them. It has been printed in two colors, dark blue and a green-blue background.

ARTIST
Henri de Toulouse-Lautrec

DIMENSIONS
60.8cm x 79.1cm

TECHNIQUE
Lithography

SIGNATURE
In the printed image, HTL elephant monogram

SUPPORT TYPE
Wove paper

PRINTER
None

SUPPORT FIBRE TYPE
Wood

INSCRIPTIONS
Verso, bottom right corner, "16" or "76", and along top edge, under the lining there is an unknown inscription

SECONDARY SUPPORT
Loosely woven textile support, cotton

PREVIOUS TREATMENT
No visible previous treatment

SUPPORT CONDITION
There is a minor overall color shift visible, as well as many small yellow-brown spot stains throughout the paper sheet, possibly due to an unidentified paste mixture. There is significant planar distortion present (exposure to moisture? from lining?) and an overall crinkly feel to the poster. There is some surface grime present.

IMAGE CONDITION
The media appear stable, the ink rests with a slight three dimensional quality on the paper sheet and has an even tone of application.

TESTING
The media was tested for solubility with distilled water, both colors exhibited some sensitivity to moisture, see attached media card. The work also responded well to a dry surface cleaning test, however, some surface media may transfer; a gentle dry surface cleaning with a soft brush is recommended. The secondary support may undergo fiber analysis to determine the fiber type.

SECONDARY SUPPORT CONDITION
The secondary support is unstable and aiding planar distortions. There are slubs present and the small yellow-brown spot stains mentioned above are also visible on the secondary support. The adhesive binding the secondary support to the poster is quite dry and the adhesion is not very strong. Hinges are attached to the lining on the verso of the work, as well as a paper remnant in the top right corner.

PROPOSED TREATMENT
Overall dry surface cleaning, mechanical or aqueous removal of secondary support depending on the results of further testing, adherence of new secondary support (to be determined), appropriate drying, assess any losses for fill and/or toning requirements.

TREATMENT
The poster underwent dry surface cleaning using a soft brush. The fabric lining was removed using the thread-by-thread method. The lining removal revealed a collector's inscription located at the middle of the top edge, adjacent to a central fold, the inscription reads "Lautrec L'Aube".

A methylcellulose poultice and spatula were used to remove the residual adhesive from the verso, as a cautionary note, the support unexpectedly became very reactive to this process. The support would temporarily appear as though the residual adhesive had been removed, however, on drying, the treated area would crinkle, and had a tendency to split along creases (fig. 14b)[10]. Also, after removing the residual adhesive a pasting pattern became clearly discernable. The pasting pattern could have been caused by the application of the previous lining or the adherence of the poster to a wall. Visually, there appeared to be two different types of paste on the verso of the poster, the adhesive was removed to the extent possible before relining the poster.

The poster was humidified in a chamber and then lined with natural color étamine and wheat starch paste. Paste was first applied to the fabric lining using a Japanese brush. After removing the poster from the humidity chamber a dahlia sprayer was sparingly used on the verso of the poster to ensure it did not dry out and return to its previously distorted state. The poster was then placed on the pasted lining fabric. With a Mylar© sheet on the recto, the poster was smoothed out from the center using light hand pressure. The lined poster was dried under tension on an acrylic sheet with weights along the edges of the lining to hold tension. Before, during, and after treatment images can be seen in figures 14a, 14b, 14c, and 14d.

NOTES

1. The law still remains in effect today, for further information visit www.france.fr/en/institutions-and-values/freedom-press-fundamental-legal-cornerstones.html
2. See Phillip Dennis Cate, *The Color Revolution*, 1978, 10.
3. See Jane Abdy, *The French Poster: Chéret to Cappiello*, London, 1969, 21.
4. Translated by Christine Fillion, Conservator of Paintings, Art Gallery of Ontario
5. Analysis was completed using Fourier transform infrared spectroscopy (FTIR), pyrolysis-gas chromatography-mass spectrometry (Py-GC-MS) and polarized light microscopy (PLM).
6. Analysis was completed using Peptide mass fingerprinting (PMF).
7. Designed to slide between and separate materials, visit www.jeffpeachey.com
8. The fabrics were sourced from Marché Saint-Pierre, 2 Rue Charles Nodier, 75018 Paris, France
9. Analysis was completed using scanning electron microscopy/energy dispersive spectrometry (SEM/EDS), Fourier transform infrared spectroscopy (FTIR), pyrolysis-gas chromatography-mass spectrometry (Py-GC-MS) and polarized light microscopy (PLM).
10. A similar result can be seen in the during treatment images provided by Ingelise Nielsen in *The Conservation of Toulouse-Lautrec Posters.*

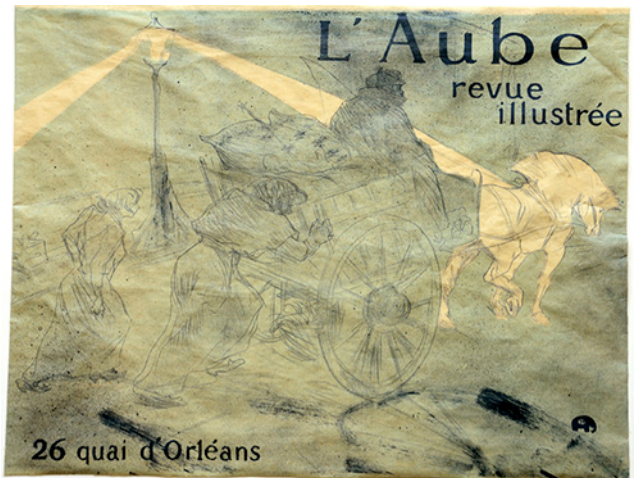


Fig. 14a. Before treatment. *L'Aube*, Henri de Toulouse-Lautrec, 1896, lithograph on paper, 60.9 x 41cm, Collection of the Art Gallery of Ontario, 2010/101

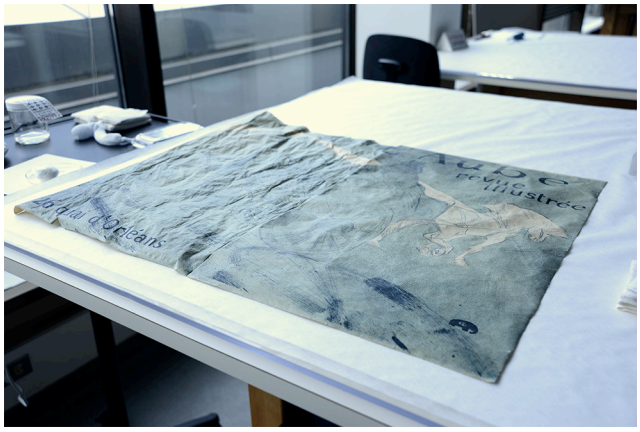


Fig. 14b. During treatment, recto; methylcellulose poultice has been used on the verso of the left side to remove residual adhesive, on drying the poster crinkled significantly. *L'Aube*, Henri de Toulouse-Lautrec, 1896, lithograph on paper, 60.9 x 41cm, Collection of the Art Gallery of Ontario, 2010/101

Fig. 14c. During treatment, detail of verso showing pasting pattern. *L'Aube*, Henri de Toulouse-Lautrec, 1896, lithograph on paper, 60.9 x 41cm, Collection of the Art Gallery of Ontario, 2010/101

Fig. 14d. After treatment. *L'Aube*, Henri de Toulouse-Lautrec, 1896, lithograph on paper, 60.9 x 41cm, Collection of the Art Gallery of Ontario, 2010/101

REFERENCES

Abdy, Jane. 1969. *The French Poster*: *Chéret to Cappiello*. London: Studio Vista.

Alexander, Arsène. 1895. *The Modern Poster*. New York: C. Scribners sons.

Au Pied de l'Echafaud. Henri de Toulouse-Lautrec, 1893, lithograph on paper, 83.4 x 61cm, Collection of the Art Gallery of Ontario. Gift of the Ross R. Scott and Donald R. Muller Collection, 2010/92.

Babylone d'Allemagne, Henri de Toulouse-Lautrec, 1894, lithograph on paper, 125.5 x 89cm, Collection of the Art Gallery of Ontario. Gift of the Ross R. Scott and Donald R. Muller Collection, 2010/93.

Bargièl, Réjane. 2014. Personal communication. Les Arts Décoratifs, Paris, France.

Bottin du Commerce, 1898. Archives de Paris. 2mi3/119.

Catcher, Susan. 2014. Personal communication. Victoria and Albert Museum, London, UK.

Cate, P. D. 1978. *The color revolution: color lithography in France, 1890-1900.* Santa Barbara: P. Smith.

Cate, P.D. 1985. *The Popularization of Lautrec*. In *Henri de Toulouse-Lautrec. Images of the 1890s, Catalogue of the exhibition held at the Museum of Modern Art, New York*. Edited by Riva Castleman and Wolfgang Wittrock. (90).

Ed. Sagot Estampes Modernes, Alexandre Lunois, 1894, lithograph on paper, 20.6 x 29.8cm. http://collection.imamuseum.org/artwork/70848/index.html (04/30/15).

Helwig, Kate and Jennifer Poulin. 2014. *Analysis of Four Belle Époque Poster Linings for Art Gallery of Ontario, Toronto, Ontario.* Canadian Conservation Institute.

Moffatt, Elizabeth, Season Tse and Jennifer Poulin. 2014. *Analysis of Two Fabrics Considered for Use as Poster Lining*

Materials for Art Gallery of Ontario, Toronto, Ontario. Canadian Conservation Institute.

Nielsen, Ingelise. 1992. "The conservation of 41 Toulouse-Lautrec posters." Paper presented at the Institute of Paper Conservation Conference, Manchester, UK.

Nielsen, Ingelise. 1995. "The Conservation of Toulouse-Lautrec Posters." In *Toulouse-Lautrec posters: the collection of the Danish Museum of Decorative Art/ Mirjam Gelfer-JØrgensen; with contributions by Ingelise Nielsen, Marianne Ertberg, and Vibeke Holten Lange*, 101–115. Copenhagen.

Romand, Mireille. 2014. Personal communication. Galerie Documents, Paris, France.

Romand, Nicolas. 2014. Personal communication. Galerie Sagot-Le Garrec, Paris, France.

Sagot, Edmond. 1891. *Billing the costs to have posters of various sizes mounted on cloth*. Unpublished letter/invoice. Designmuseum Danmark, Denmark.

Edmond Sagot Archive. *Tarif des Entoilage sans bordure*. Institut National d'histoire de l'art, Paris, France.

Weill, Alain. 1985. *The poster: a worldwide survey and history.* Boston: G.K. Hall

TESSA THOMAS
Samuel H. Kress Fellow in Paper Conservation
Art Gallery of Ontario
Toronto, Ontario, Canada
tessa.thomas@rogers.com

JOAN WEIR
Conservator Works on Paper
Art Gallery of Ontario
Toronto, Ontario, Canada
Joan_Weir@ago.net

HSIN-CHEN TSAI

To Do or Not To Do: Two Examples of Decision Making for Digital Infilling on Asian Format Mounting

ABSTRACT

Mountings play an important role in the support and display of East Asian pictorial art, whether on silk or paper. They often reflect the work's era, genre and aesthetic. Many mountings that we see today may have been changed several times in the past, and as a result, can be viewed as having lost integrity in relationship to the work of art. Also, the physical condition of mountings can be so poor that they no longer function properly in their role as a support. When undertaking the treatment of East Asian artworks with a mounting, conservator and curator alike should take these two factors, physical condition and authentic information, into account in order to determine an appropriate course of action.

This paper presents two examples of East Asian artworks having original mountings in poor condition. The pair of folding screens, *The Deities of the Tanni-sho*, by Munakata Shiko (Japanese, 1903–1975) and the hanging scroll, *Standing Courtesan*, by Keisai Eisen (Japanese, 1790–1848) from the Museum of Fine Arts, Boston's collections are both Japanese prints with Asian format mountings. Taking into consideration historical background, condition, and material characteristics of the mounting papers, this article presents decision making regarding digital infilling and two different approaches used to achieve satisfactory results for loss compensation.

INTRODUCTION: THE MOUNTING OF EAST ASIAN ARTWORKS

East Asian artworks usually are mounted into different formats: hanging scroll, hand scroll, folding screen, panel, album leaf, etc. These mountings function as a means of support, display and storage. In addition, the selection of colors, patterns and style of mounting lends another aspect to the artworks and how it will appear to the viewer. For example, the colors of a mounting might compliment the artwork's palette, or the patterns might relate to the artwork's subject. Traditionally, East Asian format mountings are often changed or replaced by mounters when the condition of a mounting is no longer able to support the artwork or at the whim of the owner. Many mountings seen today may have been changed several times, and some may not present the proper style or aesthetic in relationship to the work of art.

Today, when contemplating the treatment of East Asian pictorial works, two important factors that conservators and curators have to consider are physical condition of the mounting and the information carried on the mounting. At first, conservators examine the condition of the mounting, and judge if it's able to function as intended to support, display or properly store the artwork. Once evaluated, the conservator and curator should have a discussion about the mounting and its context to the work of art. Several questions might arise:

- Is the mounting original/ Has this mounting been changed?
- Are there important marks (seals, inscriptions, etcetera) on the mounting that should be retained and or documented?
- Is the style and aesthetic of the mounting appropriate for the work of art?
- Can the current mounting be retained, or if needs to be replaced, should the mounting be in the same style, or changed to a more appropriate one?

Table 1 shows the relationship between two major factors in determining whether to replace or retain a mounting. The pair of folding screens, *The Deities of the Tanni-sho* (figs. 1a, 1b), by Munakata Shiko (Japanese, 1903–1975) and the hanging scroll, *Standing Courtesan* (fig. 2), by Keisai Eisen are both from Museum of Fine Arts, Boston's collection and belong to the situation III category. For the situation III, course of action should be straight forward since the mounting may be original or there are important marks on the mounting. For these reasons, the mounting should be kept and treated like an artwork. The history background of these two examples, are described as following section.

Presented at the Book and Paper Group Session, AIC's 43rd Annual Meeting, May 13–16, 2015, Miami, Florida

	Information - ⟶	Information +
Condition + ↓ Condition -	I. Condition is good. The information carried on the mounting is important and original.	II. Condition is good. The mounting is not original, is not carrying the right information
	III. Condition is poor. The information carried on the mounting is important and original.	IV. Condition is poor. The information that was carried is not much then the just color, or style, which can be reproduced.

Table 1. Mounting elevation table

LEFT TO RIGHT

Fig. 1a. Munakata Shiko, *The Deities of the Tanni-sho*, the right screen, ca. 1950, woodblock prints mounted on one of a pair of six-panel folding screens, ink on paper, 115.6 x 257.2 cm, Anonymous gift in memory of Blanchette and John D. Rockefeller III, Museum of Fine Arts, Boston, 2001.180.1

Fig. 1b. The left screen

Fig. 2. Keisai Eisen, *Standing Courtesan*, ca. 1830, woodblock print; color on paper, 76 x 25 cm, William Sturgis Bigelow Collection, Museum of Fine Arts, Boston, 11.28587.

WHY TO RETAIN THE MOUNTING MATERIALS FOR THESE TWO CASES

For *The Deities of the Tanni-sho* by Munakata Shiko, Munakata Shiko is a 20th century important artist, and was active in the Folk Art Movement (*Mingei*) developed and founded by Yanagi Soetsu (1889–1961). The Folk Art Movement focused on "hand-crafted art by ordinary people" including ceramics, lacquer, textiles, and woodwork. Yanagi wanted people to review the traditional Japanese beauty in everyday craft. Fold-dyed paper (*Orizomegami*) is one of these crafts, usually used on book covers, commonly seen in people's daily life.

Tang Chinese paper (*karagami*) with bird patterns is the most prevalent decorative paper used on the back of Japanese folding screens. However, the decorative papers on the back of Munakata's screens are typical Folk Art Movement style fold-dyed papers. In addition, Munakata Shiko, dedicated these screens to the founder of the Folk Art Movement, Yanagi Soetsu, with an inscription located on the labels at the back of the screens (fig. 3). The presence of these inscriptions is indicative of the strong connection between the artist and the Folk Art Movement during its period. Therefore, these fold-dyed papers had to be kept and treated as part of the artworks.

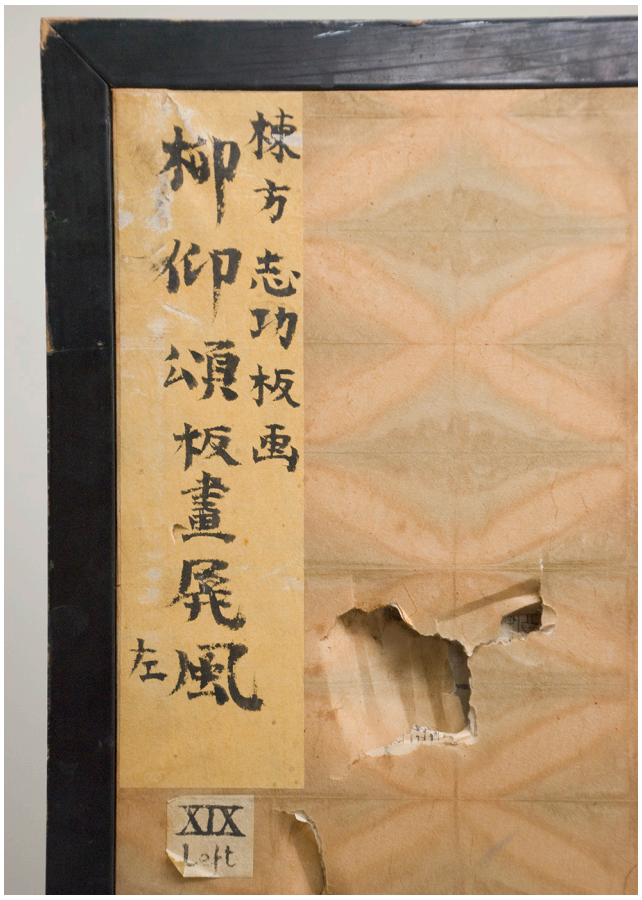


Fig. 3. The inscription on the label at the back of left screen.

Concerning *Standing Courtesan* by Keisai Eisen, MFA has one of the largest of Japanese color woodblock print collections, numbering over 50,000 works, outside of Japan. The majority are Edo period (1615–1868) color woodblock prints known as "Pictures of the Floating World" or *Ukiyo-e.* A number of prints retain materials or exhibit conditions that indicate that they were likely mounted as hanging scrolls. Figure 4 shows triptych prints by Kitagawa Utamaro (Japanese, ?–1806) that present scenes of a print shop at Edo period. (fig. 4) Some pillar prints with mountings displayed as hanging scrolls are seen at the back of the shop. Since *Ukiyo-e* prints were mass produced works of art intended for Tokyo's burgeoning middle class, their mountings were fabricated from inexpensive materials such as decorative papers, bamboo dowels and staves as seen on these Utamaro's prints. One such print, *Standing Courtesan* is an example from the MFA's collection that still retains most elements of its original format. Likely mounted prior to sale by the shop where it was purchased, this print was mounted with Japanese paste papers, decorative strips (*ichimonji* and *suji*), a single backing and thin bamboo dowel and stave, in a manner similar to those depicted by Utamaro.

Several conditions seen on this print likely occurred due to its function as a hanging scroll and the type of materials that were used. Crude overlaps located at the joints between inconsistent thicknesses of mounting components and the mechanical action of rolling and un-rolling around a thin dowel resulted in structural damages. Exposure to light, pollutants, and insects resulted in overall soiling, discoloration and localized flyspecks. Although this format might have

Fig. 4. Kitagawa Utamaro, *Woodblock Printer; Print Shop; Distributing New Prints*, ca.1803, woodblock print; ink and color on paper, 38 x 75.6 cm, William Sturgis Bigelow Collection, Museum of Fine Arts, Boston, triptych: 11.14539 (left), 11.14540 (center), 11.14541 (right).

Fig. 5. Before treatment: punctures and large losses are seen in the fold-dyed paper before treatment.

affected the preservation of the print, few prints have survived relative to the quantity printed, and of those, even fewer have survived with their decorative mountings intact. In order to conserve this print with its proper historical format intact, a treatment had to be designed to improve both the aesthetic and condition of the print and it's mounting.

COMPENSATION FOR THE LOSSES TO THE MOUNTING

In the case of Munakata Shiko's folding screens, different compensation techniques were considered. Firstly, the most common technique is infilling with toned paper, but the two colors used on the fold-dyed papers (fig. 5), green and brown, have a strong contrast and would be difficult to integrate into the original with a single tone and would also disrupt the repeating patterns on the fold-dyed papers. Hand-painting the pattern on a toned paper for infilling was considered as well. However, this technique would be time-consuming and might not achieve the best result. The result of reproducing fold-dyed papers also was not satisfactory (fig. 6). Compelling reasons for compensating losses to the fold-dyed paper of

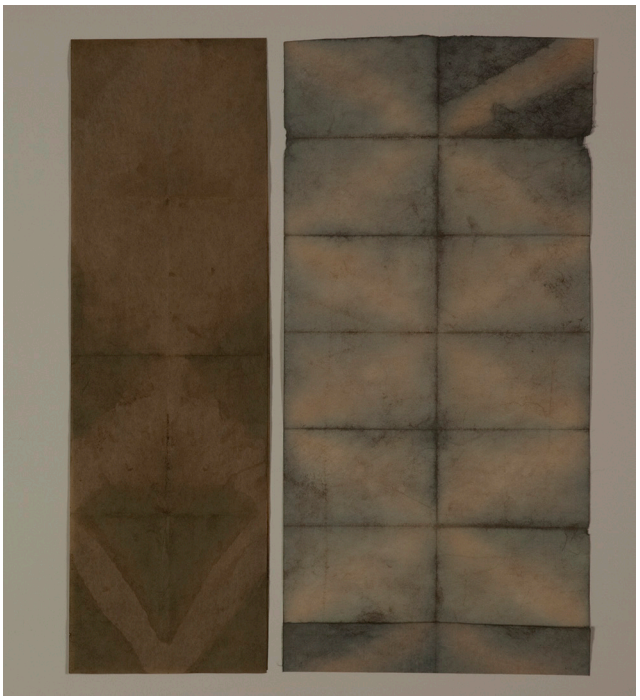


Fig. 6. The fold-dyed paper made by author. The tones are uneven and not matching to the original fold-dyed papers on the Munakata's screens.

Munakata Shiko's folding screens with digital infills were determined. They were:

1. The digital reproduction has enough reference from the original. The image of patterns could be captured from undamaged areas of fold-dyed papers by photography.
2. The losses to the fold-dyed papers are located on the folding screen's reverse. The fold-dyed papers present a style of craft-art but not the fine art created by the artist. Reproducing partial patterns would not change the context and character of these fold-dyed papers.
3. A digital reproduction would be less time-consuming and would result in the most visually satisfactory infill than the other possibilities, such as using basic toned infills, reproducing fold-dyed paper using traditional techniques for infills and hand painted infills.
4. The digital infills are printed in a lighter tone than the original, so it would be clearly visible at close viewing. The authenticity of the original would still be distinguishable from the repairs.

In the case of Eisen's mounting, the blue paste paper is also patterned. Digital infilling was also considered. After capturing the patterns from an area of the mounting free of damages, it proved difficult to find a repeat that matched the area of the loss located at the upper portion of the mounting. Although the pattern on the blue paste paper seems repetitive,

Fig. 7. The blue paste paper (top) and the digital printing (bottom). The circles indicate the location of major flower patterns. The patterns appear arranged randomly and irregularly.

Fig. 8. *Uda* paper was sized with alum gelatin solution (3% gelatin and 0.5% alum) using 1–2 brushed applications.

Fig. 9. A mixture of indigo (from the colorant stick) and paste was applied on the sized paper.

under careful examination, a repeat was not found and its pattern was revealed to be random (fig. 7). The reason for that might be the patterns were made from wood block that were cut free hand. Therefore, the digital infilling was not undertaken because of integrity issue.

Toned paper infills samples were made in order to evaluate their potential to integrate with the original surround. However, the samples did not blend well into the surrounding paper because of the absence of pattern and texture. Upon closer examination, the tone of the original paste paper displayed tones varying from lighter paper tone to dark blue and these uneven, tiny dots caused the paper to get a grainy texture. A review of the process for making paste paper in Japan revealed that one of the steps in the processes is sizing the Japanese paper using alum gelatin solution. This step likely gives the paste paper its grainy texture. Therefore, the papers to be used for filling were sized with an alum gelatin solution (3% gelatin and 0.5% alum) using 1–2 brushed applications (fig. 8). After drying, a mixture of indigo pigment and paste was applied in the manner of traditional Japanese paste paper technique to the sized paper (fig. 9). This method successfully approximated the texture and tone of the original surrounding paper even though it was not patterned. The decision for loss compensation was made.

TREATMENTS

The treatment for these two cases are described below:

MUNAKATA SHIKO'S FOLDING SCREENS:

After completing examination, writing the condition report and treatment proposal, the folding screens were photographed before and after treatment to further document their condition. Wooden trims were disassembled; each panel was separated and the fold-dyed papers were removed from the panels. The papers attached to the back of the fold-dyed papers were removed using Gore-Tex humidification to aid their release. This was followed by pressing them between Reemay, blotting paper and thick Plexiglas.

Of the twelve fold-dyed papers, three had considerable losses and required large digital infills. Since the fold-dyed papers were going to be pasted onto new under cores, the infilling papers had to be close to or slightly thinner thickness than the original fold-dyed papers, so they would have similar expansion and shrinkage during mounting. Japanese handmade *Sekishu* paper was chosen for printing the image onto for infilling. The image was taken from an area of fold-dyed paper with fair condition and a clear pattern. Photoshop® was used for adjusting the image by Color Balance and Brightness/Contrast functions. Several trials were carried out for comparing the color of the reproduction to the original. An Epson Stylus Pro 4900 printer was used for printing and the ink was tested and shown to have great light resistance ('Epson Stylus Pro4900-Print', 2010). Trials showed that there was no migration of ink after the lining treatment. In addition, the trials passed the Oddy Test carried out by the preventive conservation specialist at the MFA.

Unfortunately, the *Sekishu* paper was not compatible with the printer. After discussing this with the photography/printing expert, we found the irregular surface and the

Fig. 10. The lined *Sekishu* paper was accepted by the printer and was able to receive the required image successfully.

Fig. 12. The digital in-fills were positioned to match the patterns and the losses were traced roughly with pencil marks in transmitted light.

Fig. 11. The sizing application was undertaken for fixing the fibers on the digital in-fills.

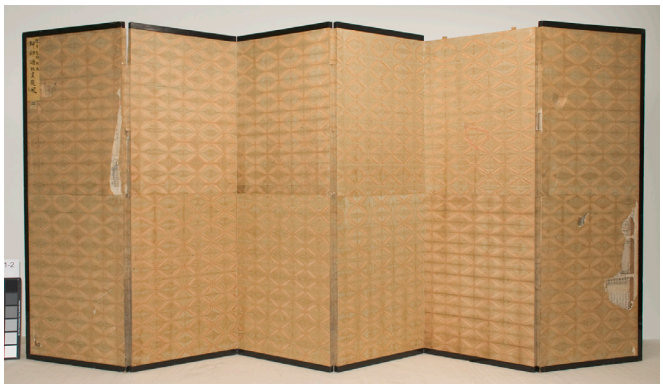
Fig. 13. After lining, flattened fold-dyed papers on the drying board.

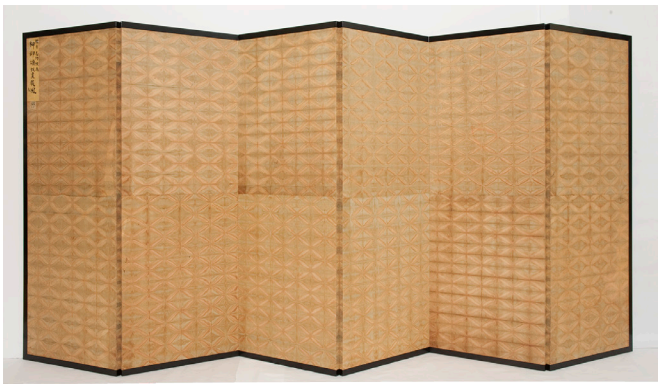
thinness of the *Sekishu* paper might cause the paper to jam in the printer. Therefore, one layer of a temporary lining was added to the back of the *Sekishu* paper so it could be properly printed. The lined *Sekishu* paper was accepted by the printer and was able to receive the required image successfully (fig. 10). A coating was not necessary in this case, because the patterns on the fold-dyed papers are irregular and slightly blurred in character.

After printing the digital infills, sizing was applied on the surface and the temporary lining was removed. The sizing application was necessary for the digital infills since the printing actually only stayed on the surface of the fibers and could be lost or diminished if fibers lifted or were abraded through handling (fig. 11). Sizing also aided the application of toned washes with Japanese colorant sticks. Digital infills were toned to slightly different levels to blend into individual panels although; they could be easily distinguished at a close viewing distance once filled. Before infilling, the digital infills were positioned to match the patterns and the losses were traced roughly with pencil marks in transmitted light (fig. 12). This helped to find the position right away after wetting the fold-dyed papers.

For protection, the fold-dyed papers were humidified overall using a sprayer and placed on the top of Rayon paper. Once moist, they were brushed out from the center to reduce creases and to realign tears. The digital infills were set into place with a slight overlap using wheat starch paste. One layer of lining was added and then paper strips were pasted into place for reinforcing tears and supporting the reverse of severe creases. Finally, the lined fold-dyed papers were flattened on the drying board to prepare them for placement back onto the folding screens (fig. 13).

Besides compensating large losses, digital printings were also used for the covers of the hinges. Since they were dirty





LEFT TO RIGHT

Fig. 14a. Before treatment: the reverse of left screen overall.

Fig. 14b. After treatment: The reverse of left screen overall. The large losses located at the first (the far left) and sixth panels (the far right) have been filled with digital in-fills, and hinges covers have been replaced with digital printing as well.

LEFT TO RIGHT

Fig. 15a. Before treatment: punctures and losses are seen in the fold-dyed paper of sixth panel.

Fig. 15b. After treatment: the digital infill can be distinguished easily at a close-up distance.

and damaged, they were replaced with new ones (figs. 14a, 14b). After treatment, larger losses were filled with *Sekishu* paper of similar texture and character to the fold-dyed papers. These infills not only matched the fold-dyed papers in structure, but also provided a continuous pattern to aesthetically compensate the areas of loss. (figs. 15a, 15b)

KEISAI EISEN'S HANGING SCROLL

After completing examination, writing the condition report and treatment proposal, the scroll was photographed before and after treatment to document its condition under normal, raking and transmitted light. The tear was reinforced on the back using strips of Japanese paper set into place with wheat starch paste (fig. 16). The dowel and stave were removed. Since the scroll appeared stiff and brittle, it was humidified overall using Gore-Tex to bring back the flexibility of the papers.

After surface cleaning the front and back with triple-washed chamois cloth and kneaded eraser, spot tests using filtered water applied to the print's colorants and every element of the mounting including blue and brown paste

Fig. 16. The tear was temporarily reinforced on the back using strips of Japanese paper.

Fig. 17. After Gore-Tex humidification, backing of the scroll was removed.

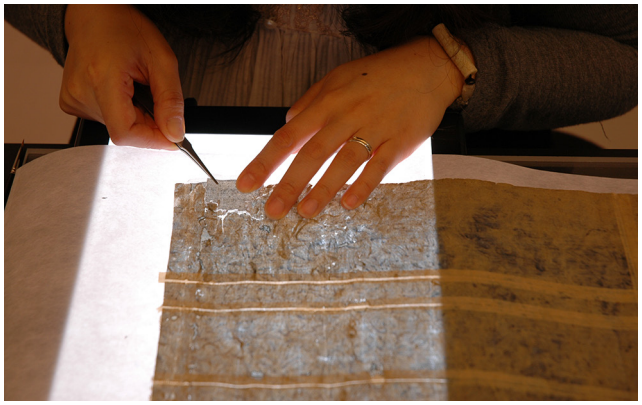


Fig. 18. Losses were set into place with starch paste and pressed under weights between Reemay, blotters, Plexiglas until completely dry.

papers, decorated strips (*ichmonji*), and thin red strips (*suji*) were carried out. The results showed the print's colorants were stable. The colorants used for the blue and brown paste papers, decorated strips and thin red trips were slightly water soluble, especially the mica on the decorated strips.

The scroll was humidified section by section using Gore-Tex as an aid for backing removal and the backing was

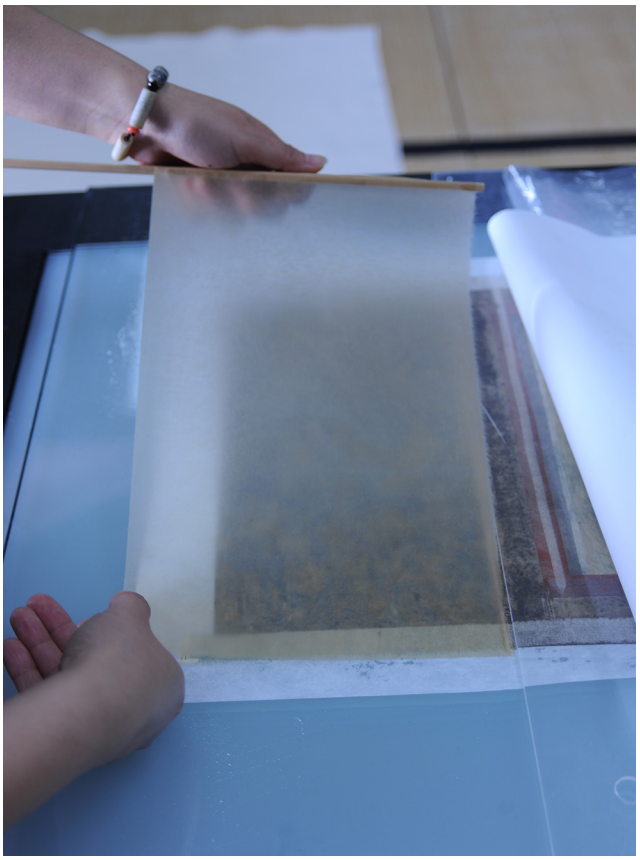


Fig. 19. A layer of new backing was added at the back of the scroll.

removed (fig. 17). Since the print had yellowed overall, local cleaning was undertaken. This treatment was able to release some discoloration from the print. In order to prevent the formation of tide lines, overall cleaning was undertaken. First, the print along with mounting was humidified overall using Gore-Tex until it was just slightly damp since the mounting part is slightly water sensitive. Temporary reinforcements were removed at this point. Then, water was brush-applied to the print. Discoloration was picked-up with blotting paper squares. After cleaning, the print along with its mounting was face up and pressed under light weight between a dry blotting paper underneath and Gore-Tex on the top. This way the print could dry slowly so as to avoid the formation of tide lines. This process was repeated 2–3 times until the discoloration was reduced and the print's overall appearance improved.

After wet treatment, every joint was checked to make sure they were still attached to each other. Once the joint was lifted, to set it back into place, paste was applied onto Mylar to help transfer it into the area of separation. Options for infilling were discussed with the curator as described in the previous session. Appropriate Japanese papers for filling losses to the paste paper were chosen by using a micrometer to select a thickness slightly less than support, and visually

LEFT TO RIGHT

Fig. 20a. Before treatment: creases are seen overall. Losses are located at the upper portion of mounting. A tear is located at the upper portion of the print.

Fig. 20b. After treatment: the large losses on the upper mounting have been filled. The crease and tear have been supported with reinforcements and a new backing.

matching chain lines and texture. For matching the tone of the paste paper, infills were sized prior to color application. Losses were set into place with starch paste and pressed under weights between smooth Reemay, blotters, Plexiglas until completely dry (fig. 18). Edge losses were compensated and extended with blue and brown toned infills.

To reinforce tears, creases and thinner parts of the mounting, strips of Japanese paper were set into place with starch paste. Reinforcements were not added to the back of those creases that were formed during printing since they are considered to be an original part of the work of art.

Fig. 21a. Before treatment: details of the upper mounting.

Fig. 21b. After treatment: the losses were compensated with the infills made using traditional paste paper techniques.

Before lining, thinned areas of the paste paper mounting were filled with Japanese papers with the aid of transmitted light. One layer of paper, Mino (2.5 mm) was applied as an overall lining using thin starch paste. (fig. 19) After lining, the print and its mounting were brushed onto the drying board so it could dry flat without planar distortion. After

inpainting, the original stave and dowel were placed back into their location on the scroll although the original nails and cord were replaced. In addition, a section of spider wire was added into the cord for strengthening. After treatment, the infills made using traditional paste paper techniques successfully compensated the areas of loss although without the patterns (figs. 20a, 20b, 21a, 21b). For storage and preservation, the scroll has been rolled onto a large roll (*futomaki)*, wrapped with a piece of silk cloth, and placed in a paulownia box and then a paper box. The original nail and the cord are retained in the box as well.

CONCLUSION

Digital infills were used in the compensation losses for decorative papers on the Munakata Shiko's folding screens because this technique was efficient in reproducing the patterns that were captured from the original artefact. In the case of Keisai Eisen's hanging scroll, fabricating infills using traditional paste paper techniques for compensation also showed a satisfactory result when there is not enough reference to make a digital reproduction.

There is no perfect treatment that can be used for all situations. Through these two examples for treating the mountings for Asian artworks, we can see that studying craft techniques and historical background helped explore treatment possibilities and discover the best way to solve problems. Fortunately, conservators are now able to adopt new techniques like digital printing for use in treatment. To do or not to do is not just a question. It is a process; a whole process of testing, studying and decision making.

ACKNOWLEDGEMENTS

I would like to thank the following MFA colleagues.

I am grateful for the supervision of these Conservation Projects: *Deities of the Tanni-sho*, by Munakata Shiko and *Standing Courtesan* by Keisai Eisen from Joan Wright, Bettina Burr Conservator and Philip Meredith, Higashiyama-kaii Japanese Paintings Conservator.

Thank to Jacki Elgar, Head of Asian Conservation Studio, Jing Gao, Cornelius Van der Starr Conservator of Chinese Paintings, Tanya Uyeda, Associate Conservator and John Woolf, Digital Systems Manager, for all their generous support and encouragement.

REFERENCE

'Epson Stylus Pro4900-Print Permanence Ratings', 2010. http://www.wilhelm-research.com/epson/ESP4900.html (accessed 06/17/15)

HSIN-CHEN TSAI
Associate Conservator, Asian Conservation
Museum of Fine Arts, Boston
Boston, MA
htsai@mfa.org

LAUREN M. VARGA, JENNIFER K. HERRMANN, AND KATHLEEN LUDWIG

Heat-Set Tissue: Finding a Practical Solution of Adhesives

From 1997–2014, Kathy Ludwig served as senior conservator and liaison to the Textual Unit at the National Archives & Records Administration. In addition to many other contributions to the field of conservation and the agency, Kathy initiated this research project in 2013. She researched the replacement resins and conducted the aging, reversibility and blocking studies. She also perfected the technique of making heat-set tissue before retiring in July 2014. Kathy passed away in May 2015. This paper is dedicated to her memory as a gifted conservator and kind friend.

INTRODUCTION

For years the Document Conservation Laboratory at the National Archives & Records Administration has been using heat-set tissue as one of the methods to mend documents. Heat-set tissue consists of a low-viscosity acrylic emulsion polymer applied to various weights of mending tissue. The adhesive is reactivated using either heat or solvent during application, although both applications will be referred to as heat-set tissue in this paper. It can be used to mend tears, fill losses and line documents. It is a preferred method for mending certain types of documents due to its transparency, low sheen, reversibility, consistency among users, ease and speed of application and it does not require moisture. Heat-set tissue is used in other contexts such as mending tracing papers or other similar thin papers. It is preferred when treating mold damaged records to avoid introducing moisture to vulnerable substrates.

The National Archives & Records Administration has approximately 12 billion textual documents in its holdings. The use of heat-set tissue has increased as more of the holdings are scheduled to be digitized. In 2014, approximately 11,000 records came into the Document Conservation Lab for treatment prior to scanning. 65% of these records required mending for stabilization to permit safe handling at the camera and assure legibility of text. (fig. 1) The number of documents needing treatment may fluctuate year to year depending on the project or condition of the records. Thus mending must be quick without compromising neatness or the proper alignment of text. Often the documents have text on both sides. Conservators mend directly over printed and

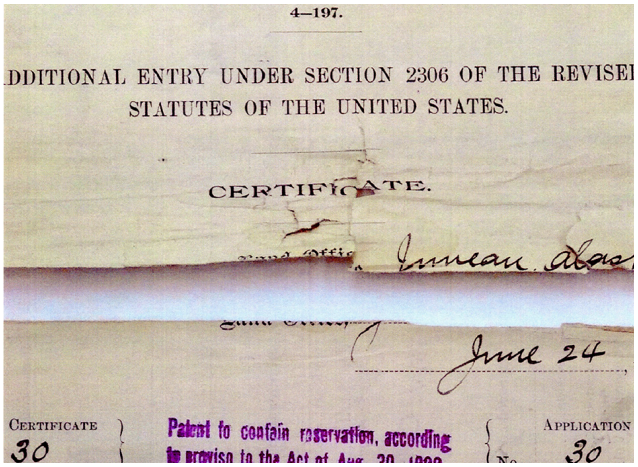


Fig. 1. Example of torn textual document.

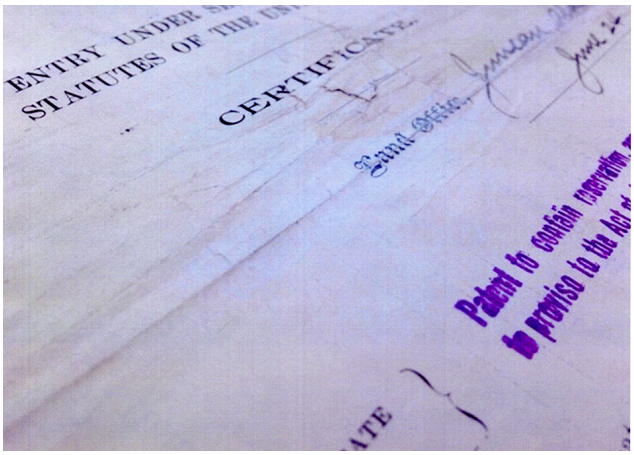


Fig. 2. Example of heat-set tissue mend applied over text.

Presented at the Book and Paper Group Session, AIC's 43rd Annual Meeting, May 13–16, 2015, Miami, Florida

written ink. (fig. 2) For digital prep, the documents are rarely washed and minor tears or losses are not repaired. In addition to heat-set tissue, gelatin remoistenable tissue and wheat starch paste and Japanese paper mends are used for mending.

EVOLUTION OF THE RECIPE

In the past, conservators at the National Archives & Records Administration used a heat-set tissue recipe that was first developed by colleagues at the Library of Congress in the 1970s. The recipe itself has evolved over time due to the marketplace discontinuation of the acrylic emulsions. Thus, conservators have been forced to explore the use of other available resources.

Over the past several years, we have worked to find a replacement resin with acceptable working properties, adhesion, and appearance that also meet the conservation requirements of the National Archives & Records Administration. This was a collaborative effort between conservation and conservation science staff. Many factors were evaluated including various combinations of adhesives and methods of adhesive application on different types and weights of paper.

Prior to settling on the current recipe, the National Archives & Records Administration had used two other recipes over the years. All three contain three components—water, a flexible but tacky resin and a brittle resin. The brittle resin is added to make the mixture less tacky to avoid blocking. The first recipe from the 1970s combined Rhoplex™ AC-73 with Plextol® B 500. However, Plextol® B 500 became difficult to purchase. Eventually Plextol® B 500 was replaced with Rhoplex™ AC-234. Meanwhile the Rhoplex™ AC-73 remained part of the mixture. This recipe was used for decades until both manufacture of Rhoplex™ AC-234 and Rhoplex™ AC-73 was discontinued. By 2012 NARA could no longer order these products. National Archives & Records Administration's Senior Conservator Kathy Ludwig began to search for an alternative.

FINDING REPLACEMENT RESINS

Two alternatives were compared to the original recipe. One mixture combined Plextol® B 500 and Avanse™ MV-100 while the other combined Rhoplex™ ML 200 with the Avanse™ MV-100. The two trial mixtures were cast onto sheets of lens tissue and Kozo papers. The tissue was adhered with heat (225–250° F) onto two different expendable substrates along with strips of the original Rhoplex™ mixture.

AGING STUDIES

Aging studies were performed to observe color change, working properties and reversibility on the comparable resins. The mends created with the three recipes were placed in an aging oven using ISO aging conditions of 80° C and 65% RH for 44 days. Prior to the oven aging, the samples were photographed for color comparison and were photographed again after oven aging. The aging study was performed on photocopy paper for ease of noting color change of just the heat-set tissue. Accelerated aging experiments with reversibility studies, as well as FTIR, were run to characterize the adhesives further. The Avanse ™/Plextol® mixture aged well and looked similar to the original heat-set tissue, (fig. 3) whereas the Rhoplex™/Avanse ™ adhesive turned brown with aging. In addition, the Avanse ™/Plextol® mixture passed the Photographic Activity Test.

REVERSIBILITY STUDY

The Avanse ™/Plextol® samples were easier to remove with local applications of ethanol and acetone. The Rhoplex™/Avanse ™ samples required more physical manipulation. We looked at a commercially-available heat set tissue, as well. It is reversible after aging with ethanol and acetone but it is too opaque and can obscure textual information on documents. In addition, the commercially-available product requires constant monitoring to ensure that the adhesive formulation does not change.

BLOCKING STUDY BASED ON MIXTURE RATIO

Based on the above studies, the Avanse ™/Plextol® recipe seemed to be the best resin mixture. Avanse™ MV-100 is the brittle component while Plextol® B 500 is the flexible component. A 4:1:1 ratio is ideal. When diluted to 5 parts water, the mends do not stick. With a 3:1:1 ratio, it is difficult to remove the heat-set tissue from the silicone coated Mylar before use. Additionally, the tissue was too tacky and shiny. This caused blocking with adjacent records and materials. The heat-set tissue was adhered to expendable paper and placed under 200 lbs for 75 days. No blocking was observed. There is often a lag time between treatment and when a document is imaged and posted online by our digital partners. During this interim period when original records are still accessed, none of our mended documents have returned to the lab with blocking issues.

MAKING THE HEAT-SET TISSUE

Today the National Archives & Records Administration is currently using the recipe that includes 4 parts water, 1 part Avanse ™ MV-100 and 1 part Plextol® B 500. The resin is mixed and applied to Abaca lens tissue and two weights of Kozo (Haini) paper. Occasionally custom heat-set tissue is made with different sizes and types of papers to meet particular project needs. The goal is to produce a tissue with consistent quality and a uniform application of adhesive without creating wrinkles or holes in the thin paper.

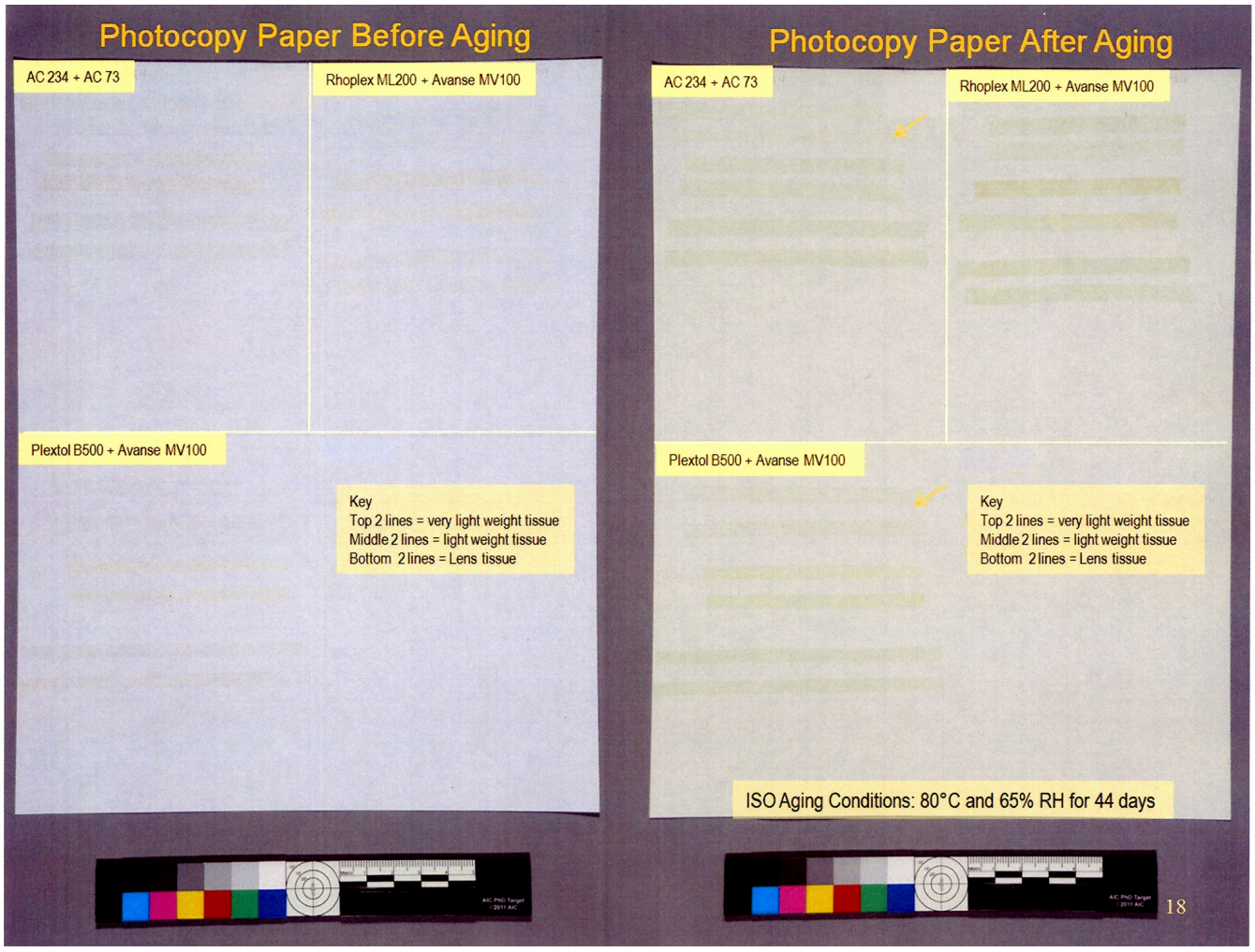


Fig. 3. Heat-set tissue mends adhered to photocopy paper before and after aging.

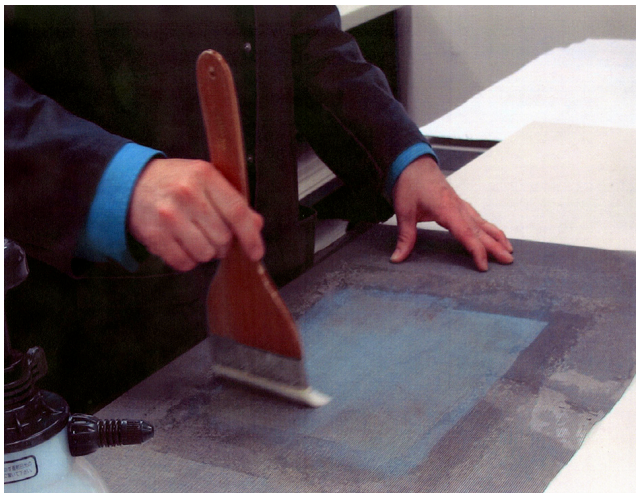


Fig. 4. Brush apply adhesive through a screen.

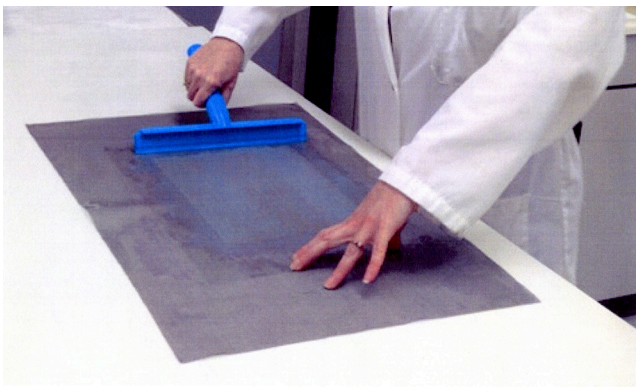


Fig. 5. After brush-applying adhesive, squeegee for even consistency.

CASTING THE RESIN MIXTURE

First a dry sheet of paper is placed on a sheet of silicone coated Mylar. A screen is placed over the paper and gently misted with deionized water to expand the fibers. It is then smoothed out with a squeegee to disperse the water. Next the resin is brushed through the screen in a union-jack pattern and squeegeed again to ensure an even consistency. (figs. 4–5) Finally the screen is peeled back and the tissue is placed on the drying rack. The tissue remains on the silicone coated Mylar during drying to keep it from distorting.

During trials, conservators experimented with brushing the adhesive onto silicone coated Mylar and dropping the Japanese paper on top. This technique keeps the adhesive on one side of the Japanese paper thereby preventing the documents from blocking or sticking to each other over time. However, it produces a higher uneven sheen than the brush-applied method. In addition, it is more difficult to peel off of the silicone coated Mylar before use.

APPLYING THE HEAT-SET TISSUE

Heat-Set

Once the heat-set tissue is dry, it can be used whole or cut into strips and shapes. It can be easily peeled off of the silicone coated Mylar after it dries or during use. Moderate temperature (250–350° F) reactivates the adhesive to adhere it to the document. The tacking iron's dwell time on the records is usually less than 15 seconds. Glassine paper or silicone release paper works well as a barrier between the document and the iron.

Solvent-Set

When the application of heat is not effective or desired, the resin can be reactivated with solvent. Ethanol is brushed onto the tissue which is resting on blotter. The tissue is then placed on the document and gently pressed with a burnishing tool. No heat or weight is needed.

Applying the solvent to the tissue while it was already in place on the document makes the document more vulnerable to tidelines. It is difficult to control the solvent and the adhesive from penetrating into the substrate. Both the heat-set and the solvent-set mends are reversible with heat and solvent.

OPTICAL BRIGHTENING AGENTS IN AVANSE™ MV-100

Avanse™ MV-100 contains optical brightening agents. The heat-set tissue fluoresces under shortwave ultraviolet illumination. After aging studies were performed, there was no noticeable migration of the fluorescence beyond the edges of the tissue. This was further tested by removing the aged tissue with a damp swab of acetone. No fluorescence was left behind on the substrate. The tissue seemed to retain the adhesive film as it could be re-adhered to the paper with a heated spatula. In the area where the tissue had been removed, conservators tried to adhere a new piece of plain, uncoated, Japanese paper. It did not adhere which denotes that there was no measurable residual adhesive left behind on the substrate. Note: the original Rhoplex™ 73/234 recipe fluoresces under shortwave ultraviolet illumination, as well.

INCONSISTENT ADHESION

The heat-set tissue works well with most papers. However, it does not always adhere well to all papers. On occasion, the tissue will stick initially and then fail after some time. After application, conservators gently flex the sheets to make sure that the mends do not pop off. There are occasions when several sheets within a batch of heat-set tissue do not adhere at all. Currently, conservators are exploring ways to avoid this in the future.

SHEEN

There is a visible sheen with the heat-set tissue made with both the original and current recipes. Some conservators are disturbed by this because the mends can be visually distracting and obvious when viewed at some angles. The sheen can be dissipated with the application of solvent. However, it adds time to the process and is only possible for papers and inks that can tolerate solvents.

CONCULSIONS

In closing, the heat-set tissue is not perfect. Despite concerns, the benefits of this method outweigh the shortcomings. In researching the adhesives we learned that chemical companies discontinue products like resins when large quantities are no longer in demand. This may occur when a large contract ends or if specifications for the product change. Discontinuation rarely occurs due to a defective product. The current recipe may continue to evolve but for now the National Archives & Records Administration plans to continue to make and use the Avanse™ /Plextol® heat-set tissue for much of the digital prep. It is the best option for a transparent, reversible tissue that is easily and quickly applied without the introduction of moisture. This is imperative when treating the volume of records that we prepare for digitization at the National Archives & Records Administration.

ACKNOWLEDGEMENTS

We wish to thank everyone who helped during this project both at the National Archives & Records Administration and the Library of Congress. We specifically recognize NARA Conservation and Preservation: Doris Hamburg, Mary Lynn Ritzenthaler, Kitty Nicholson, Terry Boone, Amy Lubick, YoonjooStrumfels, Lisa Isbell, Sara Shpargel, Morgan

Zinsmeister, Halaina Demba, and the Heat-Set Tissue Team: Doug McRae, Richard Hnat, Kellie Shipley, and Charles Clausen, as well as our colleagues at Library of Congress: Holly Krueger, Susan Peckham, Claire Dekle, Julie Biggs, Dana Hemmenway, and Michele Youket.

APPENDIX: INSTRUCTIONS FOR MAKING & USING HEAT-SET TISSUE

ADHESIVE RESIN FORMULA

Combine and stir the following ingredients.

- 4 parts water
- 1 part Avanse™ MV-100
- 1 part Plextol© B500

CASTING THE RESIN MIXTURE

Instructions for casting the mixture onto a preferred mending tissue are below.

1. Place a dry sheet of paper on a sheet of silicone coated Mylar
2. Place a screen over the paper and gently mist with deionized water to expand the fibers.
3. Smooth with a squeegee to disperse the water.
4. Brush the resin though the screen in a union-jack pattern.
5. Smooth with a squeegee to ensure even consistency
6. Remove screen
7. Air-dry tissue on the silicone coated Mylar.
8. Store heat-set tissue in a folder to avoid dust accumulation. It can be stored on the silicone coated Mylar. Or it can be peeled off of the silicone Mylar and stored with a non-stick interleaving paper such as glassine.

GUIDELINES FOR USING HEAT-SET TISSUE

Heat-Set Instructions

Peel the heat-set tissue off the silicone coated Mylar and cut into shapes. Or cut tissue while still adhered to silicone coated Mylar.

Once cut into strips or shapes, heat-set tissue can be applied with the shiny side towards the mend using a tacking iron set to 250–350° F. Dwell time of the tacking iron should be less than 15 seconds. Use glassine or silicone-release paper as an interleaving between the tacking iron and object.

Solvent-Set Instructions

1. Peel heat-set tissue off the silicone coated Mylar and cut into shapes. Or cut tissue while still adhered to silicone coated Mylar.
2. Place heat-set tissue on blotter and apply ethanol to shiny side with a flat brush.
3. Move heat-set tissue to object with the shiny side towards the mend, apply and burnish. Weight or heat is not needed.

NOTE

This recipe meets conservation standards for use on original paper-based collection materials. Scientific analysis, accelerated aging studies with ISO aging conditions and the Photographic Activity Test were conducted. The Avanse resin contains optical brightening agents. After aging and reversibility studies, there was no noticeable migration of the fluorescing resin. The heat-set tissue works well with most papers. However, it does not always adhere well to all papers.

LAUREN M. VARGA
Senior Conservator
National Archives & Records Administration
College Park, MD
lauren.varga@nara.gov

JENNIFER K. HERRMANN
Senior Conservation Scientist
National Archives & Records Administration
College Park, MD
jennifer.herrmann@nara.gov

KATHLEEN LUDWIG
Senior Conservator
National Archives & Records Administration
College Park, MD

ANDREA KNOWLTON AND DAWN MANKOWSKI
DISCUSSION GROUP CO-CHAIRS

Archives Conservation Discussion Group 2015: The Effects of MPLP on Archives: 10 Years Later

ABSTRACT

The topic of this year's discussion was "More Product, Less Process," or MPLP. Over the past ten years, the archival profession has applied the methods advocated by MPLP to streamline processing practices and reduce collection backlogs, sometimes at the expense of preservation activities. To provide additional context for the discussion, co-chair Andrea Knowlton began the session with a short presentation on MPLP. Three panelists presented short talks on MPLP and related shifts in processing practices in their home institutions. All three talks emphasized the importance of collaboration between archivists and conservators to achieve both preservation and access. Following the presentations, the panelists answered questions and the audience participated in an open discussion.

SUMMARY OF PRESENTATIONS

ANDREA KNOWLTON
AN INTRODUCTION TO GREENE AND MEISSNER'S "MORE PRODUCT, LESS PROCESS"

The concept of "More Product, Less Process," better known as MPLP, was introduced by archivists Mark A. Greene and Dennis Meissner in their 2005 article in *The American Archivist* titled, "More Product, Less Process: Revamping Traditional Archival Processing." The authors advocate for a more efficient alternative to established archival processing standards in order to address the problem of inaccessible collections in backlogs. To this end, they argue for a reduction in arrangement and description of collections as well as the considered elimination of many practices typically associated with preservation. These tasks include re-foldering into buffered folders, removing metal fasteners, and providing additional housing for damaged or fragile items. What they instead propose is a minimal, or baseline, approach to archival processing.

Greene and Meissner specifically target preservation-related activities as a major point of inefficiency in archival processing, arguing that these actions force item-level handling of the collections (Greene and Meissner 2005). The overall effect of the argument is to position preservation and access as competing priorities (McCann 2013).

The authors are particularly concerned with the time and resources required for re-foldering, and they return to this issue several times throughout the article. They report that replacing folders is among the most resource-intensive components of processing in terms of both materials and labor. They assert, "An unconscionable fraction of our limited and—all too often—declining processing resources are being badly spent on this and other extremely labor-intensive conservation actions" (Greene and Meissner 2005, 221).

For many institutions, resources are limited. Archivists recognize that compromises have to be made during processing in order to keep up with the volume of new acquisitions and make them available to researchers within a reasonable time frame. The result has been a shift in attitudes and practices across the archival field. Now, ten years after the original publication of Greene and Meissner's article, minimal-level processing as outlined by MPLP has become a widely accepted practice.

That does not mean, however, that minimal processing has been adopted across the board, and actually this was never the argument intended by Greene and Meissner. Anecdotally, many archivists report that this approach simply widens the range of options available, allowing the work of arrangement and processing to change depending on the needs of any given collection.

This open discussion took place on May 16, 2015, during the AIC 43rd Annual Meeting, May 13–May 16, 2015, Miami, FL. The moderators organized and led the discussion and recorded notes. Readers are reminded that the moderators do not necessarily endorse all the comments recorded, and that although every effort was made to record proceedings accurately, further evaluation or research is advised before putting treatment observations into practice.

LAURA MCCANN
PARTNERING FOR PRESERVATION AND ACCESS

The NYU Libraries hold substantial collections of archival materials, which are housed both in Bobst Library and in an off-site storage facility. There are actually three separate archival repositories within the NYU Libraries: 1) the Fales Library and Special Collections, 2) the Tamiment Library and Robert F. Wagner Labor Archive, and 3) the University Archives. Until very recently, each of these three repositories operated separately, with different programs, policies and workflows, including differing approaches to preservation and the selection of materials for conservation.

MPLP as it is applied at NYU Libraries can be better described as "contemporary archival collection management practice." A practice, as opposed to a philosophy or methodology, is a way of approaching your work based on a set of core values. For contemporary archival practice, the core values are centered on the user, which Greene and Meissner emphasize repeatedly. From a conservation perspective, we consider both users in the reading room today, but also the students and faculty who will use collections far into the future.

MPLP advocates for responsible use of resources and a holistic approach to address collection needs without focusing on certain user groups or collections. The focus instead is on sustainable programs and policies that can be implemented across the board, such as baseline-level processing for all collections. To achieve a goal of sustainability, practices and workflows need to be data-driven. This means not only collecting statistics on use, but also understanding your inventory and your resources and using that data to plan and manage work responsibly.

These user-centered core values have been adopted by staff of the archival repositories at NYU Libraries, and the impact has been significant, including changes both to the organizational structure and to workflows. The largest change has been the establishment of a new department called Archival Collections Management. This department is responsible for accessioning, processing, inventory control, and data collection for all three archival repositories. In addition, a new preservation archivist position was created within the preservation department. This person essentially acts as a preventive conservator who works with archivists in each of the repositories to prolong the life of the collections. The work can include monitoring the environment, training staff on best practices for handling, and collection assessment. Survey data can be used to develop and inform preservation projects managed by the preservation archivist.

In the conservation unit at NYU Libraries, there has been a significant shift in the way materials are selected for conservation. Previously, materials were selected by archivists and curators based on intellectual interest or high monetary value. Today, use of the collections, coupled with condition concerns, is the most important consideration, with particular emphasis on collections that are used in instructional contexts. Courses may be taught in special collections by archivists, librarians, and curators as well as by NYU faculty. Some courses are repeated regularly, and as a result, the collections used for these courses can receive repeated, heavy use. Work in the conservation lab has shifted to reflect these changes so that these heavily-used materials can be stabilized and rehoused to support their use in the classroom.

The most important change in the past ten years has been to develop a stronger partnership with archivists at NYU, and the preservation archivist has played an extremely important role in this. Close work with archivists has allowed the preservation unit to better understand the storage environments on-site and off-site, how materials are pulled from storage, and how conservation impacts housing and storage. This information has led to practical changes. One example is a change in housing practices. In the past, odd-shaped collections would be housed in unique, custom-sized boxes. It is now recognized that these odd-sized housings may not fit the usual dimensions of the shelves, which can result in handling challenges and improper shelving. To minimize these problems, the conservation unit now uses standard-sized boxes for housings whenever possible, with internal fillers and adjustments within the box to safely cradle the object.

Beyond Greene and Meissner, numerous articles and other resources from the archival community address the application of minimal processing. In addition to McCann's own 2013 article, works by Christine Weideman and Thomas Hyry may be of particular interest.

Laura McCann, Conservation Librarian, New York University Libraries

MICHAEL SMITH
ACQUISITION, PRESERVATION AND IMMEDIACY: A DIFFERENT APPROACH TO BALANCING THE DEMANDS OF MAKING ARCHIVAL MATERIAL QUICKLY ACCESSIBLE

Library and Archives Canada (LAC) is a federal institution tasked with acquiring, preserving and making Canada's documentary heritage known and accessible. Two recent large-scale digitization projects challenged LAC to adapt its normal processing and conservation treatment procedures, and required the institution to accept certain risks of physical damage, in order to make the material quickly accessible to researchers.

In September 2013, LAC acquired the Sir John Coape Sherbrooke Collection. Sherbrooke was an influential figure in the formation of Canada during the pre-Confederation era, serving as Lieutenant Governor of Nova Scotia from 1811–1816 and as Governor General of British North America from 1816–1818. The Sherbrooke collection consisted of 37

notebooks, 79 maps, 4 boxes of textual material, as well as paintings and various artifacts. Since this collection had not previously been accessible to researchers, digitization and access became predominant institutional priorities.

The Stewardship Branch of LAC was given a tight timeframe for making this collection digitally available online, with a total of two months allotted to complete processing, conservation treatment, and imaging. As a result, the usual processing and conservation procedures had to be modified to accommodate these deadlines. In LAC's normal workflows, the collection is processed and described by archivists shortly after it is acquired. Fragile materials and formats are noted, and the collection is conserved and rehoused if necessary. Digitization occurs once the material can be safely handled, usually after conservation treatment. Once digital images are made available online, the use of the physical collection is restricted. In some cases, is moved to LAC's high-density storage facility.

In preparing the Sherbrooke collection for digitization, LAC adapted these procedures in order to be able to treat, describe, and process the material concurrently. These modified processes required close collaboration with members of the LAC's Archival, Collection Management, Conservation, Digitization, Circulation, and Inventory Control teams.

Conservators assigned temporary numbers that allowed staff to keep the Sherbrooke records in their original arrangement as they were unpacked. These numbers also assisted archivists with tracking the objects at each phase, from processing through digitization, until permanent collection numbers could be assigned to the material. Archivists worked side by side with conservators, and, as the material was humidified, flattened, and safely unrolled, archivists began the descriptive process. Conservators and archivists also collaborated to determine what level of treatment was appropriate to ensure the collection could be processed in a timely manner and would be in the best possible condition for imaging. Once the material was described and authenticated against the inventory list, it was properly housed, barcoded, and digitized before going into storage. As a result of this successful collaboration, the entire collection was made available online for public access within the parameters of the deadline.

The second mass digitization project at LAC, which is still ongoing, is the imaging of military personnel files from the Canadian Expeditionary Forces (CEF), dating from World War I. The records hold attestation papers, medical histories, pay sheets, discharge certificates, casualty forms, and separation allowances from service members in the CEF. The 650,000 military personnel files in this collection reside in 10,702 containers and represent 2 miles (3.2 kilometers) of documents.

Imaging the CEF Files is a priority because it is one of LAC's most heavily used collections. For example, during 2011, 12,645 boxes of CEF documents were circulated. Of those, 3,439 were requested more than once. Prior to this project, only items from this collection that were requested by researchers were imaged. The typical process is that a researcher orders the container for consultation, locates their file, and submits a digitization request. The entire container is then sent to the conservation lab, where the requested item is treated if necessary, then digitized, returned to the box, and sent to storage until it is requested again.

The CEF documents had been considered at risk for some time. The majority of the records were never fully processed, leaving the burden of discovery on researchers. In recent years, there was also increasing concern about this collection's deterioration, due to the high volume of consultation requests and the inherent vice of the material's acidic paper. Other preservation issues, such as fastener damage and inadequate housing were also cause for concern.

For the digitization of the CEF files, new workflows were created. One team is tasked with the preparation of the materials, such as fastener removal, review of objects needing conservation treatment, and mold identification. A second team concurrently completes conservation treatment.

In order to better meet the deadline, the methods used to digitize the collection were also modified. The bulk of the files were scanned on a high speed BancTec scanner, which uses a conveyor belt that employs suction to keep the documents in place as they are imaged. In light of the decision to use the BancTec scanners to digitize this collection, Library and Archives Canada decided that the records would need to be triaged prior to digitization. Items deemed too large or too fragile would be scanned in an upright, full flatbed scanner. After imaging the documents, the records are withdrawn from circulation and placed in high-density storage to preserve the original material. There was a small danger of physical damage using the BancTec scanners, but these risks are outweighed by the risks associated with cumulative damage from continued circulation.

Taken together, both of these projects underline the importance of collaboration between all stakeholders. LAC ensured that it had consulted with all colleagues involved about best practices for each project, as the success of these large digitization efforts depended on staff's openness to modifying existing procedures. As access remains a mandated priority for LAC, mass digitization projects like these will likely continue. In addition, LAC has recently opened a high-density collections storage facility, so it is feasible that use of original materials will be restricted in favor of access to digital surrogates. Based on the success of these modified workflows, LAC may consider adapting their processes for future digitization projects.

Michael Smith, Collection Manager for Textual and Cartographic Material, Library and Archives Canada

KIM NORMAN
MPLP AND CONSERVATION AT THE GEORGIA ARCHIVES

Making collections available to research patrons is the primary goal of the Georgia Archives. Many of the records acquired by the Georgia Archives are large, encompass a variety of formats, and are not always accessible without some intervention. Consequently, the Preservation and Archival Services Departments collaborate to ensure the best possible outcome with regard to both preservation and access. Based on observations from these collaborations, can we draw an analogy between MPLP and phased conservation? Both call for minimal intervention to meet immediate needs without closing the door to future actions.

Some conservators feel that the phased conservation approach means that items will not receive treatment beyond the initial basic stabilization; however, it is not always feasible to process, conserve, and rehouse entire collections completely. For example, a collection of county courthouse records were received in their original bundled packages and transport boxes. They could not be used by patrons in the current condition due to handling challenges presented by the tied bundles and tight folds of the paper. Providing digital scans or copies for researchers is a service provided by the Georgia Archives, so collections like these must be stabilized enough to ensure they can be safely handled, either in the reading room or during digitization. Stabilization may be considered the first phase of treatment.

Toward this end, archivists are trained to independently use some of the equipment in the conservation lab. It is possible for them to do light humidification, flattening, or other preservation activities as they process a collection. During this initial phase of treatment, archivists maintain the original order and humidify the documents in their original groupings. They also might create custom sleeves, remove fasteners, or rehouse parts of the collection.

It is vital that staff in both the Archival Services and Preservation departments agree about the limitations of the project and reasoning behind certain actions. A conservator might want to use a polyester sleeve to protect a document, based on its condition or vulnerability to future damage. An archivist, though, may decide to sleeve a document, but might make that decision based on its historical relevance and anticipated use. Both of these ways of approaching the material might have the same end result, but the decision making process is different.

At the Georgia Archives, phased conservation and MPLP strategies are less about streamlining treatment techniques and more about allocating resources to reach sufficient levels of processing and treatment to facilitate access to collection materials. Conservators are then free to identify items that require more intensive treatment based on condition or use.

Kim Norman, Preservation Manager and Conservator, Georgia Archives

DISCUSSION

After the presentations, the moderator opened the discussion period to the audience. Questions and comments are paraphrased below.

Commenter: This question is for Laura McCann, about boxes for odd-shaped items. Was that practice in place when you came to NYU, or was that something you had to implement? Did you have to retroactively move items from odd-sized or small boxes to standard-sized boxes, then follow up with changes to finding aids?

McCann: The need for standard-sized boxes is something that we started to understand about two years ago, by building strong relationships with staff and determining their concerns. Right now, our policy is to use standard-sized boxes going forward. We deal with a lot of off-site storage, and full records boxes are best for that. Odd-sized boxes are not a good use of off-site storage, because then you are paying for empty space. Calling back all of the odd-sized boxes from off-site storage is our next phase. We are going to be renovating our special collections in the next 5–7 years, so we will be looking towards that. The first stage will be putting things that aren't housed yet into standard-sized boxes, and then we can address the things in odd-sized boxes.

Commenter: Laura McCann, you mentioned both baseline processing and the importance of data to drive processing and preservation activities. Are you seeing collections that initially receive minimal or baseline-level processing return to staff for re-processing or re-housing at a later time?

McCann: This is iterative processing, something the archivists at NYU refer to all the time. I think that this is the goal. Our Archival Collection Management department is very young, and their plan at this point is for everything to be given an accession record and a basic level of preservation intervention at the same time. The preservation archivist defines what that level should be. Use of collections is tracked, so as collections are used, description can be enhanced as necessary, and materials can be flagged for further preservation if needed. The preservation archivist will assess collections, and objects can be identified that need to go to the Conservation Lab. This process is just getting started.

Norman: I would not say that things are coming back to us frequently. We treat items upon patron request. Sometimes a request develops into a larger project, and we continue if we see there is a need. One example is the courthouse documents I highlighted in my presentation, which began after a historic courthouse burned to the ground about a year ago. All of the courthouse records housed there were almost completely

burned, and very few could be salvaged. The Georgia Archives intended to make our records immediately accessible to researchers and citizens of the county where the courthouse had burned, so the Archive's large collection of courthouse documents were sent to the conservation lab. Treating large collections like this is a new workflow for us, and it is a bit early for us to see any repeated treatment of materials.

Commenter: At our institution we are seeing an enormous increase in the amount of audiovisual materials that are coming into the archival collections, at a rate that vastly exceeds our capacity to make them accessible or preserve them. We are doing minimal processing of these materials, with everything getting a label and a box list. There is little expectation that preservation money will be available for reformatting in the immediate future. For those materials that are unlikely to see heavy use in the next 5–10 years, we have begun to prep them for the move from the downtown library to a high-density storage facility, where we have very strict temperature and humidity controls. This should help to extend the useful lives of the materials, just as Greene and Meissner suggest, by providing the best environment that we can. This can be part of an iterative process. In the future, if someone requests these materials, we can process and preserve them at that point.

Commenter: I'm coming from a different angle. We have traditionally dealt with archives in our museum program, and there has been a lot of maximum processing done by curatorial staff. I am a curator, and I have an archivist on staff, but no conservator. We may eventually have a half-time archives technician. We have been looking at the issue of trying to implement MPLP locally. Our records are current resource management documents generated over the past 70 years, but there are a lot of other formats as well. Our clients are, for the most part, our own staff, although we do get some external researchers. We have a lot of inherent problems with our collections, so I'm trying to identify the best area to put our resources. We are trying to find the right balance for the formats that we have, the lack of conservators on staff, and the users of our collections. We'd like to develop a justified, thoughtful approach that balances use, but also accounts for those things that general environmental control is not going to solve for us. Have you thought about some of these things in more specific terms?

McCann: I think what I'm hearing here is, "How would you define the baseline, in terms of both archival processing and preservation management?" There are tools available. Many of us know of the Collection Care benchmarks—that is one I like. The Northeast Document Conservation Center (NEDCC) has some useful checklists. But descriptive processing is really resource-specific, so I'd look to the California Processing Manual to see if it fits your needs. It's really about collecting data, understanding what your resources, staffing, and goals are, and deciding how quickly you want to attain those goals. You may start with a very minimal approach—every single collection is going to have an accession record, it's going to be in a sturdy box, and in folders that aren't falling apart. You might do that and then go back. That is the iterative process. If you don't have a lot of resources, set realistic, sustainable goals, and then reassess. Especially when you aren't sure of future staffing levels, it might be best to set a low baseline. Then make sure everyone understands that the initial baseline is not the end point. When you have met that initial benchmark, you can go back to target additional components.

Smith: At LAC, we are currently undergoing a major backlog project. For us, we want to make collections discoverable. That means we aren't necessarily describing to the item level, but we are making sure they have the right housing, dividing media up the best we can, and providing enough information that people can access the material they need. As a federal institution, we have private archival documents, but we get all of the government records as well. It's an ongoing fight just to try to keep up with the material we get on a daily basis and to try to make it available for people to find. It's much the same—trying to do the minimum amount of work just to make it discoverable.

Commenter: This is a comment about fasteners. I wonder if people will know what staples or paperclips are 100 years from now, and if we need to think twice about automatically removing them as part of the processing process. Once you dispose of that archival process, you lose that history of archiving and filing systems. This is a particular problem in the Early Modern period. There are wonderful filing systems found in the 18th century, but the filing strings have been removed from everything, they have been taken out of the wonderful canvas bags they were stored in, and there is very little evidence for recovering what those administrative processes were. At our institution, we've stopped removing fasteners for this reason, though we sometimes need to make sure they don't cause damage to other things. I hope that in these large collections you maintain some of the original filing processes so that a hundred years from now, or even sooner than that, people can remember how we did things.

McCann: They do tell a story, but in many of these big projects that promote access, you often have to take them out. I think that's where having selective documentation is important, and to make sure that the documentation is accessible to scholars and curators. It's also important to make sure the curators understand what you are taking apart.

Commenter: I'm located in the South and I have a lot of small institutions around me that don't have ideal climate control. Greene and Meissner's article seems fundamentally based on the idea that you have great climate control that mitigates all the other problems that might arise. That's what allows you to defer things like removing metal fasteners or other activities like separating media from each other. So, what do you do in terms of advising the local history collection or the small historic houses that have archival collections located in areas where we know they don't have good environmental control?

Norman: It is problematic, because climate control is one of the first lines of defense. We have to go back to our mission—what is it in our collections that our patrons or clients or visitors want? As a state archives, our visitors want access to our records, and by law, they have to have that. How does that figure in when the environment is not so great? It's hard to say where to begin. If I were to ask our facilities manager, I think he would say to tighten up the envelope of the building first.

McCann: This is one of the things I find frustrating with Greene and Meissner's original article, and even with the 2010 follow-up article written by Greene alone. They talk about environmental control, but they actually never specify what they mean. A library with an HVAC system can have environmental control, yet have uncontrolled relative humidity resulting in wide relative humidity fluctuations. Greene doesn't talk about climate control goals for collections, so he is putting out the idea without important details. One of the things we can all do, especially when you are working with or advising small institutions, is to communicate climate control goals while not overly focusing on strict environmental set points. We need to keep the focus on how to improve the environmental conditions with the resources available.

Commenter: The archives community latched on to what Greene and Meissner said about climate control because it's straightforward, much like the preservation world latched onto Garry Thomson when he recommended 70F/50%RH. What Thomson really said was 70F/50%RH is good in certain circumstances. Every institution is different and every collection has unique needs. However, it's often easier to teach one focused lesson that everyone can take away. For archivists, the easy takeaway from Greene and Meissner is that climate control is all that's required. Part of our job as conservators is to share the rest of the context, and to explain that very few institutions can realistically meet the goal of having environmental conditions that are so ideal you don't have to worry about anything else. What that means for a historic house in Virginia Beach will be different than for a museum in Denver, Colorado. Maybe there is no perfect answer and the reality is just doing the best that you can, given limits on money, time, and personnel.

Commenter: My thought about "More Product, Less Process" is that you're trying to reduce staff time spent on processing each collection in order to be able to keep up with newly acquired material. However, small historic houses or small museums don't usually have the volume of collections coming in that a bigger institution will have. They also often have a group of very dedicated volunteers. So my thought is, in that context, process as much as you want. I think that we as preservation specialists should know what the big picture is and what you are gaining and losing by making those choices. We have to acknowledge the article, but also explain that your context may be different. So, spend as much time as you want on the fasteners or the foldering, if that is what's meaningful to your institution.

Commenter: My question is about mold remediation and where it fits into the processing and digitization workflow. We do mold training for our graduate student and adjunct workers in our collections. They are the ones who process the collections, and contact me if they suspect a collection is moldy. We also have a quarantine room in our off-site facility, where these items can be stored until we are ready to address treatment. But, in processing the collection, mold remediation is a speed bump, and materials that go to the quarantine room often stay there for months. In your workflow, how did you handle mold remediation and did it slow down the process for you?

Smith: We built it into the workflow from the beginning. The team working on the CEF project was trained in mold identification, so by the time the material was sent to the labs, or frozen and sent out for treatment, it was a pretty seamless workflow. Day to day, it can definitely cause a delay in processing. If an archivist is processing a collection where mold is suspected, they contact me and I will look at the material. If the object is moldy, it will be frozen, treated, and then sent back to the archivist. We're quite lucky in that we have the resources to handle that in our building. We have freezers and conservation staff dedicated to mold remediation work, but it can definitely cause delays.

Commenter: We found it is not cost-effective to have staff do mold remediation, because it is so labor intensive. Things stay in the freezer or the fume hood for months or a year. We're experimenting now by doing a few pilot projects to have vendors do the mold remediation. We are finding that it's not that expensive, and we set aside money in the annual budget to keep that workflow seamless.

Commenter: What is the scale of those projects like?

Commenter: We had three pilot projects, and I think each had dozens of boxes, not hundreds. However, we did work with a vendor when we had a film project that was around 200 boxes, so it varies.

Commenter: We tend to come across just a few items at a time, very small scale. For larger projects, we try to utilize vendors as well.

McCann: Definitely, we have gained a lot of efficiency with the larger projects by using vendors, especially for the media collections.

Commenter: Do you have any recommendations for newly acquired collections where pest infestation is suspected?

Smith: We had a recent acquisition we suspected might be infested with silverfish. We rented freezer trucks and isolated the material in there for three weeks. After that, we placed the collection in our cold vaults on skids. We also placed traps around the skids to monitor until we were satisfied there was no pest activity. However, the length of time to freeze and monitor the collection really depends on the type of pest and its life cycle.

McCann: With new collections coming in with pests, we generally hire a contractor to examine and treat them, because we don't have the in-house facilities. I also want to refer everyone to museumpests.net. Their listserv is a great resource and they have specialists who are able to respond to more specific questions.

Commenter: We used the company Pests Unlimited, who was able to give us advice about recognizing particular kinds of insect damage and frass. Once we were able to do that, we could target the pests with pheromone traps. We've also used the Keepsafe anoxic system, particularly for large collections.

Commenter: I'm concerned that the workflows don't show the work schedules each step of the way. At our museum, especially with our archival and manuscript collections, which form the vast majority of our holdings, the schedule seems to be that everybody wants it now. I'm wondering how you negotiate those kinds of time pressures in your institutions? How do you negotiate, and who drives those pressures and the resulting work schedule?

Smith: For the kinds of projects that I have talked about, we're not normally in a position to say no when we are given a deadline. We are told this has to happen, and we try our best to make it happen. We are fortunate, maybe as opposed to some of the smaller museums, that we do have a budget. Sometimes we have money available to hire extra staff for large projects, which is what we did for the CEF records. It is always a negotiation to make sure that we can meet the deadline, and to make sure that management is aware that there might be potential risks to the collection. An example is the decision to use the BancTec scanners for the mass digitization project, to make sure it was digitized quickly. But we also let them know that there was a chance that some material could be damaged when we did this, so we could make sure they are comfortable with the risks involved.

Norman: I would say that, at the Georgia Archives, our workflow is more fluid than that. We do respond to patron requests, and that is part of what drives our schedule. One of the things that can really strain our schedule and resources would be a large state legal case. It is not uncommon for attorneys to come in and request everything in a collection so they can have a reference copy to determine what is important to their case. Those are the moments when things get really tight for us.

McCann: Our schedules are driven more by instructional needs than digitization or exhibition programs. I think that allows for reasonable lead time on projects. One factor that also helps is having the preservation archivist, who is proactively working in the collections and with staff. He is working really closely with me in the Preservation Department, but also partnering with the archivists. This way, I know what's coming early in the process, and I know what kind of time constraints to expect. Good communication between departments helps me to know what's happening and what classes might be taught in the near future. Getting collections ready in time for classes in September can be really challenging. So in January, when a class is over, we try to get the object into the lab right away if they want to have it treated for the next class the following September.

Commenter—NYU Preservation Archivist: As a large, private university we have a very internally-focused user base, so we don't have outside deadlines that other institutions face. Our timelines primarily come from the curators of our special collections. My job is to be that link between the preservation department and curatorial departments. Conservators don't say no—we make it work. But occasionally you have to say no. That's what that relationship is about, as well as building trust. When we say we can't do something, or warn that it might be destructive and damaging, that trust supports the conversation and sets a context for negotiation.

Commenter: What we are describing here is an approach that forces a choice among competing priorities with limited resources—we can't do this if we also want to do this. Some management philosophies argue for an alternative approach with a positive spin—how can we make it better? If you want to achieve a new goal, what resources can you offer to make it happen? Can additional money, staff, or space be made available? How can staff collaborate in unique ways to complete projects? That can be on a large scale or on a small scale.

ACKNOWLEDGEMENTS

The co-chairs of ACDG would like to thank Book and Paper Group Program Chair Fletcher Durant and outgoing ACDG co-chair Tonia Grafakos for their assistance in planning and organizing this session. They also wish to express their gratitude to Laura McCann, Michael Smith, and Kim Norman for their willingness to share their insights and expertise. Thanks also go to those audience members who participated in the discussion following the presentations.

REFERENCES

Greene, M. A., and D. Meissner. 2005. More product, less process: Revamping traditional archival processing. *The American Archivist* 68(2): 208–263.

McCann, L. 2013. Preservation as obstacle or opportunity? Rethinking the preservation-access model in the age of MPLP. *Journal of Archival Organization* 11(1–2): 23–48.

FURTHER READING

Bachli, K., M. Light, K. McAnnaney, D. Morrison, D. Seubert, A. E. Yun, J. Cuellar, and A. Turner. 2012. Guidelines for Efficient Archival Processing in the University of California Libraries.

http://libraries.universityofcalifornia.edu/groups/files/hosc/docs/_Efficient_Archival_Processing_Guidelines_v3-1. pdf (accessed 6/17/2015).

The Collections Trust. 2014. Benchmarks in Collections Care. www.collectionstrust.org.uk/benchmarks-in-collections-care (accessed 6/17/15).

Greene, M. A. MPLP: It's not just for processing anymore. *The American Archivist* 73(1): 175–203.

Hyry, T. 2007. Reassessing backlogs: Extensible processing is a better way to make materials available. *Library Journal* 132(7): 8–9.

Hyry, T. 2006. More for less in archives: The Greene/Meissner approach at work at Yale. Paper presented at the RLG Member Forum: More, Better, Faster, Cheaper: The Economics of Descriptive Practice. www.worldcat.org/arcviewer/1/OCC/2007/08/08/0000070504/viewer/file209.pdf (accessed 06/18/15).

Meissner, D, and M. A. Greene. 2010. More application while less appreciation: The Adopters and antagonists of MPLP. *Journal of Archival Organization* 8(3–4): 174–226.

Northeast Document Conservation Center (NEDCC). 1.6 Priority Actions for Preservation. www.nedcc.org/free-resources/preservation-leaflets/1.-planning-and-prioritizing/1.6-priority-actions-for-preservation (accessed 6/18/15).

Weideman, C. Accessioning as processing. *The American Archivist* 69(2): 274–283.

ANDREA KNOWLTON
Assistant Conservator for Special Collections
The Louis Round Wilson Special Collections Library
The University of North Carolina at Chapel Hill
Chapel Hill, NC
aknow@email.unc.edu

DAWN MANKOWSKI
Book and Paper Conservator
New York State Office of Cultural Education
Albany, NY
dawn.mankowski@nysed.gov

ANAHIT CAMPBELL, DANIELLE CREECH, AND JACQUELINE KECK
DISCUSSION GROUP CO-CHAIRS

Library Collections Conservation Discussion Group 2015: Let Me Help You Help Me: Outreach as Preventative Conservation

INTRODUCTION

The Library Collections Conservation Discussion Group (LCCDG) explored various methods of outreach through three presentations. Which channels worked best to communicate knowledge and resources? Which best captured community interest? The discussions incorporated case studies and presented both theoretical concepts and practical advice centered on preservation outreach to patrons of libraries, training of non-conservation staff to identify collection issues and use of social media to highlight conservators and their work.

LAURA MCCANN
TRAINING LIBRARY EMPLOYEES: A CASE STUDY FROM NYU LIBRARIES

The Bobst Library Access Services staff and student workers are responsible for identifying circulating materials that are in need of preservation action. The library has established written workflows to aid in this determination, but it was discovered that those workflows were often misunderstood. The conservation unit developed a hands-on training program to educate library staff. This intensive training was successful with the permanent paraprofessional staff. The training resulted in timelier reporting of mold issues, an increase in communication between units, and an overall increase in preservation queries. Unfortunately, conservation staff found it difficult to engage the student workers during these intensive training sessions. It was difficult to keep them focused and off of their phones. In addition, it was challenging to arrange the sessions for student workers' staggered schedules, and as a result there was less than a sixty percent attendance rate. A high turn-over rate among student workers made the investment of preservation staff's time especially inefficient considering the inconsistent results.

To address these issues, conservation staff changed their tactics dramatically. The intensive hands-on training was shortened to a fifteen minute PowerPoint presentation given as part of a New Student Employee Orientation. Attending the orientation is mandatory for student workers, and to further entice students to show up and pay attention snacks were provided and their supervisors were also in attendance. These changes allowed conservation staff to train ninety to one hundred percent of student workers and led to a significant increase in items properly selected for preservation action by Access Services student employees.

NYU has three other campuses: NYU Polytechnic School of Engineering in Brooklyn, NYU Abu Dhabi and NYU Shanghai. There are no preservation staff at these campuses, and the time differences between New York and the Abu Dhabi and Shanghai campuses make instructor-led training methods nearly impossible. Preservation staff has turned to LibGuides as their solution to deliver preservation information to staff at geographically distant campuses. LibGuides allow preservation staff to present training and guidelines that can be accessed at any time by distant staff. These guides can also be used to link to tutorials and information created by other preservation professionals around the world, and can be a useful resource even to preservation staff themselves.

Q: Do you have any other tips on how to best train library staff and student workers on preservation?
McCann: It helps to include previously trained staff and supervisors. This keeps everyone up to date on changes in training and helps keep new staff focused. Try to keep the conversation positive and message clear and concise.

This open discussion took place on May 16, 2015, during the AIC 43rd Annual Meeting, May 13–May 16, 2015, Miami, FL. The moderators organized and led the discussion and recorded notes. Readers are reminded that the moderators do not necessarily endorse all the comments recorded, and that although every effort was made to record proceedings accurately, further evaluation or research is advised before putting treatment observations into practice.

Q: What do you consider some of the most important information to stress during training of general library staff?
McCann: Training staff to guide users in safe handling of library materials is key. It is also important to make sure everyone knows they have a role to play in keeping library collections safe.

Q: How do you reach the public and pass preservation best practices on to them?
McCann: Bookmarks and table tents can be used to communicate concise information.
Participant: Using cartoons and humor to educate the public can be very helpful.

Q: How do you make sure your training is working?
McCann: For the access services staff training we track training session attendance and the number of books selected for preservation. We also work with the special collections staff to make sure they speak with us if they see that something isn't right.

Q: How long do you think a training session should be?
McCann: That depends on the group you are training. Preservation and special collection staff seem to get the most out of longer, smaller group sessions. Positions outside of the preservation lab with high turnover should receive shorter training sessions.

Q: What is the best way to supplement training outside of the actual in person sessions?
McCann: Short videos could be uploaded to the Internet to be accessed from the web at any time. Making things simple and user friendly is a top priority for training support materials.

Laura McCann, Conservation Librarian, Barbara Goldsmith Preservation & Conservation Department, New York University Libraries

DAWN WALUS
OUTREACH AND ACCESS: A TOPIC ON COMMUNITY AND MEMBER OUTREACH

The Boston Athenaeum, an independent institution with library material and cultural history revolving around New England, was founded over two centuries ago. The institution holds the mission of serving its members, community, and scholars all over the world with community outreach at its core. The conservation department believes that this community outreach is vital to foster interest in and an understanding of the role that conservation plays in protecting the Athenaeum's collections. Rather than hiding themselves away from the public, they work hard to keep conservation in the eyes and minds of members. There are small scale and large scale measures to implement and establish community outreach programs and policies within the institution. This is done through various events and an open attitude by the conservation department in conjunction with the other departments at the Boston Athenaeum.

An active social calendar is the key for such a successful community outreach program at the Boston Athenaeum. Talking to members, advertising, giving public tours, and in general "putting out the work" are basic steps the Boston Athenaeum is taking towards community outreach. Other events that the Boston Athenaeum hosts are rare books readings, discussion groups, lectures, and performances. The Boston Athenaeum's conservation department also holds exciting and creative events throughout the year especially to invigorate patrons and donors of the institution. For example, the Athenaeum hosts an annual "A Conservation Evening" where books and materials in need of conservation work are set out for the event so that donors can pledge the cost of treatment (with the option of gifting in the memory of a loved one). The books treated during the previous year are on display as well, giving the potential donors the opportunity to see firsthand how their donations benefit the collection. Events like these encourage patrons to recommit and remain involved members of the Boston Athenaeum.

In addition, the Boston Athenaeum allows occasional opportunities for visitors/members to tour the whole of the institution. For example, recently the institution has held a public "open house" event and have been quite the successful with about 1,000 visitors (and about a quarter of whom visited the conservation lab). This allowed visitors to tour areas normally accessible only by members or through invitation only. The doors of the conservation department at the Boston Athenaeum have clear glass so that visitors can watch treatments being performed and become interested in the work being done in the conservation lab. Members are free to knock on the lab door for admittance to ask questions and learn more about the department. The conservation department further extends itself to members through a digital photo frame outside the department on which viewers can see images of the work that the conservation department has completed.

The community outreach program is designed for visitors of all ages, including young children. The Boston Athenaeum has a reading event for children once a month and supplies them with a swag bag. The conservation department hosted a series of hands-on events where children were educated about book conservation, the proper handling of library materials, book binding and making paste paper. The students from the Commonwealth Children Center even took what they learned back to the classroom where they established a "Book Hospital." Though these are younger visitors who can't immediately contribute to the department, instilling an early love of books and appreciation for conservation is clearly a long-term benefit to the lab and the Athenaeum as a whole.

In addition to outreach with the public, the conservation department is committed to giving back to the field. They have an ongoing intern program, fellowships for graduate students, and a summer institutional exchange program with several partners like The North Bennett Street School. These efforts provide an exchange of knowledge that helps improve the department, the institution, and the field as a whole. Besides supporting fellow emerging conservators, scholars from all over the world are invited to study from the special collections and they too are supported through select fellowships awarded by the Boston Athenaeum.

The Boston Athenaeum's interactive approach to community outreach sticks. The conservation department, which celebrated 50 years in 2013 has repeatedly shown a deep investment and creative approach to engaging the community. As a result, those of all ages and all levels of involvement with the Boston Athenaeum not only become aware of the conservation department, but also help to propel it forward.

Q: What group of visitors did you find most challenging to reach?
Walus: Today's world is filled with technology, so those that are constantly glued to their phones, like teens for example, are difficult to reach. The key to reaching this group is extracting their curiosity in the subject matter.

Q: So is it safe to say that the Boston Athenaeum has an open door policy for members to come into the conservation lab?
Walus: I wouldn't say it's an open door policy since we don't advertise it as we would never be able to get work done in the conservation department if we did. There is a sign on the door that says members can knock to be admitted into the lab to learn more about the conservation work. Non-members must make an appointment to tour the conservation lab.

Q: What are the biggest challenges in your role in community outreach?
Walus: Arranging events certainly takes work and at times it requires me to work weekends so you and those around you have to be flexible. That is also in a way a benefit to this job.

Q: Are there any activates or ideas you all are looking into to further your already very successful communities outreach program?
Walus: When planning events for the lab, I like to combine the hands-on aspect of conservation related technologies with other events at the Athenaeum. For instance, if we are exhibiting a rare book show in the gallery, perhaps, over the course of the exhibit, the conservation lab will hold a bookbinding workshop.

Dawn Walus, Chief Conservator of the Boston Athenaeum

SUZANNE MORGAN
CONSERVATION IN THE COMMONS: USING SOCIAL MEDIA TO TELL OUR STORY TO THE PUBLIC

Social media platforms offer conservators a new way to reach out to the public, to interest them and to inform them. For most conservators, using social media requires only an investment of time, since the platforms are easily accessible on technology that already permeates our lives and most of the accounts are free. The internet is full of tutorials on how to start up your social media presence and how to make the most out of the different platforms. So, how do you develop a successful following?

Don't overcommit. Start slow and build from there. Recognize that social media is a global community and comments will come at all hours of the night, but you do not have to reply immediately. You have to set your own boundaries to avoid getting swamped. There are many different venues, all of which are constantly emerging and evolving—find the one or two that make sense for you and your work. Keep it fun, but be consistently responsive. You also have to invest time in staying current, relevant and connected. Social media is all about interaction. Follow fellow conservators and institutions and chances are they'll follow you in return. In fact, don't just follow. Be an involved part of the conversation—repost, link and comment.

Don't be afraid to experiment. If something doesn't work, try something else. Your audience expects change. Keep an eye out for successful campaigns and apply their tactics to your own. Librarians and scientists have been especially good at using social media to mold public perception of their fields. Talk the talk and walk the walk—use memes, intriguing pictures, and videos. Keep it short and sweet, but cross-pollinate by linking with other more traditional online venues like blogs. Be human. Allow yourself to be as serious or silly as you want to be, all on one platform.

Don't go it alone. If you work for a large institution, seek out those who run the official social media accounts and offer content to get conservation under their spotlight—generally institutional accounts have a much larger following already. Use pre-existing trends like #shelfie days to tie yourself into the larger social media culture. Make full use of the technology to schedule posts to avoid floods and droughts.

Ready to dive in, or just want to find colleagues? Check out this list of conservators already on social media and add yourself. http://conservethis.tumblr.com/list

Q: What are your recommended social media sites?
Morgan: I use Twitter, Tumbler and Vine, but everyone is different and should explore all their options. Some other popular venues currently out there are Facebook, Instagram, and Pinterest.

Q: How do you deal with your institutional bureaucracy to get permission to represent them on social media?
Morgan: At my university, we have marketing staff dedicated to promoting the institution on twitter. I feed them content for the official account, and use my anonymous personal account to supplement that unofficially. I would recommend approaching someone in the university like our marketing staff would be a good first start. Give them content, build a rapport. If they let you interact with the public in your job, social media isn't a big leap. If you need to build a case for social media at all, show them successful campaigns like Emily Graslie at the Field Museum.

Q: How much time does it take per day?
Morgan: Not a lot of long stretches of dedicated time. I tend to do it in little snatches of time on breaks and before work. Again, I'm not using an official account. But you can set your own speed. Personal/Professional creep is a concern, you should try not to feel obligated. It's OK to have a life. And you can use tools like HootSuite and TweetDeck to schedule posts for a later date if you have a lot of good ideas all at once.

Q: How do you stay current on all of the incoming content from social media?
Morgan: I limit myself to a few pages of the most recent content. Trying to read everything everywhere is impossible.

Q: When is the best time of day to post to get more followers?
Morgan: I think everyone is different, but after you have been doing it for awhile, you can use Google Analytics to look for spikes in usage over time. That information can help you adjust when you post for maximum impact.

Suzanne Morgan, Preservation Specialist, Arizona State University

ANAHIT CAMPBELL
Book Conservator
University of Wisconsin
Milwaukee, WI
anahitmarina@yahoo.com

DANIELLE CREECH
Associate Conservator
HF Group/ECS Conservation
North Manchester, IN
dcreech@hfgroup.com

JACQUELINE KECK
Student, Pre-Program
jnknqb@mail.umsl.edu

AMÉLIE COUVRAT DESVERGNES

Skin Against Paper: Identification of Historical Interleaving Materials in Indo-Iranian Manuscripts

ABSTRACT

When we handle manuscripts or books, we often find various sort of materials placed between the pages to prevent the illustrations from pigment or ink offsetting and charring. These are not always poor quality or modern materials, but are sometimes part of the original conception of the objects. Some Iranian illuminated or illustrated 19th century manuscripts were supplied with a particular kind of interleaf made of thin sheets of skin. The Museum of Islamic Art in Doha, Qatar, houses three manuscripts containing these specific sheets and one copy of a Qur'an whose folia are penned on similar material. Catalogues often mention these sheets to be of gazelle or deer skins, but recent analysis conducted throughthe 'Books and Beasts' project at York University in the UK, has identified the species of the animal and corrected this assertion. The new and non-invasive technique developed by the team consists of collecting the eraser waste generated while dry cleaning a parchment surface with a plastic eraser, and analysing the collagen molecules from the scrubs through protein mass spectrometry with the MALDI TOF instrumentation. Several samples from the above manuscripts reveal that sheep skins were used and, due to the thickness of the skins, it is most likely that that these were the result of skin splitting.

While the study of this material may appear insignificant at first sight, it provides unexpected insight into book materiality at the turn of the 19th century in Iran. At that time, the Qajar rulers (1785–1925) promoted the adoption and expansion of innovative European technologies, and the renewal of artistic developments alongside cultural and diplomatic exchanges. Hence, this essay attempts to shed light on how interleaves eventually appeared to be used in manuscripts and why sheep skin was the material used, while exposing the various usages of thin skins in Central Asia and in Europe. Some links are also established with the practice of interleaving in western cultures from medieval times, where silk curtains were often inserted into lavish religious codices, until the industrial era when the illustrations of printed volumes, as well as photographs and drawings collected into albums and scrapbooks, were protected with thin, and translucent papers.

Presented at the Book and Paper Group Session, AIC's 43rd Annual Meeting, May 13–16, 2015, Miami, Florida

INTRODUCTION

This essay illustrates one aspect of on-going research surrounding the historical interleaving materials encountered in Islamic manuscripts. When we, conservators, scholars or curators, examine western or eastern manuscripts, we often find various sorts of materials inserted between the folios. These are meant, on one side, to protect the illuminations and the illustrations from abrasions and erasures and, on the other side, to keep the facing pages free from pigment offsetting and charring. When the quality of those materials is poor, however, we are often tempted to remove them as they generally damage more than they protect. In most cases, they are modern, non-archival materials such as glassine, acidic paper or plastic sheets placed by supposedly attentive readers.

The use of interleaving materials within Islamic manuscripts as part ofthe original conception of the book is rather a recent practice, dating from the 19th century. Through various examples found in the collections of the Museum of Islamic Art in Qatar, three main groups of usage were determined which correspond with three geographical areas: the Indo-Iranian regions with the use of very thin skin sheets, the Maghreb with dyed paper, and the Ottoman Empire with coloured and gilded translucent sheets. While the latter two are still undergoing research, this paper intends to present the outcomes of the most recent research among these three groups: the interleaving sheets made of skins that have been found in some manuscripts from Iran to north India. Through the examination and scientific analysis of four manuscripts, including both religious and secular, it is possible to correct misconceptions by identifying the real nature of the material used for writing support and interleaving throughout the course of the 19th century. Indeed, in some modern publications, catalogues and museum website entries there appears to

be much confusion, as the support is either mentioned as deer or gazelle skin or even snake skin. This needs to be clarified in order to better contribute to the understanding of Islamic manuscript materiality, since little research has been undertaken regarding manuscript production in its latest developments, particularly during the Qajar dynasty in Iran (1784–1925).

EXAMPLES OF SKIN INTERLEAVES IN IRANIAN MANUSCRIPTS

The first relevant example of skin use can be found in a copy of the *Divan* (a compendium of poems) of Hafez[1], dated 1812, and copied during the Qajar era (acc.no.MIA.2014.190). The illustrated and illuminated pages at the beginning of the volume are faced with sheets of very thin skin (Fig. 1). The skins remain semi translucent and very flexible, allowing the full page illustration to be visible. In this copy, it seems that the interleaves are contemporary with the text block since there are no visible traces of restoration or rebinding.

Another Qur'an copied in Bagdad during the 13th century (acc.no.MS.376.MIAQ) was restored and redecorated in a north Indian workshop in the 19th century. The manuscript was re-bound with a magnificent Indian binding. The two final end leaves show two watermarks, a crowned bear holding an axe and the monogram ЯМВСЯ, referencing the Russian provenance of the paper. It was produced in Yaroslav city in the Volga region and the monogram stands for "Yaroslavlskaja Manufaktura Vnukov Savvy Yakovleva" (Yaroslav Factory of the Grandsons of Savva Yakovlev). Russian papers were widely imported to Iran between the late 18th to 20th centuries, for the purpose of book production or refurbishment. Many loose animal skins were inserted between the pages, some of which feature the shape of the animal wherein the leg and back are partially visible (Fig. 2). It is also interesting

Fig. 1. Copy of the Divan of Hafez, acc.no. MIA.2014.190, 151 x 97 mm, the interleaf protects the full illustrated page.

Fig. 2. Copy of the Qur'an, acc.no.MS.376. MIAQ, 285 x 178 mm, the text block contains many loose interleaves whose some parts of the animal shape are still visible.

Fig. 3. Copy of the Qur'an, acc.no.MS.376. MIAQ, some tears of the pages were mended with patches of skin on which the text had been re written.

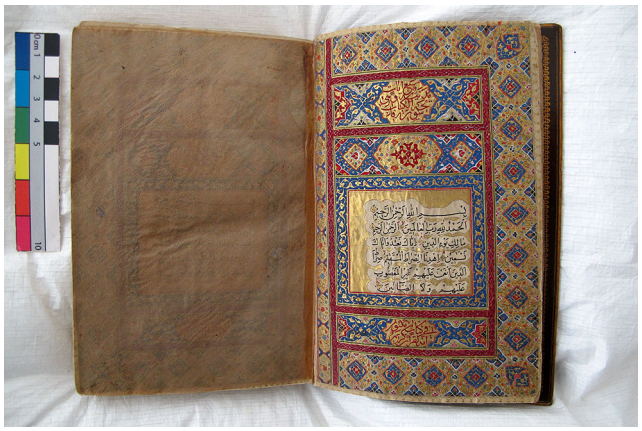


Fig. 4. Copy of the Qur'an, acc.no.MS.366. MIAQ, 155 x 105 mm, the interleaf that protects the full illuminated page has discolored probably due to the oxidization of oil or varnish applied en surface to enhance the support transparency.

to point out that strips of similar membrane were pasted to repair the tears of the folios (Fig. 3). One can wonder about the efficiency of this material since some of the interleaves do not even cover the text area. Their rough and crumpled surfaces can even cause damage to the original support and pigments.This leads us to think that they might consist of recycled materials. Nevertheless, the presence of hairs on the surface and the arrangement of follicles in some areas indicate that the de-hairing process was incomplete.

In a luxury Iranian Qur'an (acc.no.MS.366.MIAQ) dated 1784, lavishly illuminated pages are protected by a similar material. Unlike both copies presented above, however, the membranes have discolored while ageing (Fig. 4), due perhaps to an application of oil or varnish as a means to enhance the support transparency. Over time the varnish has oxidized and the skin has turned yellow. A simple observation through microscope or transmitted light offers insight into the material's process of production (Fig. 5). The strokes and marks have certainly been caused by a blade, while the skin was mechanically split to produce a couple of thin sheets. The round holes may be the result of insect bites which became larger when the skin was scraped and stretched, or accidents due to the hand of the craftsman. These were mended with small patches of the same material which indicates that the repairs are contemporary with the use of the skin. The manuscript, earlier than the previous ones, was most probably restored in Iran during the 19th century: the original binding was replaced by the extant Qajar style lacquered binding. Hence it can be assumed that the interleaves were added during the restoration, these being pasted along the gutter of the illuminated folia and not sewn into the text block.

These examples are not isolated cases. In the Heidelberg University library, a *Shahnamah* copy from Kashmir, dated 1819, shows about 90 full-page illustrations that are covered with similar interleaves (Fig. 6). This volume, therefore,

Fig. 5. Copy of the Qur'an, acc.no.MS.366. MIAQ, with transmitted light, the interleaf shows characteristic marks probably caused by the action of a blade; the holes were mended with a similar type of skin.

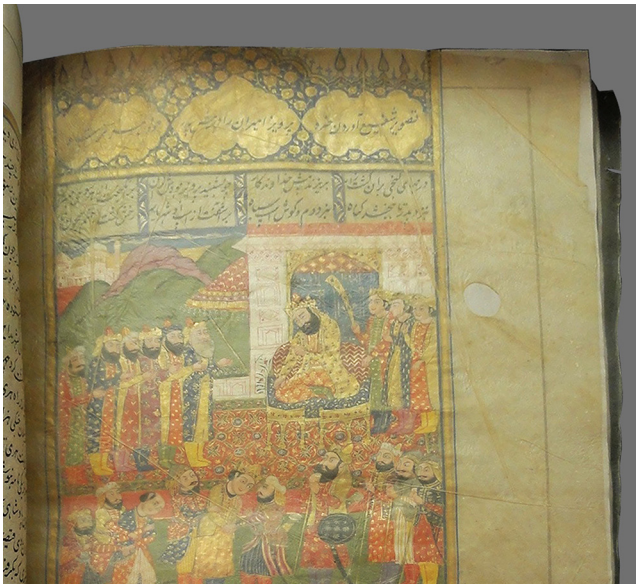


Fig. 6. Copy of the *Shahnamah* of Firdausi from Kashmir, c.1819, acc. no. Cod.Trübner 8, 440 x 265 mm, the large illustrated folios are covered with skin interleaves. Credit: Universitätsbibliothek Heidelberg, Germany.

exemplifies the adoption of this practice for a particularly large volume copied in north India[2].

USAGES OF THIN SKIN MATERIALS IN THE INDO IRANIAN CONTEXT

There are four main uses of very thin skins in the Indo-Iranian artistic sphere throughout the 18th and 19th centuries. The goldbeaters' skins were traditionally used for the manufacturing of gold leaves. These were made from the outer membrane of cow intestines which were stripped off and stretched to produce very thin and transparent materials with great tensile strength, resistant to tearing under heavy beating. The thickness usually ranged from 0.05 to 0.10 millimetres. These sheets were then placed between squares of gold leaves in a booklet which, once closed, was hammered out to shape the gold leaves.

The Qajar dynasty saw the emergence of miniature Qur'ans written on a very thin skin support, whose height reached no more than 10 centimetres and the width measured up to 6 centimetres. These precious manuscripts, penned with minute script, were not really meant to be read and opened but, rather, to be used as personal devotional objects while being kept in purses or metal cases against the body. Many museum or auction catalogues state the support as being from either deer or gazelle skins, sometimes goldbeaters' skins, snake skins, or simply thin membrane or parchment. In some copies, the support is so fine and transparent that the copyist could only pen the words on one side of each folio[3] (Bayani, Contadini, Stanley 1999). However, inthe Doha miniature Qur'an the pages are written on both sides (acc. no.MIA.2014.415). The support features an arrangement of hair follicles in clusters that are clearly visible to the naked eye, indicating that it is indeed made of skin and not guts (Fig. 7).

Further objects made from thin skins include talismanic charts. These are dated to the 18th and 19th centuries and were produced in Ottoman and Qajar ateliers. It seems that skin was favoured by the Iranian workmen whereas paper and textile was preferred in Turkey. Three charts found in the Nasser D. Khalili Collection catalogue mention "parchment, perhaps gazelle skin" as a material description (Maddison and Savage-Smith 1997)[4]. They were decorated with various writing and symbols such as Quran'ic verses, the 99 names of God, and magic squares and numbers to warn off diseases, the evil eye, the devil and misfortune. The size of these charts was quite large, the biggest measuring roughly 80 centimetres high by 70 centimetres wide. The items were used as amulets, folded several times to reach a small rectangular packet to be placed into a container, household objects such as boxes or mirror cases or held on the person. The thin skin was probably more flexible, lighter and less prone to tearing with repetitive folding than paper.

The *charbah*, very thin and transparent supports were used as tracing. The outlineof a composition was pricked and reported onto paper for a finished painting by pouncing (Chowdry 2008). Some *charbah* are still found today in collections and are precious testimonies to understanding the techniques of miniatures paintings. The various annotations often found on these supports and the alterations in the composition, from the original sketch to the final version, also provide great insight into the artistic development of an object. As for the Portrait of Sheikh Hasan Chishti from the Victoria& Albert Museum[5] and the portrait of Buhlol Dana Ghazn from the Harvard Art Museum[6], both dated to the 18th century, gold beater's skin and deer skin respectively, are mentioned in the catalogue entries. It seems that the nominations are confusing and reflect a lack of knowledge for this material due to the fact that no scientific analysis has been conducted on these materials.

Fig. 7. Copy of a miniature Qur'an, acc.no.MIA.2014.415, the writing support is made of sheep skin whose hair follicles are clearly visible in the right hand folio.

Nowadays deer and gazelle skins are said to be still used by calligraphers and copyists in Pakistan and North India. When I visited the Iranian Cultural Centre in New Delhi in 2008, the artists ensured me that the contemporary works and calligraphy are executed on deer skins (Fig. 8). Modern book binders still claim to employ this material in addition to snake skin as interleaves or writing support, as seen in a Lahore modern book bindery (Soteriou 2002). These materials are called, in Urdu, *hiran* (deer) *kechelli* or *nag* (snake) *kechelli*. These expressions are difficult to translate since *kechelli* can be interpreted differently depending on the spelling and the context. Some may translate as "Follower of the deer/snake", whereas others may think of "clothing/skin of the deer/snake", *chelli* meaning blouse. The recipe, however, is briefly described in Alexandra Soteriou's essay (Soteriou 2006), having been kept in secret for centuries and only taught by word of mouth. The skin is removed while the dead body is still warm, and is then stretched and scraped on a frame. The recipe further explains the application of a mixture made from various ingredients including antibacterial, conservative and softening properties

Fig. 8. Iranian Cultural Centre in New Delhi in 2008, artists today still produce calligraphy on a long scroll, supposedly made of deer skin.

such as red tree sap, gum Arabic, chloroform, salt and aromatic ammonia. However, no mention is made of possible lime treatment of the skin for de-hairing and fat removal. According to Soteriou, deer skin is supposedly still manufactured today in Billimaran, a section of Chandni Chowk, the Muslim bazaar in old Delhi.

SCIENTIFIC IDENTIFICATION OF THE SKIN MATERIALS FROM THE MIA MANUSCRIPTS

Confronted by this mass of information, it sounded interesting to scientifically identify the real nature of this material while attempting to analyse its components. The Books and Beasts Project based at the University of York and its founding members, Professor Matthew Collins and Doctor Sarah Fiddyment, have developed a method to identify the species of the animal used to make parchments. This novel, non-invasive technique consists of collecting the eraser waste generated while dry cleaning a parchment surface with a plastic eraser (Staedler Mars®) and analysing the collagen molecules from the scrubs through protein mass spectrometry with the MALDI (Matrix-Assisted Laser Desorption/Ionisation) TOF (time-of-flight mass spectrometry) instrumentation. The results given by the identification of more than 900 samples contribute to the understanding of book materiality, and provide historians with valuable information about European geographic distribution of livestock and animal preference for codices and archival records. In July 2014, several eraser samples of each manuscript described above were sent to York and the outcome of the tests revealed that all of the interleaves were made from sheep skins. Regarding the extreme thinness of the support, the materials were certainly obtained from the splitting of the skins. A split skin is a skin which has been delaminated manually with a blade to produce two supports. The use of sheep hides makes sense, as this animal was easily available and cheap, and its skin can delaminate easily due to the presence of abundant fat cells and its natural spongy quality. The skins were probably prepared like parchment: after soaking in a solution (enzymatic bath made of fermented organic materials or alkaline chemical bath such as lime), the epidermis was removed, keeping only the dermis as main support. The fat cells present between the reticular and the papillary layers of the dermis contain abundant fat cells which swell in the solution. Once the cells are swollen and weakened, both layers can be easily split. These are then stretched onto frames.

The data was compiled in a table in order to compare the features of the analysed sheep skin sheets (Fig. 9). The thicknesses ranged from 0.03 to 0.05mm which is fairly thin, whereas non-split sheep parchments range from 0.07 to 2 mm. For comparison, the right column displays the paper thickness of the manuscript pages which vary from 0.09 to 0.12 mm.

While today gazelles are an endangered and protected species in Pakistan and India, they were very widespread in the past when many different species of cervids were encountered in the vast territories from Iran to India. Many miniature paintings depict the animal being hunted by rulers, kings or mythical heroes. Technically, any kind of skin can be processed as long as it is free from hair, flesh and fat with specific chemical treatment such as washing, stretching and thinning produce a thin membrane. If deer hides could have been used at some point for particular use, they might also have been a selling point for art dealers, as deer sounds more exotic and precious than any domestic species.

Alongside protein spectrometry, x-ray fluorescence spectroscopy (XRF) was also conducted directly on the membranes by using a handheld XRF Olympus Innov-X Delta Premium with a 4W, 40kV Rh anode X-ray tube. This non-destructive technique allows for identifying non-organic components such as potential chemical compounds involved in the skin manufacturing. In each manuscript, two different interleaves were analysed, so each graph shows two spectra superimposed (Figs. 10–13). In all of the interleaves Sulphur, Chlorine, Potassium and Calcium were found in different quantities. From the nineteenth century onwards, chlorine was used in parchment manufacturing as disinfectant agent.

Manuscript Acc. No.	Date	Type of manuscript	Type of interleaf	Interleaf thickness in millimeters	Paper folio thickness in millimeters	Species identified with protein mass spectrometry
MS.376	13th c.	Qur'an refurbished in the19th c.	Loose	0.04–0.05	0.09 borders	Sheep
MIA.2014.190	1812	Poems, no traces of restoration	Pasted along the gutters	0.03–0.05	0.08–0.10	Sheep
MS.366	1784	Qur'an, restored in the late 19th c.	Pasted along the gutters	0.03–0.04	0.09–0.12	Sheep
MIA.2014.415	1875	Miniature Qur'an, no traces of restoration	Writing support	0.4–0.05		Sheep

Fig. 9. Description of interleaf features.

The presence of calcium highlights a possible lime treatment of the skin. Potassium might have been used in the process as well. The presence of sulphur is certainly representative of the atmospheric sulphur dioxide pollution which forms sulphuric acid so relevant to parchment degradation.

THE USES OF THIN SKINS IN EUROPE

It seems that the knowledge of how to split skins existed as far back as the Talmudic period in the Near-East, in order to optimize the skins by obtaining two writing supports from a single skin. Beforehand, the hides were probably swollen in fermented enzymatic baths to ease the mechanical splitting with long knives (Chahine 2013). Then the flesh and the hair sides were stretched on a frame.

In Medieval Europe, thin parchments were also produced for manuscripts. They were either made from young or stillborn animals, or by mechanical fleshing or splitting. To produce coverings for windows or 'paper' for reports, the hides from young animals were coated with gum Arabic, honey and egg white, in addition to linseed oil or animal glue, and were left to dry under tension. This process would induce the modification of the parchment's reflexion index, thus creating the transparency (Chahine 2013). It then seems that the technique was forgotten during the following centuries until the revival of skin objects during the 17th and 18th centuries. During this period, the demand was diverse but nevertheless quite restricted to specific usages, from the manufacturing of accessories such as pillows, gloves and fans for summer made of sheep or kid skins, to domestic goods such as labels, book covers, bottle caps, and lamp shades.

During the industrial era, transparent papers produced with chemical treatment such as immersion in acid baths, or pulp overbeating and surface super calendaring, replaced skin supports.

Little research has been carried out on the development of industrialization throughout 19th century Iran, particularly on the adoption of western artistic technologies. Few accounts discuss the domestic leather and paper industries. The tanning industry was a vital and fruitful economy throughout the whole period for footwear, clothing, horse tack and everyday goods, the main production centers being Hamadan, Mashhad, Isfahan and Tehran. Products were widely exported to neighboring countries, and commercial exchanges with Russia were frequent and lucrative (Floor 2003). No study, however, relates the state of leather and parchment production to book binding and artistic activities. Throughout the Qajar period, book production significantly decreased in favor of other forms of art that are described below. Moreover, lacquered covers in vogue at that time supplanted the traditional boards laid of decorative leather. In this context, it is quite intriguing to see the emergence of skin as it had never been in demand for books in prior centuries. This material enabled new possibilities such as the production of tiny manuscripts. The skin being much thinner than paper, it allowed for more pages and less bulk in comparison with a copy written on paper. It seems quite natural therefore, that this material was also used as interleaves for the same reasons.

THE INTERLEAVING PRACTICES FROM WEST TO EAST

Very little has been written on the practice of interleaving in western books. Nevertheless, during the medieval period, the rich ornamentation of deluxe religious codices was protected by silk curtains stitched onto the pages. The first uses of these silk curtains dates to the 11th century, but it remains debatable whether they were in fact later alterations. It would seem, however, reasonable to assume that silk was favored since it was smooth and flexible, and therefore easy to fold over. Although silk was not a transparent material, it was used

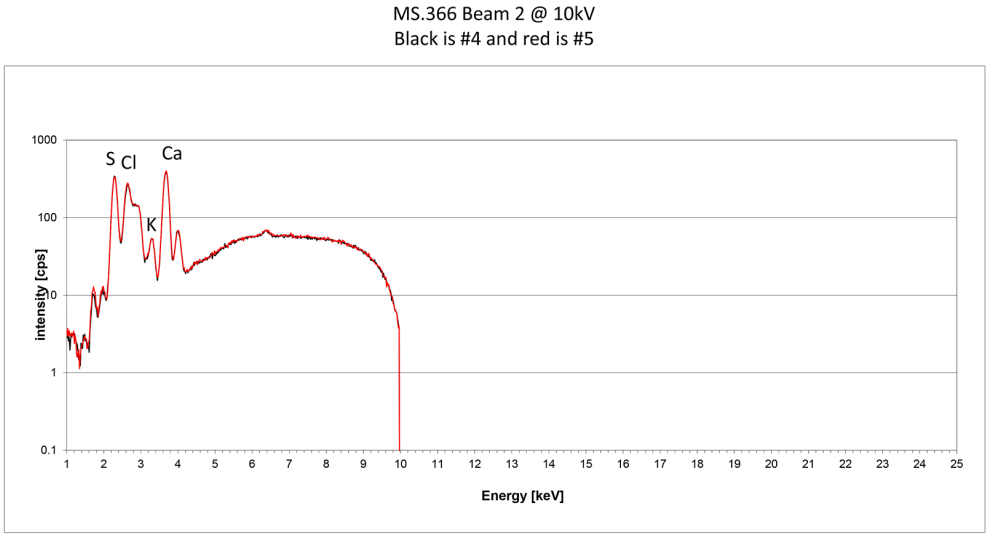


Fig. 10. XRF spectra of MS.366.MIAQ, copy of the Qur'an, under 10 kV beam.

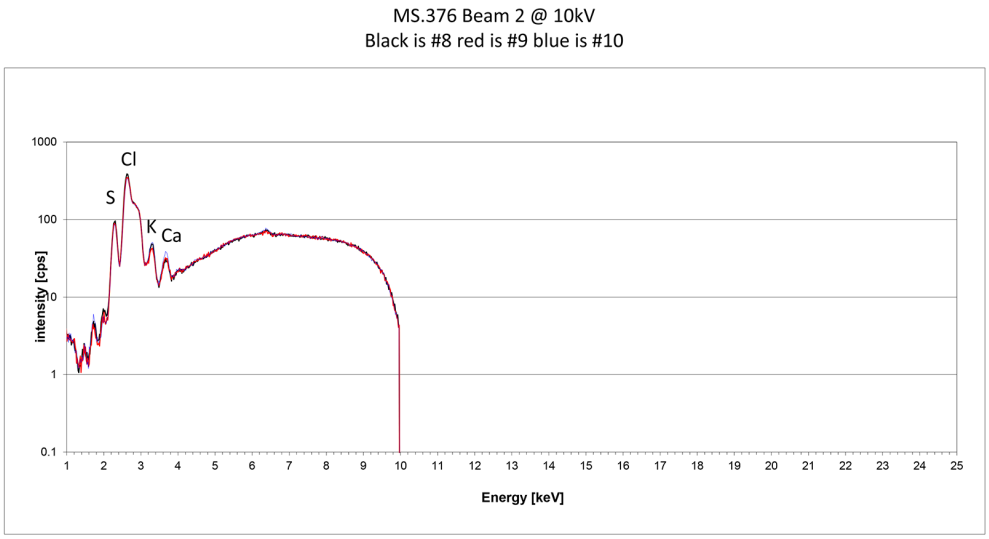


Fig. 11. XRF spectra of MS.376.MIAQ, copy of the Qur'an, under 10 kV beam.

intentionally as a protective barrier between the viewer and powerful or disturbing images. Furthermore, such interleaves served the didactic purpose of physically engaging the reader with the book by asking him or her to manually flip over these protective sheets (Sciacca 2007). Today, with repetitive handling and the fragility of the silk, these curtains are crumpled and deteriorated and no longer seem to provide the efficient protection as was first assumed.The use of silk or linen curtains did, however, continue throughout the 16th and 17th centuries for secular volumes such as the Guild Book of the Barber Surgeons of York, housed in the British Library where portrait busts of English sovereigns from Henry VII to Elizabeth I stood, also protected with green pieces of silk[7].

Paper interleaves first appeared in manuscripts or printed books from the end of the 17th century onwards (Lafitte 2007). At that time, printers and book publishers were aware of the damages caused by ink discharge. Therefore, guard sheets or loose pages were sewn into the bindings or inserted between the folios. These were made of extremely thin laid paper. These leaves were obviously not transparent but they were thin enough to not cause any bulk to the text block and to perceive the illustrations underneath. Over the course of the 19th and 20th centuries, interleaving was mainly used for deluxe editions of printed volumes which were usually supplied with various types of machine-made paper. Glassine paper became a cheap alternative since it was smooth, thin,

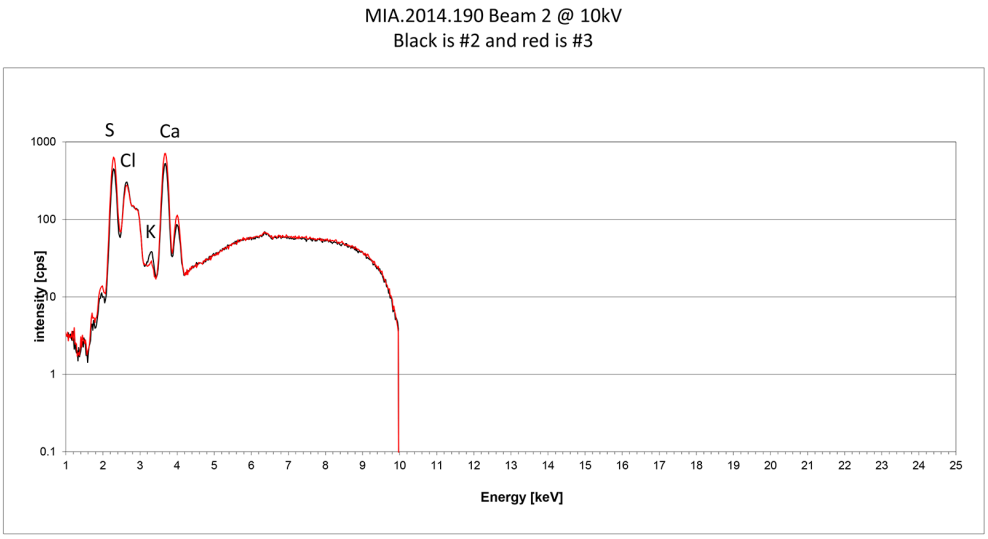


Fig. 12. XRF spectra of MIA.2014.190, Copy of the Divan of Hafez, under 10 kV beam.

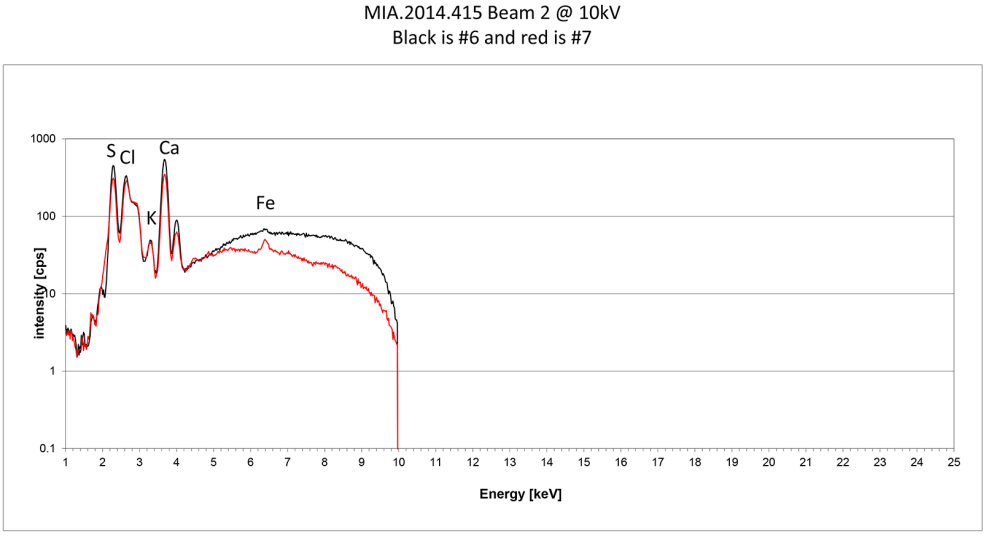


Fig. 13. XRF spectra of MIA.2014.415, Copy of the Qur'an, under 10 kV beam.

resistant and translucent. It was produced by super calendaring, where the paper was compressed through a series of alternating steel and fibre-covered rolls so that the paper fibres would flatten while still facing in the same direction.

From western books to Qajar manuscripts, how did the practice of interleaving emerge in the history of Iranian book materiality? Throughout the 19th century, the Qajar emperors, eager to modernize the country and ascend in the international scene, promoted the adoption and expansion of innovative European technologies in the fields of industry, sciences and art. Many refined western objects reflecting the creative effervescence of the 19th century were offered to the shah via diplomatic and military envoys, and inspired the renewal of Iranian production. Iranian artists and craftsmen were sent to France, Italy, England or Russia to be trained and to learn new techniques. Official court art met new developments in forms, techniques and aesthetics. New media such as large-scale oil painting, photography, and lithography introduced simultaneously in the 1820s and 1840s were used by the rulers to promote their international image.Nassir al Din-Shah (1848–1996) was so passionate about photography that he used himself as a subject to immortalize the members of the royal family. Under his reign, several professional or amateur photographers such as the Italian Luigi Pesce or the French Jules Richard were encouraged to record public events, historical monuments and sites from expeditions, and a broad

spectrum of Iranian society. They also assembled photography albums to be offered as gifts for the shah. In 1858 the Royal Photography atelier was established in the Golestan Palace (Tamasbpour 2013). It is then recorded that Nassir al Din Shah owned 1,039 albums and today 1,000 of them remain stored at the Golestan Palace (Scheiwiller 2013). Of those, 34 albums were sent from Europe as diplomatic presents (Diba 2013). It is not easy to identify the features and patterns of those albums and to determine whether they were made and purchased in Europe or *in situ*. While the history of photography in Iran is today well documented, very little is known about the supplies and the production processes. Scrap books were also introduced in Iran and the art of compiling and collecting drawings, paintings and photographs began to develop in high society. In Europe, the 1860s marked the beginning of the mass production of various types of photographic albums: *carte de visite*, then cabinet cards and snapshots. Albums and portfolios bought from the art suppliers or stationers were also used to compile drawings and lithographs which were pasted directly onto the pages. Overall, there existed a wide variety of albums in terms of layout and design, reflecting the skills and liberty of production at that time. Provenance is difficult to trace since there are no stamps or suppliers' labels (Fitzpatrick 2013). To prevent media transfer, the albums were sometimes interleaved, as seen in this volume which compiles scenes from everyday life painted with gouache by different Iranian artists (Fig. 14). Usually these paper sheets were pasted along the gutter rather than sewn, as the material was too thin to be pierced with a needle and the album arrangements did not necessarily accommodate the stitching of interleaves. However, regarding artistic and commercial exchanges, it is not impossible that interleaved photographic albums and deluxe printed volumes reached the Iranian market. If such were the case, they may have raised awareness among book binders and amateurs regarding the preservation of manuscripts, in turn promoting similar practice. The use of skin, however, remains uniquely Iranian originality and is not found in Europe.

Fig. 14. Album, acc.no.MS.772. MIAQ, compiling *scenes de genre* of the Iranian classes. The gouache paintings made by Iranian artists were faced with thin woven paper that have acted as a buffer against pigment chemical degradation as seen on the left hand side.

CONCLUSION

By the 19th century, calligraphers, painters and bookbinders were well aware of pigment and ink deteriorations and their impact on paper. This knowledge was transmitted through centuries of artistic practice, technical expertise and feedback. Several research projects have highlighted that some buffer substances were added to the painting preparation to counteract the harmful action of iron gall inks or copper green pigment corrosion (Barkeshli 1999). However, no physical barrier was inserted into the text block until the second half of the 19th century when European albums and printed volumes started emerging in high Iranian society. Today, this practice is difficult to trace since many albums have lost their interleaves. Chemically and mechanically deteriorated, these interleaves were simply torn out and discarded, as they no longer provided the efficient protection for which they were intended. While sheep split skins have been highlighted, it remains unclear whether these were made in Iran or imported from Europe. Mass spectrometry only allows for the identification of the species and not the breed of the animal, which can only be determined with DNA analysis. The use of interleaves nevertheless exemplifies a growing interest in the preservation of cultural items. Each piece of physical protection should be very carefully recorded and it is our duty as conservators, curators and scholars to make sure that these materials are kept and properly conserved in order to contribute to the dissemination of knowledge about this practice.

ACKNOWLEDGMENTS

The author is deeply indebted to Prof. Matthew Collins and Dr. Sarah Fiddyment from BioArChat University of York and members of the Books and Beasts project for identifying the species with MALDI TOF test. The author wishes also to acknowledge the contribution of Myrto Georgakopoulou and Theocratis Katrakazis from University College London, Qatar for running the XRF analysis and for sharing their expertise. Thanks also go to Claire Chahine (ARSAG-France), Abigael Quandt (Head of Conservation, Walters Museum, Baltimore USA), Olga Yastrebova (research follower at the National Library of Russia, Saint Petersburg), Karin Zimmermann (Deputy Head Librarian of Heidelberg University Library) and Aristoteles Sakellariou (Head of Conservation at the Museum of Islamic Art, Doha).

NOTES

1. Hafez is an Iranian poet and a mystic philosopher born in 1310 and dead in 1337.
2. The whole manuscript is available in the digital version on http://digi.ub.uni-heidelberg.de/diglit/codtruebner8.
3. The Nasser D. Khalili Collection owns 30 folios from Kashmir, Cat.78, QUR 500, written on one side of the support.
4. The acquisition numbers are MSS.756, MSS.734, MSS.735.
5. Accession no.IM.2-1944, see online http://collections.vam.ac.uk/item/O454963/sheikh-hasan-chishti-tracing-unknown/ (accessed 05/19/2015).
6. Accession no.1919.253; see online www.harvardartmuseums.org/collections/object/216765?position=0 (accessed 05/19/2015).
7. See Egerton 2572, online www.bl.uk/catalogues/illuminatedmanuscripts/record.asp?MSID=7581&CollID=28&NStart=2572 (accessed 05/19/2015).

REFERENCES

Barkeshli M. 1999. The use of saffron in Persian miniatures paintings and its preventive role for the destructive effect of verdigris. *ICOM Committee for conservation Journal*. 12th Triennial Meeting, Lyon. France.

Bayani M., A. Contadini, and T. Stanley. 1999. The Decorated Word, Qur'ans of the 17th to the 19th Centuries, part one. London: The Nasser D. Khalili Collection of Islamic Art, The Nour Foundation, in association with Azimuth Editions and Oxford University Press.

Chahine C. 2013.Cuir and parchemin ou la Métamorphose de la peau, Paris : CNRS editions.

Chowdry A. 2008. The studio practices of painters in Mughal ateliers. Symposium on the care and conservation
of Middle-Eastern manuscripts, University of Melbourne.

Diba, L. 2013. Qajar photography and its relationship to Iranian Art: A Reassessment, *History of Photography*, 37 (1):85–98.

Fitzpatrick, O. 2013.Design, Style and Commercial Photographic Albums. In *The Photograph and the Collection: create/preserve/analyze/present*, ed. by G. Farnell, Edinburgh: Museums Ect.

Floor W. 2003.Traditional crafts in Qajar Iran (1800–1925). Costa Mesa, California: Mazda Publishers, Inc.

Lafitte, M.P. 2007. Quelques exemples de serpentes anciennes dans les manuscrits à peintures. In *Quand la peinture était dans les livres*, Ed.by M. Hofmann, E. König, C. Zöhl, Turnhout, Belgium: Brepols Publishers.

Maddison F. and Savage-Smith E. 1997.Science, Tools and Magic.London: The Nasser D. Khalili Collection of Islamic art, The Nour Foundation, in association with Azimuth Editions and Oxford University Press: 110–112.

Scheiwiller S.G. 2013. Photographing the Other Half of the Nation: Gendered Politics of the Royal Photograph Albums of Nineteenth-Century Iran. In *The Photograph and the Album*, ed. Jonathan Carson et al. Edinburgh: Museums Etc: 30–74.

Soteriou, A. 2002.Indian Paper-making: mapping the DNA. *Hand paper making Journal,* 27 (2).

Soteriou, A. 2006.*Gift of the Conquerors: Hand Paper-Making in India*. 2nd ed. Ahmedabad: Mapin Publishing Gp Pty Ltd.

Tamasbpour M.R. 2013. Photography in Iran: a Chronology, *History of Photography*, 37 (1):7–13.

Sciacca, C. 2007. Raising the curtains on the Use of Textiles in Manuscripts. In *Weaving, Veiling and Dressing, Textiles and their Metaphors in the Late Middle Ages*, Ed. by K. Rudy and B. Baert, Turnhout, Belgium: Brepols Publishers.

FURTHER READING

Kirby D.P.and all. 2013. Identification of collagen-based materials in cultural heritage. *Analyst* 138.

AMÉLIE COUVRAT DESVERGNES
Paper and Book Conservator
Museum of Islamic Art
Doha, Qatar
adesvergnes@qma.org.qa
ameliecd@gmail.com

LINDA S. EDQUIST
PRESENTED BY SARAH STAUDERMAN

Lighten Up:
Enhancing the Visitor Experience

ABSTRACT

The Smithsonian's National Postal Museum (NPM) has over 6 million objects in its collection and the vast majority is paper based—fragile, light sensitive and small. Over the years, the biggest complaint we have received from our loyal fan base, stamp collectors, is that so much of the collection is inaccessible to them on exhibition. From the day we opened in 1993, collectors have asked for more philatelic related artifacts to be displayed and the general public regularly asks to see the famous 1918 Inverted Jenny stamp. As a conservator I want to protect the collection from light damage. As a visitor I want to be able to enjoy these rare objects in a space that enhances the museum experience.

With this in mind, beginning with the design of the new William H. Gross Stamp Gallery (which opened in September 2013), NPM focused on how to create a magical space for visitors to engage in a topic, show our most valuable artifacts and still protect them for future generations. NPM addressed some of these concerns by approaching the problem in 3 distinct areas:

- Museum envelope improvements
- Gallery specific solutions
- Object level protection

In the effort to control light damage, we developed four specific tactics based on exhibit and case furniture design and new technological developments within the lighting industry. The strategies include: limiting light exposure through historic windows by embedding images on an interior glass framework; designing and creating vertical pullout display furniture; utilizing lift-up door cases and using SmartGlass™ technology.

In conjunction with UNESCO's Year of Light, I would like to present the decision making process that created the various solutions, the conservation concerns addressed during the entire process and the visitor perspective on the results that were devised. Rather than being afraid of light, it is time to explore other options.

Presented at the Book and Paper Group Session, AIC's 43rd Annual Meeting, May 13–16, 2015, Miami, Florida

Fig. 1. Smithsonian's National Postal Museum (NPM).

INTRODUCTION

The National Postal Museum is one of the Smithsonian's "off the Mall" museums, located on Capitol Hill next to Union Station. (fig. 1) The Postal Square building was designed by the architect Daniel Burnham and opened in 1914. It served as the hub of postal operations for District of Columbia for approximately 70 years when mail was transported across the country on trains.

In the late 1980's the building was renovated and repurposed as a government office building. As part of the renovation project the central lower level and atrium opened in 1993 as the Smithsonian's National Postal Museum. The building houses not only the museum and the Dorothy I. Height Post Office but also the U.S. Bureau of Labor Statistics, Architect of the Capitol and formerly a Capitol City Brewery restaurant. Visitors entered through the Historic

Fig. 2. Museum entrance in 1993.

Fig. 3. Every stamp tells a story.

Lobby to an escalator that took you to the lower level atrium where the museum was located. (fig. 2)

In 2007 the museum had the opportunity to expand the museum floor plan by 18,000 square feet in the space vacated by the restaurant on the upper level and off the Historic Lobby.

The Mission Statement for this expansion project was:

> The Gross Gallery will provide innovative and engaging access to stamps and mail. Its centerpiece will be the National Stamp Collection, featuring stamps and rarities from the NPM collection. It will tell the story of stamp design, production, and use, in ways that will engage and inspire casual and specialized philatelists as well as non-collectors. Other galleries will display permanent, rotating and educational exhibits that tell philatelic stories in the context of themes relevant to visitors.

UNESCO YEAR OF LIGHT

For the UNESCO Year of Light I would like to present the solutions to some of the conservation challenges brought to light in designing the new galleries. At first it seemed a stretch to think that the global perspective presented by UNESCO could be related to the preservation issues of light for those of us concerned with historic artifacts. However, of the 8 goals for the Year of Light—2 of them relate to those of us in the conservation profession.

- Highlight the importance of research both into the fundamental science of light and its applications, and promote careers in science in these fields.
- Highlight and explain the intimate link between light and art and culture, enhancing the role of optical technology to preserve cultural heritage. (UNESCO 2014)

With the Gross Stamp Gallery expansion, the final approach included some very basic preservation practices as well as exploring the new optical technology now available to museums. Rather than being afraid of light, the team was interested in exploring display options for light sensitive historic artifacts within a historic structure "bathed' in light on a rather permanent basis.

PHILATELY

Since I had no idea what philately was back in 1992 when I started work at the Postal Museum, and since most of the staff I have hired over the years have not either, I decided to provide you with this definition from *Stamp Collecting for Dummies*: "PHILATELY Taken from the Greek philos, loving + atelieia, exemption from (further) tax, taken as the equivalent of postage paid; the collection and study of postage stamps, postmarks, stamped envelopes, and so on."(Sine 2001)

Serious collectors are Philatelists and artifacts are Philatelic objects.

Welcome to the World of Stamps where every stamps tells a story. (fig. 3)

WORKING FROM THE OUTSIDE IN

The planning for the new galleries began in 2006 with input from the entire Postal Museum staff, the NPM Council of Philatelist (COP) and a feasibility study by the Smith Group. In the project plan distributed to all stakeholders and exhibit design prospects was this important line: "The gallery's layout and design will reflect the beauty of the space including the exterior exposure of the windows facing north, and architecturally, the most significant, side of the Postal Square Building" (Ganz and Piazza 2009, 9). Also, "The museum wishes to avoid creating excessively low light levels that might adversely influence the visitor experience" (Ganz and Piazza 2009, 10).

Not easy goals for a conservator who is concerned with the long-term care of the artifacts.

Figure 4 shows the general plan for the museum – the upper portion of the plan is the original footprint of the museum and the lower is the Gross Stamp Gallery and

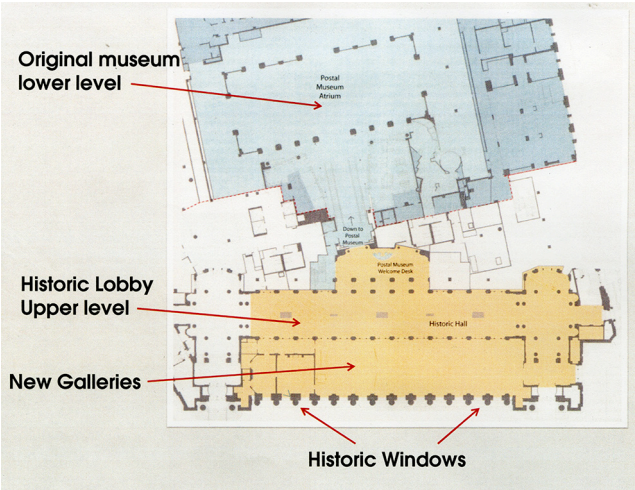


Fig. 4. Layout of the 2 levels for the NPM galleries.

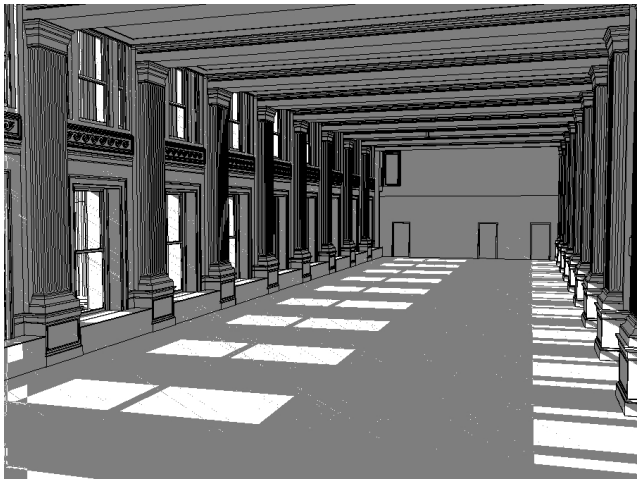


Fig. 5. Light study for new galleries, winter solstice at noon.

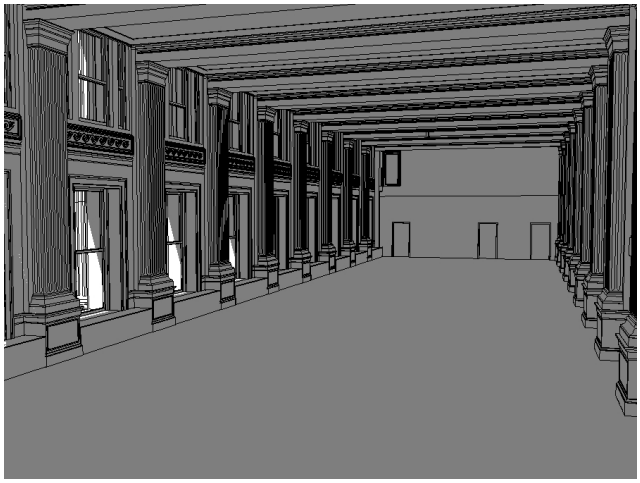


Fig. 6. Summer solstice at noon.

Fig. 7. Constructing barrier walls to block sunlight.

the Historic Lobby. The south facing windows face onto Massachusetts Ave—facing the north side of the Capitol. It is the historic two-story windows that create the first major challenge for the control of light in the galleries. (Fig 4)

HISTORIC EXTERIOR WINDOWS

The museum was lucky to have enough time before completion of construction plans to conduct a year-long, solar tracking and light penetration study which would provide the data required for designing the lighting control strategies. We tracked by seasons, starting with the period of greatest sunlight penetration which was late October to the end of January when afternoon sunlight is aligned to shine directly into the galleries. (fig. 5)(fig. 6) This information was used to determine where barrier walls would be constructed relative to the location of the most-light sensitive artifacts. (fig. 7)

Suzanne Keene stated in her book, *Managing Conservation in Museums*: "Conservators and museum managers still need to create the political will to take greater account of the long-term functions of museums, to balance that for the more obvious short-term benefits of display and exhibition and interaction with audiences" (Keene 2002, 248).

As a conservator, the challenge was to embrace the goals for the project yet work with the curators, exhibit designers and fabricators to create a space that would also protect the artifacts. Embracing the team approach by listening, building consensus, we found solutions that would benefit the entire project and most of all, our visitors. I was lucky that the team saw the importance of ensuring that conservation was part of these discussions from the beginning of the project.

In the initial decision making process, the team started with the museum envelope. Research on the visitor experience has shown that a view to the outside improves their experience within the galleries and this includes an allowance for a connection to some external light. Angela Matchica's article *The Fine Art of Museum Lighting*, states: "Because of the positive emotional, physical and energy impacts daylight has to offer, it has become standard to incorporate it into building designs. Museums are no exception—daylight, or any connection with outdoors, contributes to prolonged visitor stays. It also provides a time of day reference and a natural place for gathering, easing fatigue and over exposure during visits" (Matchica, 2013, P 46).

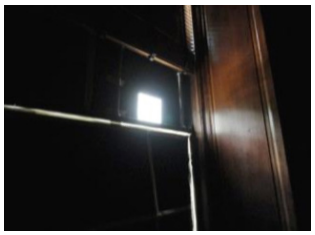
For the museum there was the need to protect objects but also a need to respect the historic structure, so what followed were numerous discussions with the designers, architects, security, curators and conservation staff as to what would be possible.

The windows are single pane old glass from 1914 and had to be maintained as is. (fig. 8) Besides the issue of light, there were the security concerns of not having adequate theft protection and the environmental concerns of maintaining the temperature and humidity levels. Changing the exterior windows was not an option. The solution was to create a new interior set of windows that would open to the inside and that would provide the required security and environmental protections.

But what about the light issue? The team played with various options from blacking them out to dark shades but it did not seem to fit into the goal of creating a unique visitor experience. Could stamp images be embedded between laminated glasses and would that block enough of the light?

A sample of the stamp image embedded in glass was created and tests were conducted to see how much light it could filter. (fig. 9) Available Light, our lighting designers, created a test using a single aperture window in one of the rooms. (fig. 10) With nothing blocking the aperture, the reading was 3.25 foot candles (FC) according to his report (Barnwell, 2010). With the translucent stamp graphic placed over the aperture the reading fell to 0.7 FC and when a MechoSystems shadecoth (EcoVeil Screen 3% open) was added the reading fell to 0.1 FC. This test was conducted in the summer months when direct light is not strong and it was conducted in a vacuum—not in the scenario of full banks of windows. However, this did give us enough information to know that a graphic image embedded in the window would not be enough filtration and additional protection, such as shades, would be required.

Fig. 8. South facing historic windows.



LEFT TO RIGHT

Fig. 9. Sample window with embedded stamp image.

Fig. 10. Light testing aperture for sample window.

Next, this presented an opportunity to enliven the windows beyond the light blocking protection they were intended to provide. A new larger sample of windows was created and an additional feature was added. At sunset the darker shades would be automatically retracted, a pause, and at the onset of night—white opaque shades would be lowered and a LED light bar would come on to illuminate the exterior windows with the stamp images at night. Bonus and a way to highlight the museum even after hours—and of course I let conservation take the credit for this brilliant solution to a light problem. (fig. 11)

Our project manager, Glen Hopkins, was tasked with getting the various historic preservation boards in DC on board

Fig. 11. NPM historic windows lite up at night.

Fig. 12. Testing a denser shade for additional light blocking.

Fig. 13. Entrance to the William H. Gross Stamp Galleries.

with this idea and he did manage to secure approval in less than 6 months (it may be a DC record for historic preservation board's approval).

Challenge to the Window Solution

I would like to say that this resolved the window light challenge but I will not. Though this resolved some of the problem additional precautions were necessary in the layout of the galleries and casework to reach the levels that were within acceptable perimeters. In the Postmaster Suite Gallery where exhibit wall barriers were not possible, the density of the shades needed to be increased in order to block the direct sun light during the winter solstice. The shade cloth needed to be changed from the 3% open to the 1% open in order to protect the artifacts in the cases (0950 series). The unfortunate outcome is that these rooms are less inviting to the visitor and especially our director who still complains about the low light levels in these rooms. (fig. 12)

GALLERY SPECIFIC

With the larger envelope solutions determined, the time came for gallery-level initiatives to be explored. There were seven new galleries included in the Gross Stamp Galleries and each offered a different challenge for the exhibition team. (fig. 13) The galleries are, in order: World of Stamps, Gems, Mail Marks History, Connect With Stamps, National Stamp Salon, Stamps Around the Globe, and the Postmaster Suite Rotating Gallery.

GEMS GALLERY

The official entrance to the galleries is off of the interior Historic Lobby, entering into the World of Stamps. This gallery is an introduction and meant to give a sense of intrigue and curiosity into exactly what a stamp can represent in life. Since the location is in the interior section of the galleries, the exterior windows are not yet visible which means that the visitor's eyes are adjusted to a lower light level. The World of Stamps gallery flows directly into the Gems Gallery, which is at the far-east end of the building and tucked away behind the historic windows.

For the Gems Gallery, the curators selected what they felt were philatelic icons of the American Experience and wanted these gems exhibited for long-term display. The selected stamps include a cover sent to John Hancock on July 4 1776, an iconic block of four of the Inverted Jenny Stamp from 1918, a cover carried by the Pony Express and a cover cancelled on the Moon in 1971. (fig. 14)

The gallery was designed to limit light levels but also to give a sense of reverence for what the visitors would be experiencing in the gallery. (fig. 15) The wall is curved to give a sense of direction and flow. The small cases are highlighted on the exterior with floor to ceiling graphic panels that glow. As the

Fig. 14. Display of the Pony Express mail in the Gems Gallery.

visitor approaches, the cases interior lights glow on the objects that are mounted on a frosted Plexi panel to add a soft light around the artifacts. Light levels when the visitor is viewing the artifact were originally set for 30 lux, the thinking being that that would be as low as possible for viewing the artifact. The sensors are set in a tight semi-circle and the light remains on for 30 seconds before starting to dim. The amazing thing is that because of the low ambient light levels as the visitor enters the gallery, the glowing manner in which the cases are illuminated, and the use of a frosted Plexi mount for the artifacts, the visitor is able to view them quite easily without any additional light.

Fig. 15. Curved and illuminated panels in Gems Gallery.

The gallery's successes are that it gives a sense that you are in a special, quiet, space with artifacts that are iconic to history. As a conservator, I can feel secure in the fact that ambient light levels are not going to add an additional risk to the artifacts and I appreciate the fact that the curators added a panel at the beginning of the gallery explaining the low light levels.

The challenge in this gallery is that it is difficult to get an accurate cumulative lux reading without interfering with the visitor experience. However, when one of the artifacts was removed for a short term loan, a light meter that read the light levels every second was installed so that a more accurate reading could be obtained. A graphic was installed in the empty case which described the testing that was underway with the additional hope of engaging the visitor in the testing experience as well. The monitoring results were surprising and gave added assurance that the levels the artifacts were being exposed to were minimal and yet were sufficient for viewing by visitors. The levels during the day were 2 lux in their dark state to 16 lux during viewing (viewing time was less than a minute). The fact that the cases need daily cleaning to get the

nose and finger prints off of the glass demonstrates that there is an engagement by the visitor with the artifacts on display.

MAIL MARKS HISTORY GALLERY

Once the visitor leaves the Gems Gallery they enter Mail Marks History and the first view of the historic windows. This is the gallery where the light levels are the biggest challenge so the artifacts used to highlight the curators' text are mainly 3-D artifacts that do not pose the same rigorous standards that paper does. However, there were some 2-D pieces that are included in the section and in the later Stamps Around the Globe (the international gallery) section that required a case design to limit their exposure to light.

Since the gallery has a large bank of windows, the design of the space had to enhance and yet block the lower level windows. The decision early on was to place casework off to the side and facing away from the windows as much as possible. Large graphic panels were placed directly in front of the windows, panels that could also be moved so there would be access to the windows for cleaning and security checks. These walls added some light blocking but still allowed the visitor to see the windows. (fig. 16)

Fig. 16. Mail Marks History Gallery with panels blocking portions of the historic windows.

Fig. 17. Winter solstice light on case in Mail Marks History.

Though the larger wall and window panels help eliminate some of the direct exposure of the south facing windows, there are still challenges during the winter months when light comes into the gallery in a more sideways direction. The design of the exhibition casework that follows will address some of the concerns; there are still some light exposure issues that should be addressed on several cases. These individual issues still need to be remedied. (fig. 17)

EXHIBIT CASEWORK

Though attempts were made to mitigate the lighting issues of the historic windows through the museum envelope and gallery design, there were still areas where additional case-level solutions were necessary. As it turned out, no one solution would work for all of the artifacts and galleries but rather, four different techniques were chosen to provide adequate protection.

LIFT UP AND PULLOUT CASES

In the Mail Marks History and Stamps Around the Globe Galleries, there were individual paper artifacts which the curators wanted to have on long term display. These included items such as a letter written aboard the Titanic, a 1923 cover from the DeAutremont train robbery disaster, and a cover from an Italian soldier in Napoleon's army mailed from Prussia in 1812. These and other items were too fragile to put into any casework that required mechanical action for viewing access as well as requiring limited light exposure. The solution for these items was to place them each in a small individual case that was covered by graphic text on the exterior and for viewing, the visitor must use a handle to lift a door to see the object. Once the door is lifted the light in the case comes and then goes off when closed. There are only five of these cases in the Mail Marks History gallery but there are 16 in Stamps Around the Globe. (fig. 18)

These lift-up cases, much to my surprise, have proved to be very popular with the visitor. They feel a sense of engagement because it requires action on their part to see the artifact—the simple lifting of the door connects the visitor to the piece in a way that just looking within a case does not. However, as the conservator, I know that the true benefit is that the artifact is only lit when it is being viewed and it is protected from ambient light at all other times.

The challenge with these cases has to do with the mechanics—they are only as good as the fabrication. The museum has had some problems with the pulley mechanisms on some of the cases and with the magnetic light sensors. I originally wanted the lights in these cases to be on a 20–30 second timer like the Gems cases to ensure that if there was a problem with the primary mechanism there would be a backup plan for the lights to go off. This did not get into the final design and there have been problems with some of the case lights remaining

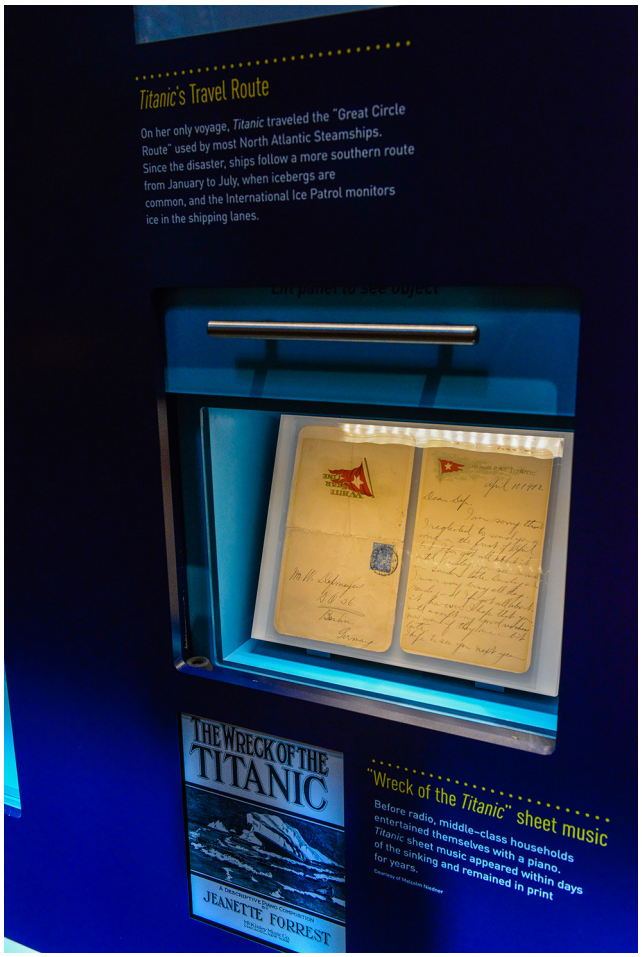


Fig. 18. Lift-up case for a letter written aboard the RMS Titanic.

Fig. 19. International Treasures with lower row of pullout drawers cases.

Fig. 20. Smithsonian Postal Collection from the late 1800's.

on. Luckily security staff keep an eye out for problems with the cases and contacts us as soon as they notice a problem.

There are eight pullout drawers in the Stamps Around the Globe section where a lift-up door would have been too low. Using a drawer had the added benefit of giving the curators an opportunity to include oversized pieces that would not fit in the smaller lift-up cases. (fig. 19)

For the drawers in the Stamps Around the Globe, there was a larger problem with the design and mechanisms on the cases. They have required numerous repairs by the fabricators and the exhibits department which also requires de-installation and reinstallation of the artifacts each time. The fabricators went back to the drawing board to find a better solution. A new weighted pulley system using bike cabling has been installed and the drawers are now experiencing few problems.

VERTICAL PULLOUT FRAMES

The classic method for display of philatelic artifacts around the world has been using vertical pullout frames. The Smithsonian has incorporated the use of pullouts since the late 1800's when the collection was displayed in the Arts and Industry building. (fig. 20) When the museum first opened in 1993 there was a gallery with frames that were purchased used from Canada and were used until the new galleries opened. These re-used cases were problematic in many respects: they lacked the security for high value artifacts to be displayed; the glass affected the color of the material displayed; they were not environmentally stable; they were difficult for visitors to manipulate and a safety concern for those of us who had to work with them.

Over the years I have received numerous calls from archives and museums asking me about purchasing pullouts, but there were no longer any manufacturers that specialized in that type of casework to refer them to or for NPM to purchase from.

The good news was that the NPM staff knew what an ideal pullout frame should be and the team set out to create the perfect casework. The design team (curators, collections and conservation staff) created a very specific document

Fig. 21. Working on prototype with Goppion staff in Milan Italy.

Fig. 22. National Stamp Collection in banks of pullout frames.

outlining our goals and our engineering and conservation requirements. We sent out a bid document to engineers and fabricators looking for 786 pullout frames, in two sizes for over 10,000 objects ranging from stamps, covers, album pages, large plate proofs, artwork and more.

In the end, the museum hired Goppion from Milan, Italy to engineer and construct the pullouts. There were three week-long meetings in Milan working through prototype after prototype until the desired outcome was achieved. (fig. 21)

The museum philatelic council and the philatelic curators worked for over five years selecting the artifacts that they felt would represent the National Stamp Collection. They wanted to make available those objects to the public and world at large (all of the artifacts are also available online) in a manner that a collector and non-collector could appreciate. There is much talk about the democratization of museum collections, making more of the hidden visible by creating visible-storage galleries. This is great for many artifacts that are not light sensitive like ceramics, metal or glass but there has been little done to make light sensitive 2-D collections available in the same manner. The museum achieved their goal for visible storage for a large part of our collection with these pullout frames.

The successes have been numerous for our stakeholders, visitors, researchers, and the museum staff. A member of our philatelic council who helped the museum with the creation of the new galleries but was not really a fan of the idea for the pullouts came up to me at the opening. He told me he could not have been more wrong about the outcome—he loved the gallery, the display and the access the public now has to the National Stamp Collection. Hopefully this is an indication that after 20 years of philatelists complaining about the museum's lack of exhibiting rare artifacts they can finally stop. (fig. 22) The New York Times reporter Edward Rothstein started his review with this line: 'It could easily be a glorious Pharaonic tomb, stocked with all the sustenance a philatelist might require for the afterlife.' (Rothstein 2013)

The artifacts are exposed to light only when they are viewed, they are stable within the display mounts on materials that were tested for long term stability. One of my concerns was how the visitors would treat the frames since we had had problems with the previous frames and young children abusing them. These cases have enough weight to them that they are not easily toyed with and once the visitor sees how they operate, they do feel comfortable using them. I also think that the room where most of the banks of frames are displayed creates an environment that is not conducive to abusing them.

Since the artifacts are hidden from our view most of the time and to ensure that the artifacts are in fact safe for the long term, there is a monthly gathering of the Collections Management and Preservation staff to clean the frames and check to see that all of the artifacts are still secure on their panels. It takes one hour and it serves as a good time to catch up with each other; it may also be why none of us want to clean the windows in our homes.

The challenge for this type of display, for many, may be the initial cost, though if compared with the cost of rotations the return on investment could be realized over a few years. There have been a few mechanical problems though the warranty and service agreement with Goppion means these have not been a major challenge.

SMARTGLASS TECHNOLOGY

It may seem that there are enough solutions to controlling light already covered, however there is one more technology that recently became available to museums. SmartGlass is a film of microscopic particles that can be laminated between any two clear supports (glass or Plexiglas). "When no standard AC voltage is applied, the particles are randomly positioned and block visible light. When voltage is present, the particles align and allow light to pass, thus making the VariGuard transparent" (VariGuard 2015). In a case using this

Fig. 23. Anthrax Letter case, on left, in the off state and on right, where push button activates SmartGlass.

technology over 95% of the ambient light from the room is blocked. The artifact in the case is only exposed to light when it is actually being viewed. This is not new technology, it has been used in aircraft, buildings and vehicles for years but because of the small production size that museums require it has been difficult to obtain. There were discussions during the Historic Windows exhibit as to whether it would be an option but it was nixed due to the cost at that time.

In 2014 the museum first used SmartGlass in a new exhibit, Behind the Badge: The U.S. Postal Inspection Service, for the display of one of the 2001 Anthrax letters that were sent to the Senate. This is the letter and cover sent to Senator Daschle. Because of the decontamination process and the investigative testing that these artifacts went through during the investigation, the letter and cover are extremely fragile. There was no conservation treatment that would improve the condition of the material, so the only display choice we had was to lay the items flat in a case without any mounting supports and with extremely limited light exposure. I saw SmartGlass at an AAM meeting and realized that this could be the light-protection answer for these two artifacts. (fig. 23)

The exhibit case is protected on three sides to prevent any bumping into the case that could cause the object to shift since it is not mounted to the sink mat it rests upon. The visitor approaches the case and sees the text explaining that the anthrax letter and cover are within this dark case. The visitor then pushes the button and the glass clears with the LED light illuminating the artifact. Once the visitor removes the pressure from the button, the lights lower and the glass slowly goes opaque again. There is light on the artifact only when it is being viewed.

The NPM Preservation Office worked with Seth Van Voorhees from VariGuard after the exhibit opened to test and determine exactly how much light blocking there was achieved with the Smart Glass. A recording light meter was temporarily installed inside the case with the artifacts and another was installed on the exterior of the case. Light level readings were taken every second from both meters and the data was compared. The interior readings showed that the artifacts in the case were receiving over 90% less light than the exterior of the case. I wish there was a non-obtrusive recording light meter where we could continue with a longer study but at this point I do not know of one and keeping the current one in the case was too visually distracting to continue the study.

The curators are thrilled that these artifacts can remain on exhibit for longer periods of time. I am thrilled that the ambient gallery lighting is not affecting the artifact. The film will not wear out over time so it can easily be used for years, mitigating the cost of replacement. The challenge for implementing this technology in the exhibit context is more about how it is used in the exhibit and designing supporting graphics that let the visitor know there is actually something to see inside that dark case.

CONCLUSION

There are light-control options available that can enhance the design of an exhibit and the visitor experience while protecting the objects at the same time. I believe there is still more that can be done for the Gross Stamp Gallery to reach those three goals and I am always on the lookout for those opportunities. (fig. 24)

The teamwork from the start of this project made for more inclusive and better decisions. Over the years, conservation has been known as the naysayer because too often we are brought in after a design is complete and changes were difficult and expensive. If conservation is allowed to come to the table at the beginning of an exhibition project—we can come with a positive attitude, new ideas and work with the other stakeholders to find solutions when problems arise. It can be challenging to assert design elements that will add to the cost of the project, so be willing to justify where there maybe flexibility and cost savings in the future.

Fig. 24. Exterior of NPM at night.

I would like to thank the great team that worked together to create the William H. Gross Stamp Gallery:

- Project Manager: Glen Hopkins
- Architects: Cho Benn Holback & Associates
- Exhibit Designers: Gallagher and Associates
- Lighting Designers: Available Light
- Fabrication: Design and Production
- And of course the ENTIRE NPM Staff

REFERENCES

Ganz, Dr. C. and D. A. Piazza. November 30, 2009. William H. Gross Stamp Gallery Expansion Project Plan 2009–2012: A new home for a national treasure. Smithsonian National Postal Museum, Washington D.C. 42 pp

Keene, S. 2002. *Managing Conservation in Museums*. Routledge, NY, NY. 258 pp.

Matchia, A. 2013. Museum Trends: The Fine Art of Museum Lighting. *LD + A May 2013*:45–49.

Sine, R. L. 2001. *Stamp Collecting for Dummies*. P 285. Hungry Minds Inc., NYC, NY. 312 pp.

UNESCO. 2014 July. *Prospectus: An international year of light and light-based technologies 2015*. P 6. United Nations Educational, Scientific and Cultural Organization (UNESCO). NYC, NY. 13 pp.

Rothstein, E. 2013. Its main mission: forever stamps, William H. Gross Stamp Gallery at National Postal Museum. *The New York Times*, September 23.

VariGuard. 2015. VariGuard Fact Sheet. http://variguard.com/wp-content/uploads/2014/09/Fact-Sheet.pdf (accessed 7/1/2015).

IN-HOUSE REPORT

Barnwell, D. 22 July 2010. Lighting Mock-up. Smithsonian's National Postal Museum, Washington, D.C.

Ganz, Dr. C. and D. A. Piazza. November 30, 2009. William H. Gross Stamp Gallery Expansion Project Plan 2009–2012: A new home for a national treasure. Smithsonian National Postal Museum, Washington D.C. 42 pp.

PRODUCT INFORMATION

- MechoSystems. 2015. 1550 Series, EcoVeil Screens (3% open). Long Island City, NY. www.mechoshade.com/shadecoth/ecoveil.cfm. (June 28, 2015)
- VariGuard. 2015. VariGuard SmartGlass. New York. http://variguard.com/products/. (July 1,2015)

LINDA EDQUIST
Conservator, Head of Preservation
Smithsonian's National Postal Museum
Washington DC
edquistls@si.edu

STEPHANIE M. HOAGLAND

Paper, Pins, and Preservation: The Evolution of Wallpaper Conservation in a "Ruin" Environment

INTRODUCTION

As a design element subject to changes in taste and style, and fairly easy to remove and replace, wallpapers are one of the most vulnerable elements of a building and surviving examples of historic papers can be rare.

Search the term "Wallpaper Conservation" and most of the results will discuss the preservation of opulent, high-end papers found in the homes of the wealthy. This bias is also seen in numerous books on the history of wallpaper, the technical brief issued by the National Park Service, and multiple articles published by conservators. But as preservation expands to include more vernacular structures, conservators are increasingly being asked to preserve interiors finished in inexpensive, mass-produced wallpapers often overlooked by the conservation community. These materials bring with them a new set of conservation issues not seen in higher-end wallpapers.

The goal of most conservation efforts in historic house museums is to make it appear the occupants have just stepped out of the room for a minute; but what if that goal instead is to try and retain the sense that the visitor has just walked into a space that has been left abandoned for the last 50 years? This is the preservation challenge present at the Lower East Side Tenement Museum.

THE LOWER EAST SIDE TENEMENT MUSEUM

The Lower East Side Tenement Museum, a National Historic Site, is the nation's first history museum specifically devoted to the urban immigrant experience. It is located in a five-story, brick tenement building in New York City's Lower East Side, considered by many to be the most famous immigrant neighborhood in the United States. Constructed in 1863 in the Italianate style, the building initially contained 22 apartments and a commercial saloon in the basement. Originally intended for middle-class families, the three-room apartments were arranged four per floor—two in the front and two in the rear—accessed by an unlighted staircase which ran up the center of the building. The apartments contain a parlor, a kitchen, and a small bedroom and were approximately 325 square feet in size with no indoor toilets or running water. Light was supplied by oil lamps and heat from coal stoves. Despite the apartments' small size, it was not unusual for each household to contain seven or more tenants. In the 72 years the apartments were occupied, nearly 7,000 people from over 20 countries lived in the tiny apartments of 97 Orchard Street.

Like many tenement buildings, modifications were made to 97 Orchard to comply with the city's developing housing laws. Passage of the First Tenement House Act in 1867 saw the installation of fire escapes for every unit. The Second Tenement House Act in 1879 required each room of each apartment to have windows to increase air and light, which necessitated cutting new openings into interior walls to admit air and light into the kitchens and bedrooms. The Tenement House Act of 1901 lead to major changes, including the introduction of indoor toilets (two per floor), gas lighting, and increased ventilation through the addition of a full-height air-shaft. The toilets and air-shaft were added to the southern half of the building, which reduced the size of the already small bedrooms for half of the apartments.

Even with these upgrades, the middle-class families continued to move out to newer homes with more modern amenities and were replaced by poor families and recent immigrants. The passage of restrictive immigrant laws in the 1920s also greatly reduced the number of new immigrants moving to the Lower East Side neighborhood, with the population declining 40% between 1920 and 1930.

The difficulty of filling these apartments, combined with the passage of a 1934 law which would have required the replacement of the central staircase at great expense, lead the landlord to evict the tenants and seal off the upper floors, leaving only the storefront units open and generating rental income.

These upper floors remained unoccupied until 1988 when the museum purchased the building and discovered over 2,000 objects in the apartments which had been left by the

Presented at the Book and Paper Group Session, AIC's 43rd Annual Meeting, May 13–16, 2015, Miami, Florida

last inhabitants. As a result, these apartments had become a time capsule of immigrant life in America.

WALLPAPER AT THE LOWER EAST SIDE TENEMENT MUSEUM

The Tenement Museum currently has 19 apartments, 15 of which are open to the public. The museum is unique in its restoration and interpretation of the building and its occupants, and its treatment of some of the apartments in a state of "arrested decay."

The museum classifies their apartments into two different categories, "restored" and "preserved." Restored apartments are those which have been restored or reconstructed to a specific time period in the building's history and are used as interpretive spaces. These apartments tell the story of actual residents of 97 Orchard Street using information gathered through historic research and family histories. Restoration treatments included new plasterwork and sheet rock, skim coats of plaster over historic finishes, painted finishes, and new wallpaper (fig. 1).

Of the six restored apartments, the parlors of the Gumpertz, the Rogarshevsky, and the Levine family apartments have wallpapers that are re-creations of original historic papers that were found within 97 Orchard Street. In 1994 paper conservator Reba Fishman Snyder conducted an "archaeological dig" of the wallpapers at the museum and catalogued the papers found within the various rooms. She carefully removed small sections of the wallpaper for analysis, gently separating the layers using a microspatula. In one apartment she found upwards of 22 layers of wallpaper.

Ms. Snyder and the museum worked with wallpaper company Scalamandre, who provided their services pro-bono, to recreate some of the papers found during the analysis. The floral paper used in the Gumpertz parlor is a reproduction of the earliest wallpaper discovered in the museum. The red wallpaper used in the Rogarshevsky parlor is the 14th layer found in Apartment 11 (fig. 2). Based upon the wallpaper's location within the stratigraphy of the layers, and the color and style of the wallpaper pattern, museum curators determined that this paper most likely dated to circa 1910, when the Rogarshevsky family would have been living in the building.

Scalamandre are manufacturers of high-end textiles and wallpapers who tout their use of the finest materials. While their replicated papers are beautiful, the quality of these wallpapers is very different than the wood pulp papers used by the original inhabitants of 97 Orchard.

HISTORIC WALLPAPER FOUND AT THE LOWER EAST SIDE TENEMENT MUSEUM

Wallpaper, originally made of cotton rag, was too expensive for the majority of Americans to afford until the mid-19th century. However, with the introduction of machinery to make and print continuous rolls of paper, prices began to fall in the 1840s. It was the introduction of wood pulp to the paper making process which drove prices down far enough to become popular even among the poorest Americans. With prices starting at 4.5 cents per roll in 1898, an entire apartment could be papered for less than $1.00.

Fig. 1. Parlor of the "restored" Rogarshevsky apartment.

Fig. 2. Historic wallpaper on the left was recreated for the Rogarshevsky parlor (right).

Inexpensive wallpapers were printed in the most popular styles and patterns. An 1884 edition of *Carpentry and Building Magazine* stated, "It is quite remarkable how quickly the supply for cheap and truly artistic papers has responded to the demand."

Wallpaper was a popular interior finish for the working poor as can be seen in the majority of the apartments at the Tenement Museum where there is a wide array of patterns including Asian-inspired designs, abstracts, florals, brocades, and stripes (fig. 3). Borders, running around the perimeter of rooms, are found in both floral and geometric patterns.

The wallpapers in these apartments are not relegated to just the walls; they are also located on the plaster ceilings in the parlors and kitchens of many of the apartments. These papers may have been applied as decoration, or to hide cracks in the ceilings as the building aged.

Fig. 3. Examples of wallpapers found within the LESTM apartments.

The Tenement Museum also has examples of sanitary papers. The late 19th century saw a great rise in sanitary concerns and wallpapers were frowned upon as decoration because they could not be cleaned. Wallpapers accumulated dirt, soot, and grease, and were thought by some to harbor insects and disease. Sanitary papers were seen as the answer to this problem, having a coating of varnish which allowed them to be washable. An 1887 article in the *Journal of Decorative Arts* entitled "The Homes of the Lower Classes; How to Make Them Sweet, Clean, and Beautiful," stressed the use of this "economical and hard wearing" paper for "poorer households." The walls of the kitchen in Apartment 11 were finished with at least two layers of sanitary paper. The design on this paper is one that was popular for many sanitary papers, which is in imitation of another material known for its sanitary properties-ceramic tiles (fig. 4).

Fig. 4. Washable "sanitary" paper found in the kitchen of Apartment 11.

Based upon historic research at the museum, wallpaper began to replace paint on the front room (parlor) walls of the apartments in the mid-to-late 1880s. The museum believes that the landlord arranged for the walls to be papered every time new tenants moved into an apartment. While some tenants added their own layer of wallpaper to beautify their apartment, landlords may have opted to use wallpaper instead of paint because, with its busy patterns, it better hid imperfections in the walls and general soiling. Also, compared to oil paints, which could take up to a week to dry, wallpaper could be applied in one day. Unlike higher-end wallpapers, which were generally applied over a liner, the wallpapers at the Tenement Museum were first applied either directly over multiple layers of paint, or over plaster or wallboard repairs. Where liners are found, it is often an old newspaper. But more often than not, the wallpapers were applied one layer over the other.

In 1885 a law was passed in New York mandating that "no wall paper [*sic*] shall be placed upon a wall or ceiling of any tenement or lodging-house, unless all paper shall be

Fig. 5. "Preserved" kitchen of Apartment 11.

first removed therefrom and said wall and ceiling thoroughly cleaned." While considered by many to be "a very slovenly and unhealthy practice," luckily for historians and conservators, many landlords skirted the law on this issue. The amount of retained paper varies greatly from apartment to apartment, with some rooms retaining only a few scraps of paper while others had upwards of 20 layers. As was customary at the time, none of the bedrooms were papered on either the walls or the ceilings.

These historic wallpapers are all found at the Tenement Museum, in what they call a "preserved" apartment. The preserved apartments are those spaces which have been stabilized in their as-found condition and presented as "ruins" (fig. 5). These apartments endured over fifty years of water infiltration, uncontrolled fluctuations in temperature and humidity, and general neglect. Many of the papers in these apartments are in poor condition. They are stained, torn, and sagging. Additionally, these apartments also exhibit substrate conditions which greatly affect the historic paper, including exposed lath, peeling paint, and cracked, bulging, and detached plaster.

Analysis of the historic wallpapers found them to be pigmented Kraft-based papers with starch and glue paste adhesives. So, in addition to the damages caused by fluctuations in temperature and relative humidity, exposure to ultraviolet light, and failures of the substrate, these papers are also affected by the oxidation of the acidic wood pulp paper which caused the paper to darken, become brittle, and loose strength over time.

While the papers in these apartments are in poor condition, exhibiting extensive levels of deterioration, they are an *integral* part of the museum. In addition to helping define the authenticity of the apartments, the original wallpapers tell the story of the building's occupants including financial situations, sanitary concerns, and changes in aesthetic tastes over time.

WALLPAPER CONSERVATION AT THE LOWER EAST SIDE TENEMENT MUSEUM

Jablonski Building Conservation Inc., (JBC) began working with the Tenement Museum on interior finishes in 2002 when, with funding from the Getty, the preserved apartments were surveyed and a conservation plan was created. Conservation treatments were tested to determine the most successful means and methods of stabilizing the wallpapers. The conservation plan included recommendations to address soiling, minor wallpaper delamination (where just the edges had lifted), and major delamination (where more than 50% of the paper had fallen away from the plaster substrate). As the water-staining was so extensive and as it is primarily an aesthetic issue, tests for stain removal were not performed. Multiple campaigns of in-situ wallpaper and plaster conservation have been performed since 2008. Due to limited pre-existing studies on the conservation of vernacular wallpapers, many of the treatments were experimental, though performed with the philosophy of doing the least harm. Conservation treatments have included the following:

CLEANING

One of the easiest and least expensive treatments for the papers of the Tenement Museum was simple cleaning. Many of the papers were torn and folded over, or had become detached and were rippled on the surface of the wall. Each ledge of the paper was completely coated in a thick layer of dust. The paper is extremely brittle and breaks easily; therefore any cleaning had to be undertaken with great care.

Two methods were used to clean the papers depending upon their condition and location. Paper that remained fairly well attached to the wall, but was rippled, was gently vacuumed using a HEPA vacuum with a soft brush attachment. Paper that had become detached was supported from behind by hand and the soil gently dusted away with a soft, natural-bristle brush.

One of the more challenging items to clean was the large amount of debris that had accumulated behind the detached paper. This debris consisted of the detached finish plaster and paint fragments which had fallen behind the loose wallpaper and gathered at the base of the void. Where possible, tweezers and micro vacuum tools were used to remove the debris so the wallpaper could lie flat. In some locations the presence of shelving additions had trapped the fragments and the tools could not reach the debris. While cutting the paper below the level of the shelf was an option to create an opening to remove the fragments, it was decided against further damaging the wallpaper. Instead the debris was left behind the paper and the upper loose portions of wallpaper stabilized.

SYNTHETIC ADHESIVE

As part of the 2002 conservation plan, multiple types of adhesives were tested on the wallpaper. A 20% solution of Paraloid B-72 in acetone, and Jade R, a reversible, acid-free, archival adhesive proved to be the most successful at reattaching the paper to the substrate. Due to the brittleness of the papers, they were often first softened with a light spray of steam and the adhesive applied to the substrate and the back of the paper. The paper was then gently pressed back into place using a piece of silicone release paper as a barrier. The wallpapers were held in place by hand until the adhesive dried.

Unfortunately, due to the dry, porous nature of these wood pulp papers, they were very absorbent and were easily stained. While this was not as much of a concern on the earlier heavier weight wallpapers, it was most noticeable on the thin Kraft-based wallpapers. These papers are often the most recently applied, especially on the ceilings. The application of Jade R to these papers always seeped through to stain the surface. While our initial testing found that a 20% solution of B-72 in acetone did not stain the wallpapers, additional tests using 15%, 25%, and 50% solutions found that a 50% solution of B-72 in acetone was required to re-attach the paper without staining. Unfortunately, the adhesive above a 25% solution was thick and gummy, creating thin tendrils of adhesive that would stretch between the container and the brush, which made it difficult to keep adhesive off the surface of the paper. Any B-72 solution which was accidently deposited on the paper surface made it dark and shiny.

PINS

In an effort to avoid the creation of additional stains caused by the adhesives on some wallpapers, buttons or pins were also used to re-attach the loose paper to the plaster walls. The pins are clear acrylic, 1/16-inch thick, in a variety of shapes and sizes with edges sanded smooth. They were installed with small stainless steel brads inserted through a pre-drilled hole in the button and gently hammered into the plaster (fig. 6). Rectangular pins were generally used for securing long tears; large disks for joining multiple tears; and small disks for small adhesion areas.

If the pins were carefully placed at the edge or along a tear, it was possible to re-adhere the wallpaper without puncturing it. Once installed, the clear pins do not block the pattern of the wallpaper and are often difficult to discern when viewed from a short distance from the wall.

The pinning treatment, however, also had its drawbacks. While an effort was made to place the pins at an edge of the paper in order to not perforate it, this was only successful if all of the paper edges are aligned. Due to the manner in which the wallpapers have torn, the edge of the top paper is often stepped back from the layers below.

The stainless steel brads also required a stable substrate in which to be inserted. Several examples can be found in the museum where multiple pin holes have been punctured into the paper, but no pin remains. These pins kept falling out due to the numerous layers of wallpaper which have nothing behind them into which the brad can secure. In other locations, the pins remain in place, but have become loose causing the rectangular pins, which were initially installed vertically, to rotate on the brad to a horizontal position. Additionally, much of the plaster in the museum is precarious and even gentle hammering can cause it to become detached.

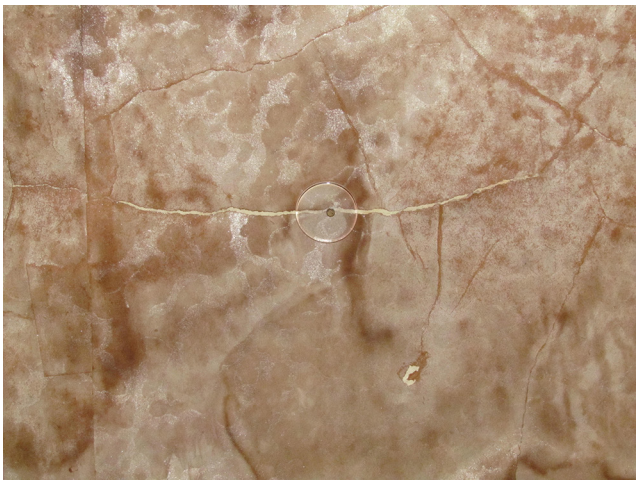


Fig. 6. A pin placed along a tear to prevent puncturing the wallpaper.

Even with these drawbacks, pinning is an inexpensive, low-tech repair, and JBC has been able to instruct the museum staff how to install the pins when they find new detachments. This prevents the paper from continuing to tear from its own weight until JBC can return to the museum to perform treatment.

STABILIZATION OF THE SUBSTRATE

As the loss of the substrate, either paint or plaster, has an effect on the paper finishes, these elements have also had to be addressed. In several apartments, multiple layers of wallpaper have been applied directly over oil-based finishes which themselves have been painted over water-soluble distemper paints. High humidity and water infiltration had caused the distemper paints to fail. As the loss of paint leads to additional loss of paper, stabilizing the paint had to be part of the wallpaper stabilization.

Flaking paint was stabilized using a 10% solution of Aquazol 200 in water applied with a natural bristle brush. Working in small sections, three applications of the Aquazol 200 solution were applied and then using a sheet of silicone paper against the surface of the paint, slight pressure was applied to the area. Larger paint chips that were completely loose from the plaster but which remained in place were re-adhered with an application of Jade R adhesive to the back of the sample and reset using tweezers. Once a smooth, stable

Fig. 7. Stabilization of the plaster substrate to prevent additional wallpaper loss.

surface was achieved, the wallpaper was re-secured to the substrate using pins and Jade R adhesive where applicable.

Much of the plaster in the museum has become detached from the lath and is in danger of being lost and taking the wallpaper finishes with it. The south wall in Apartment 11 exhibited a large area of exposed lath and the plaster at the western end of the wall was severely bulging. As the plaster was extremely soft, and the bulging area filled with debris and broken keys, there was a concern that any attempt to stabilize the wall by getting the plaster flush with the lath would result in the complete loss of both plaster and wallpapers. As the wall did not appear to be continuing to move, the conservation treatment was to remove as much debris as possible and then simply fill the void with Ethafoam to create resistance behind the wall should anyone press against it. The open face was spackled over and painted to mimic the color of the exposed plaster brown coat (fig. 7). Additional treatments included the tinted spackle application without the Ethafoam, and consolidation of plaster using Rhoplex and Methyl Alcohol.

NATURAL ADHESIVES

One of the most recent materials being using for wallpaper conservation at the museum is funori or TRI-Funori™. Furori is a polysaccharide mucilage (similar to carrageenan) made from seaweed harvested from natural populations in Japan. It is available in dry form from conservation suppliers such as Talas, which must be cooked and strained. Tri-Funori is a pre-mixed version available from Historic Plaster Conservation Services.

Funori has been used in Japan for over 300 years as a consolidant, an adhesive, and a cleaning agent. Although primarily used by book and paper conservators, the product is just becoming known to architectural conservators. Testing of this product has found that it does not leave tide-lines, dries to a matte finish, and is non-toxic. As funori is a mild adhesive, a 4% solution of sturgeon glue was added to increase the strength of the adhesion for this project.

Prior to conserving the wallpaper, the backs of all of the detached papers were cleaned using a soft natural bristle brush. Three coats of funori were then spray-applied to the exposed distemper paints on the plaster. Over time these water soluble paints had become powdery and friable.

Fig. 8. Process of wallpaper stabilization using Tri-funori includes cleaning, consolidating, re-adhering, saturating, flattening, and cleaning.

After the distemper paints had been consolidated, pieces of hanging paper were re-attached. Using natural bristle brushes, the funori/sturgeon glue mixture was applied to the exposed plaster and the back of the wallpaper which was then gently pushed back flat against the plaster. If the papers were extremely brittle, the surface was gently misted to soften it enough so that it would not break when returned to its original position. A second coat of the funori mixture was applied to the face of the wallpaper over a small square of Japanese tissue paper. For larger sections of detached wallpaper, an additional application of the mixture was injected behind the wallpaper to saturate it. Once the entire piece of failed wallpaper was re-adhered to the substrate, a wallpaper seam roller was rolled across the surface to remove any air pockets or creases. After the wallpaper was secured, the tissue was removed, taking care not to disrupt the bond between the wallpaper and substrate.

A side benefit of the re-adhesion process was that the funori and tissue application also cleaned the wallpapers, many of which were heavily stained from water damage (fig. 8).

Brittle, curled edges of the wallpaper which could not be flattened were consolidated and strengthened using an airbrush application of the funori/sturgeon glue mixture. Some detached pieces were left in the hanging position with a strip of Japanese tissue secured to the back with the funori/sturgeon glue mixture to provide additional support. This retained the "ruined" look of the wallpaper by leaving strips hanging from the ceiling or puckered from the wall.

Like most of the previous treatments, there were unexpected draw-backs to the funori/glue mixture. Although touted as not leaving tidemarks on paper as it dries, unacceptable staining occurred in areas where the funori was applied on the Kraft wallpaper. In an effort to determine if the paper was being over-saturated by the application methods, testing was performed applying the funori with an air sprayer. The spray application method also discolored the paper and reduced the sheen of the silver-colored printing ink on the paper. In an effort to determine if it was the conservation treatment, or the material being conserved that was causing the staining, the funori/sturgeon glue mixture was tested on an old newspaper dating to 1935. The funori left no tide marks or staining on the newspaper, indicating there was some element either in the historic wallpaper, glue, or printing ink which was reacting negatively with the funori.

The wallpaper conservation on the ceilings was the first step in the stabilization of the plaster ceilings. Much of the ceiling plaster had become detached from the lath and posed a safety hazard to visitors. Part of the plaster conservation involved removing the floors from the rooms above and consolidating the plaster from above using an aqueous acrylic emulsion. Due to cracks in the ceiling, which could not be sealed because of the ceiling papers, the consolidant seeped through the cracks and also stained the papers.

The tidelines and the darker staining of the consolidant required a discussion between JBC and the Museum regarding an acceptable final appearance. Together it was determined that it was more important to retain the historic plaster and papers, which were already heavily stained from water infiltration, than risk the loss of these elements.

CONCLUSIONS

The preservation and conservation of these historic wall and ceiling papers at the Lower East Side Tenement Museum is an important part of the interpretation of these spaces. The torn, sagging, and stained papers help evoke a sense of place and the passage of time in these apartments; their stabilization remains critical. However, due to the extensive nature of the project, with layer after layer of historic paper over what is often an unstable substrate, decisions on means and methods of wallpaper conservation must take into account multiple factors including: financial constraints, visitor's experience, and different or evolving ideas about historic preservation and conservation.

While not always ideal, each of the treatments presented in this paper will continue to be tested, built-upon, and used at the Museum. What works best for one paper may not be the best treatment for the paper in an adjoining room. As always, however, the goal remains to retain as much historic fabric as possible to ensure the unique authenticity experienced at the Lower East Side Tenement Museum is preserved.

REFERENCES

Dolkart, A. 2006. *Biography of a tenement house in New York City: an architectural history of 97 Orchard Street*. Santa Fe: The Center for American Places.

Eastlake, C. L. [1878] 1969. *Hints on household taste in furniture, upholstery, and other details*. Reprint, New York: Dover Publications, Inc.

Gillis, A.M., 2008. "Curio." *Humanities The Magazine of the National Endowment for the Humanities* Volume 29, Number 3, accessed May 2, 2015, http://www.neh.gov/humanities/2008/mayjune/curio/wallflower.

Gilmore A.M. 1981. "Wallpaper and its conservation—an architectural conservator's perspective." *Journal of the American Institute for Conservation* 20 (2): 74–81.

"History of 97 Orchard Street," Lower East Side Tenement Museum, accessed June 12, 2015, http://macaulay.cuny.edu/eportfolios/tenementmuseum/history-of-97-orchard-street/.

Warner, J. K.1994. "Proliferation: late 19th-century papers, markets and manufacturer." In *The papered wall*, ed. L. Hoskins. New York: Abrams. 173.

Loveman, K., "In situ deacidification of vernacular wallpaper" (Master's thesis, Columbia University, 2012).

Lynn, C. 1980. *Wallpaper in America: from the seventeenth century to World War I.* New York: W.W. Norton and Company.

Michel, F. 2011. "Funori and JunFunori: two related consolidants with surprising properties." *Proceedings of the CCI Symposium ICC Adhesives and Consolidants for Conservation: Research and Applications*. Ottawa, Canada. www.cci-ic.gc.ca.

National Park Service. 1995. Lower East Side Tenement Museum: Special Resource Study United States Department of the Interior, North Atlantic Regional Office, Division of Planning, Boston, MA.

Swider, J.R., and M. Smith. 2005." Funori: overview of a 300-year-old consolidant." *Journal for the American Institute for Conservation* 44 (2):117–126.

"Wallpaper: health and cleanliness," Victoria and Albert Museum, accessed May 2, 2015 www.vam.ac.uk/content/articles/w/health-and-cleanliness/.

STEPHANIE M. HOAGLAND
Principal
Jablonski Building Conservation, Inc.
New York, NY
shoagland@jbconservation.com

JENNIFER HAIN TEPER

The Preservation Self-Assessment Program: A Tool to Aid in Preservation and Conservation Prioritization

INTRODUCTION

The Preservation Self-Assessment Program (PSAP) is an online tool created by preservation and conservation staff at the University of Illinois Libraries. With generous funding by the Institute of Museum and Library Services through a National Leadership Grant, we have worked to create a free, online assessment tool designed to assist collection managers at libraries, archives, and museums begin to understand, articulate, and prioritize the preservation needs of their collections even if they have little to no preservation experience. Currently, the PSAP encompasses the identification and assessment of textual, photographic, and audiovisual collections materials. We see this project not as a replacement for professional conservation/preservation consultants' assessment of individual items or collections, but offer that it can be used as a first step towards a more fulsome professional consultation, to define project scopes, or to justify funding for basic preservation efforts.

Although the PSAP has been designed as an assessment tool, it also contains significant educational components developed to assist non-specialists or novices in better understanding the preservation of the materials in their care. The program can be used on unprocessed collections as well as fully described materials, though paring preservation needs with institutional priorities is more effective when materials are fully described, of course. While the most meaningful results will be produced by using the PSAP to evaluate collections at an item-level, the PSAP can also be used to evaluate collections using sampling techniques (this approach is discussed in detail in the project user manual) so that only a portion of a larger collection need be inspected. The information generated from the PSAP, in the form of 1) individual preservation scores for items, 2) aggregate preservation overviews for collections, and 3) summary scores for institutional preservation practices and storage environments offers users quick, numeric, and graphic representations of the highest preservation needs in their collections, which can lead to more detailed assessment or review, consultations with professional conservation or preservation professionals, rehousing projects, or other preservation projects to improve long-term accessibility of materials.

Presented at the Book and Paper Group Session, AIC's 43rd Annual Meeting, May 13–16, 2015, Miami, Florida

SCOPE OF MATERIALS

The PSAP contains assessment guides for textual materials including books, printed documents, manuscripts, office reprographics, architectural reproductions, photographs and photoreprographics, and a wide variety of audiovisual formats. Our goal is to present a tool that offers "one stop shopping" for most libraries' and archives' collections, though some rarely held formats may be omitted (fig. 1).

HOW THE PSAP WORKS

The PSAP has been designed as a web application that is functional on both PC and Mac Platforms and can be used on desktop computers, tablets, and mobile smart phones. All data is stored and backed up at the University of Illinois, who is committed to long-term support of the project. Users request a logon and an institutional affiliation and once they are logged on, they enter information about their institutional practices, their repositories (various subject libraries within a larger organization, for instance), the locations where materials are stored or exhibited, their collections, and lastly the individual items within collections.

As institutions, repositories, locations, and resources (collections or items) are created, users are asked to enter limited descriptive information about each of these creations, so that they can be identified later. Repositories, locations, and collections are all saved and available to be selected as options for further entries once entered into the system. For collections or individual items, there is also a section of optional descriptive information that maybe used in place of a nonexistent catalog, inventory, or finding aid, thus also producing

Class	Format Family	Formats Included
Audiovisual	Wire Recordings	(same)
	Grooved Media	Plastic and Wax Grooved Cylinders; Aluminum, Lacquer, Shellac and Vinyl Phonographic Records
	Audio Tapes	1/4" Open Reel, 1/2" Open Reel, 1" Open Reel, 2" Open Reel, 8-Track, Compact Cassette, Continuous Loop Cartridge (Cart), Digital Audio Tape (DAT), Digital Compact Cassette (DCC), Microcassette
	Motion Picture Film	8mm, 9.5mm, 16mm, 35mm, Super 8mm
	Video Tapes	1/2" Open Reel, 1" Open Reel, 2" Open Reel, Betacam/Betacam SP, Betacam SX, Betamax, D-1, D-2, D-3, Digital Betacam, DVCam, DVCPro, HDCam/HDCam SR, HDV, MiniDV, U-matic/U-matic SP, VHS, Video8/Hi8
	Optical Recordings	Compact Disc (CD), DVD, LaserDisc (LD), MiniDisc (MD)
Bound Materials	Binding Types	Accordion, Double Fan Adhesive (DFAB), Perfect, Punch-and-Bind, Spiral, Stab, Stapled, Through-the-Fold, Oversewn
	Board Types	Paperboard, Wood
	Covering Materials	Cloth, Leather, Paper, Parchment, Tawed Skins
	Ink Types	Ball-Point Pen, Carbon Black Inks, Colored Pencil, Copying Pencil, Dye-Based Inks, Felt-Tip Pen/Marker, Graphite, Iron Gall Ink, Pigment-Based Inks, Typewriter Ribbon, Wax-Based Pencil/Crayon
	Paper Types	Acid-free/Rag, Coated, Wood Pulp/Newsprint, Proprietary Papers, Tracing/Transparent
Flat Paper	Architectural Reproductions	Aniline, Blueprint, Diazo, Electrostatic, Ferro-Gallic, Gel-Lithograph, Hectograph, Photostat, Van Dyke, Wash-Off
	Office Copy/Printing (Reprographic) Processes	Carbon Copy, Carbonless Copy (NCR), Color Photocopy, Copybook/Roller Copy, Diazo Print, Diffusion Transfer, Dual Spectrum, Electrofax, Electrostatic Copy (Xerox), Impact Print, Inkjet Print, Laser Print, Lithograph/Office Lithograph, Photostat, Spirit Duplicate, Stencil Copy, Thermal Print (Thermofax), Typography
Photographs	Cased/Direct Photographs	Ambrotype, Daguerreotype, Tintype
	Monochrome Photographic Print	Albumin, Carbon, Cyanotype, Gelatin POP, Glossy Collodion, Matte Collodion, Platinum/Palladium, Salt, Silver Gelatin DOP
	Color Photographic Prints	Chromogenic Color, Color Carbro, Dye Transfer, Silver Dye-Bleach
	Instant Photos	Black-and-White, Color
	Negatives	Albumen Glass, Chromogenic Color, Collodion Glass, Gelatin Glass, Silver Gelatin
	Slides/Transparencies	Glass Autochrome, Glass Black-and-White, Plastic Black-and-White Film, Plastic Color Film
	Digital Prints	Inkjet, Laser
	Microformats	Mixed Aperture Card, Paper Microcard, Paper Microprint, Plastic Microfiche, Plastic Microfilm
	Photomechanical Prints	Collotype, Gravure, Letterpress Halftone, Offset Lithography, Woodburytype

Fig. 1. Range of formats covered by the PSAP

searchable (and exportable) descriptive metadata about the materials assessed.

While we cannot estimate how much time each evaluation could take a user, we have made every effort to minimize our questions to the very most critical in order to evaluate preservation effectively. Our goal has been that each item takes only a few minutes from start to finish once users are comfortable with the interface and their most common formats.

ASSESSMENT LEVELS

There are three different levels at which assessment questions are asked—institution, location, and resource/item. The institutional assessment asks questions about institutional practice related to policies, use and access of collections, disaster planning, and collections care and works independently of the rest of the PSAP scoring process, resulting in an institutional "preservation savviness" score. The assessments for location and individual resources, however, work together to develop the PSAP preservation score. For assessing your location, you will be asked about the temperature and relative humidity in the space where materials are stored or exhibited long-term, as well as fire and water protection in that space. Questions for item assessment vary depending on format, but generally revolve around a visual inspection of materials noting any damage and/or deterioration, as well as its frequency of use and uniqueness.

IDENTIFICATION TOOLS

Perhaps one of the most valuable aspects of the PSAP is the Format ID Guide (https://psap.library.illinois.edu/format-id-guide), or FIDG for short. The FIDG is a visual resource that helps users identify the format of material they want to assess. Materials are broken down into broad categories (for instance photographic prints, cased/direct photographs, negatives, or transparencies) and then each format has a page with extensive photographic references, description of the visual appearance of the material, material composition, standard deterioration pathways, historical background, and ideal storage and display recommendations. Many thanks to all who helped by contributing images to this part of the project, most importantly the Image Permanence Institute, who allowed us to use many of the images from the Graphics Atlas project for the photographic section of the FIDG (http://www.graphicsatlas.org/) (fig. 2).

SCORE GENERATION

As you assess your materials in the PSAP, you will receive a score which combines the information that you entered for the specified location an item resides in as well as the format's inherent vice and current condition. You can view a score summary for an individual item by clicking on the "score summary" tab of the individual item, once the assessment is complete. Scores are generated to give a final value between 0 and 100, where 0 is the lowest possible score and 100 is the highest possible score. Note that scores of 0 and

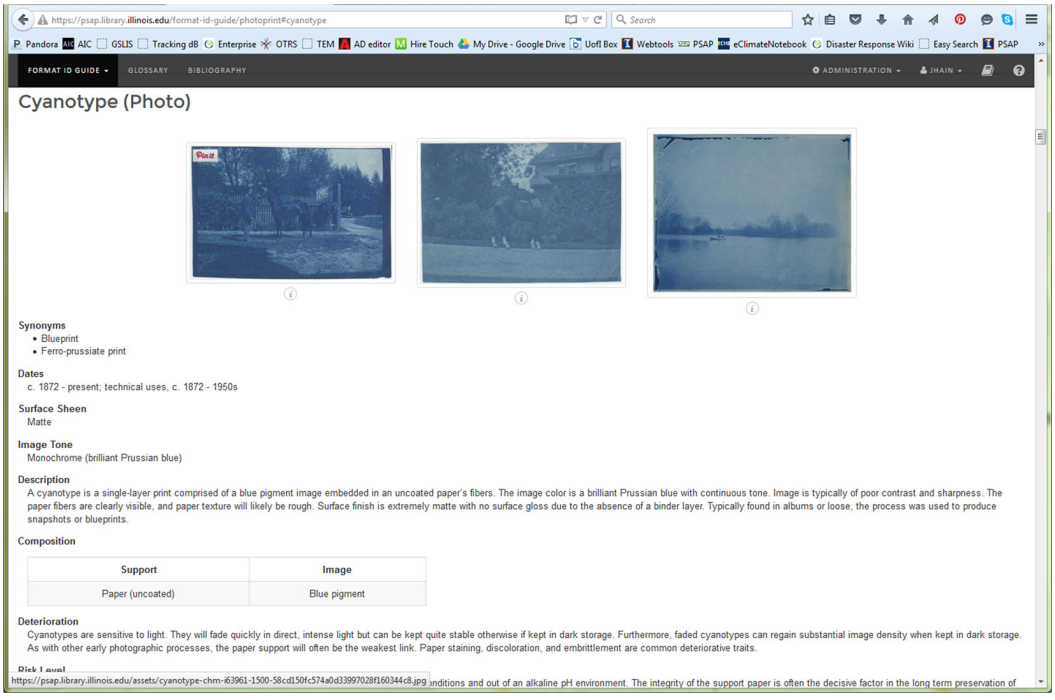


Fig. 2. Format ID Guide reference page

100 are both nearly impossible to actually attain for your final score (though possible in sections such as Location), and most final scores actually lie between 50 and 90. The final resource score is weighed such that the condition of an item is weighted as half (50%) of the score, the format of the resource is 40%, the location of the resource is 5%, and the temperature and relative humidity of the location are each 2.5% for a total of 100% of the total score. This weighting of scores was developed by the project team to represent the understood balance of the current condition of the object with the inherent vice of an individual artifact (format) and the effects of the environment on that particular format (Location, Temperature and RH) (fig. 3).

Depending on the format of your resource—specifically for original unbound papers (i.e. manuscripts) and bound papers (i.e. books)—the format score is determined differently. For bound and original unbound papers, the format score is weighted as 60% of the format of the support (paper) and 40% of the format of the ink or media used on the paper. All other formats (photographic and image materials, office reprographic processes, audiovisual materials, etc.) have a single format score.

Resource score (RS) = (sum of Question Scores / # of questions) + (0.4 * Format Score) + (0.05 * (Location Score) + (0.025 * Temperature) + (0.025 * RH)

Fig. 3. Formula used to derive final PSAP score

REPORTS

After users have entered a number of resource-level assessments, you may also view your scores in aggregate by viewing the "Assessment Reports". Assessment reports allow users to view, graphically and statistically, overviews of their institution, locations, and items. If items were grouped into collections, data will also be clustered by collection with summary overviews of the scores and formats of all materials found in each collection. These reports can be exported to PDF for easy sharing (fig. 4).

ADDED FUNCTIONALITIES

In an effort to make data entry easier and more useful for other purposes, we have added several additional functionalities to the PSAP that may be useful to users. For those institutions using ArchivesSpace (http://www.archivesspace.org/), the PSAP has the capability to import EAD-XML files exported from the ArchivesSpace software. Data entered into the PSAP can also be exported in a variety of formats (CSV, XML, and JSON) to be utilized in other applications. One export that is specifically outlined in the user manual is how to export the PSAP data into CSV and map that information over to import into PastPerfect 5.0.

To help speed along the assessment process, the PSAP is also equipped with a cloning functionality. This tool is most helpful when you are assessing a run of individual materials that share most or all of their descriptive information. For instance, a collection of 25 8x10 black and white photographs

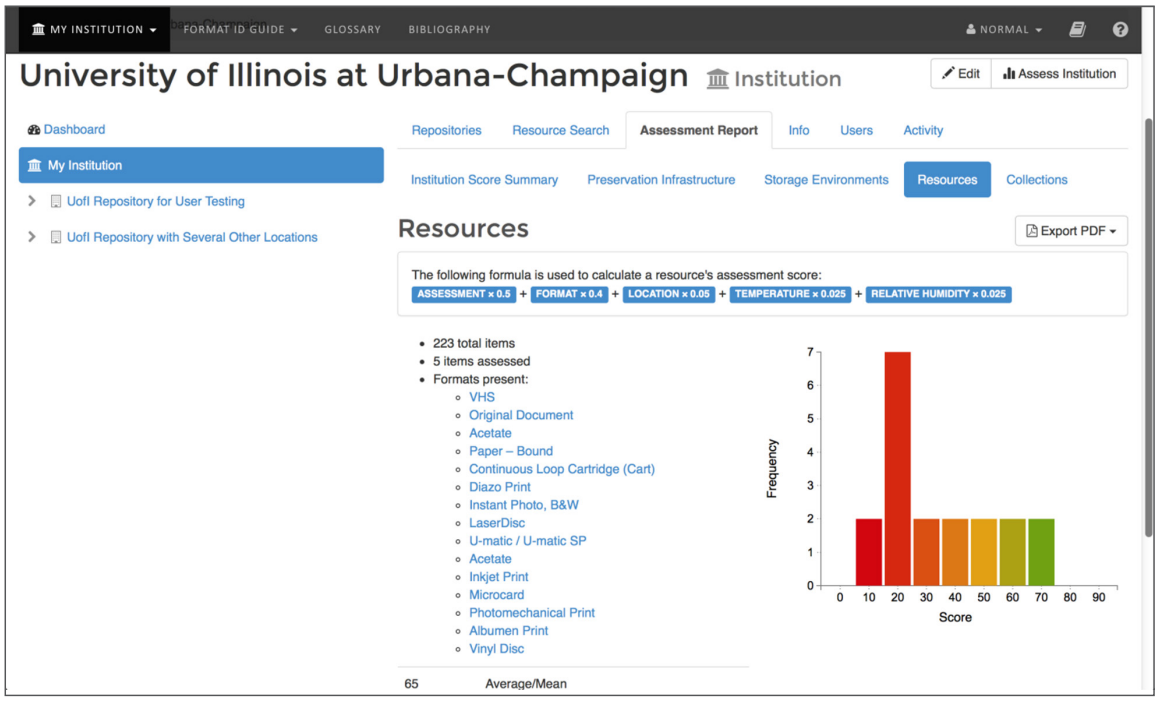


Fig. 4. Example of a resource report

of the same subject will share many data points. The clone function will allow users to create a new record that exactly copies the information from an existing resource record, reducing the need to re-enter that information manually. When a user selects to clone a resource (by clicking on the "Clone" button on the upper right of the resource page), they are prompted to clone the record either "including the assessment", or "without the assessment" depending on whether the condition of materials is consistent or variable.

Lastly, another handy tool offered by the PSAP is the "Move" function. This utility can be used to update records if an item or collection is shifted from one location to the next. Resources can be shifted individually or in batches by selecting resources found listed under any one location and the PSAP will change their location and scores to reflect this modification. This functionality can be particularly useful if users are considering the best long-term storage for an object or collection of objects. Once the descriptive, format, and condition information are entered, materials can be "moved" to different locations and scores can be compared to find the best location for long-term preservation.

ADDITIONAL RESOURCES

The PSAP offers a limited number of helpful resources to aid users in taking the "next steps" after an assessment is complete, though purposefully avoids making prescriptive recommendations for action. Resources available to users include sections on how to select and understand preservation storage materials, when and how to bring in a preservation professional or conservator, finding disaster recovery services, and what grant opportunities might be available for funding preservation projects.

PROGRAM RELEASE AND THE FUTURE

As of June 2015, the PSAP is in beta testing with plans for a public release in August of 2015. Visit www.psap.library.illinois.edu for updates on the program release and to sign up. It is our hope that we will continue to develop this application beyond the current formats. Discussions are currently underway to develop a grant application to broaden the PSAP to encompass more commonly held museum objects, such as fine art, natural history specimens, or anthropological collection materials. The long-term goal of the project is to create a universal preservation assessment tool that covers most commonly held collection materials in any library, archive, or museum.

JENNIFER HAIN TEPER
Velde Preservation Librarian and Head, Preservation Services
University of Illinois Library
Urbana, IL
jhain@illinois.edu

GWEN SPICER

The How and Why for Reusing Rare Earth Magnets

ABSTRACT

Since the early 2000's, art conservators have been increasing our use of rare earth magnets for all types of conservation work. The small size-to-strength ratio of these magnets has allowed them to be adapted to solve many formerly challenging tasks. The rare earth magnets Samarium and Neodymium are the latest two of the four permanent magnets to be developed, after Alnico and Ferrites. Neodymium is the most commonly used and best suited rare earth magnet for art conservation applications.

However, in the last decade the neodymium rare earth magnet has gone from an inexpensive material to one that has become more costly. In addition, some environmental issues have come to light in the last few years. As with any source of energy or technology, some aspects of their creation and subsequent hazards need to be known, as well as how best to protect the environment. Magnet development and history have long been interconnected with geo-politics.

INTRODUCTION

Whether we came to art conservation with a background in art or from the sciences proper, we've learned the needed basics of physics and chemistry. Yet for many of us, one particular 'puzzle' is the Periodic Table, especially the lower rows of the periodic table, which are often overlooked. The development of rare earth magnets from this row of elements is a story that touches on both early developments from chemistry and from geology. These ultra-strong magnets are well suited for applications in art conservation. Understanding the controversial geo-politics of the development and production of these magnets, and the need for their reuse, versus disposal, is necessary.

Let us be guided by the overall question: Is the use of these new materials sustainable or not?

Presented at the Book and Paper Group Session, AIC's 43rd Annual Meeting, May 13–16, 2015, Miami, Florida

WHAT ARE RARE EARTH ELEMENTS?

Rare earths are also called Lanthanides; they lie along the lower row of the periodic table. They include elements with atomic numbers 57–71 (table 1). At times, scandium (21) and yttrium (39) are also included.

The use of the term "rare earth" is misleading, in that many of these are actually not rare in abundance (Gschneider 2015). Instead, they are difficult to obtain. *Rare earth* is from an archaic nineteenth century term to describe an oxide-type of material (Trout n.d.). This group of elements is notorious for being chemically similar to each other and for many years they were not considered separate elements. In fact, no pure lanthanides are found separately in nature (Kean, 2010). Even the term "lanthanide", which comes from the Greek *lanthaneim*, "to lie hidden" illustrates how challenging it is to isolate one member of this group from another.

The story of their discovery is very confusing and complex. The search for, and discovery of, these elements constituted an integral part of the development of science and technology in the late 19th and early 20th centuries. Due to the complexity and questionable purity of samples, many claims were being made in this time for new elements that later proved false (Trout 1998, 2002; Zepf 2013).

THEIR DISCOVERY

The first rare earth element, ytterbite was discovered and isolated in 1794 in Ytterby, Sweden; initially there was no understanding of their potential use or how to separate these elements from their surrounding material. The small quarry at Ytterby was found to be rich in Lanthanide elements, revealing seven more over time, of which four are named after the community (Kean 2010; Gray 2009). Cerium (58) was the second in 1803 (Zepf 2013).

The similar structure of the rare earths is one reason for their slow separation. In the lanthanide group, each features buried electrons that are positioned more deeply than transition metals (elements located at the center of the periodic table). In the lanthanide group their additional electrons are

	Cerium Group (1) Light; (more abundant) found in the earth's crust				**(2)**	**Cerium Group**			**Ytterbite Group (3)** Heavy; (less abundant) found in earth's mantle						
Chemical Element	**La** Lanthanum	**Ce** Cerium	**Pr** Praseodymium	**Nd** Neodymium	**Pm** Promethium	**Sm** Samarium	**Eu** Europium	**Gd** Gadolinium	**Tb** Terbium	**Dy** Dysprosium	**Ho** Holmium	**Er** Erbium	**Tm** Thulium	**Yb** Ytterbium	**Lu** Lutetium
Atomic Number	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71
Atomic electron configuration	$5d^1$	$4f^1 5d^1$	$4f^3$	$4f^4$	$4f^5$	$4f^6$	$4f^7$	$4f^7 5d^1$	$4f^9$	$4f^{10}$	$4f^{11}$	$4f^{12}$	$4f^{13}$	$4f^{14}$	4f14 $5d^1$
Radius size	103	102	99	98.3	97	95.8	94.7	93.8	92.3	91.1	90.1	89	88	86.8	86.1
Radioactive					X										
Dates	1839	1803	1885	1885	1942	1879	1896; 1901	1886	1842	1886	1878	1842	1879	(1878); 1907 Isolated in pure form 1953	1906
Named after	Greek, "to lie hidden"	Dwarf planet & Roman Goddess, Ceres	Greek, "Green Twin"	Greek, "New twin"	Titan	Mineral samarskite from which it is isolated	Europe	J. Gadolin (1760-1852)	Ytterby	Greek, "hard to get at"	Stockholm	Ytterby	Thule	Ytterby	Latin for "Paris"
Use	Glass polishing	Lighter flint, polishing glass	Glass blower glasses, blue filter, lasers	Magnets, headphones, Oil filters, disk drives	Compact fluorescent, watch dials	Magnets, electric guitar pickups,	Red color TV, CRT, Compact Fluor.	MRI, Store computer data	Light weight speakers, sonar transducers	Cathode lamps, coating for hard drives,	MRI, Solid state lasers	Fiber optics, lasers, pinkish colorant in sunglasses	Halide lamps, medicine	Lasers, gamma emitter, strengthens stainless steel	High intensity discharge lights, LED lights

Table 1. Rare Earth Elements Facts.

often found two energy levels below (table 1) (Kean 2010). These electrons are located in the 5*d* and 4*f* valance levels with two previously filled levels and 4*f* has 14 places. As you move across the table, each lanthanide is distinguished from the next by the addition of one electron, which results in their wide range of physical and chemical properties (AMC 1999; Gray 2009).

Their discoveries and subsequent separation were directly based on advances in scientific techniques. Separation was first achieved primarily by repeated precipitation or crystallization. Much of the development of rare earth magnets is an evolution of compound manipulation as separation techniques were refined and became less expensive. With each new development, another rare earth could be separated. First came solvent dissolution in 1839 and in 1879 a second technique called surge optical flame spectroscopy. These two techniques led to almost half of the rare earths being identified and isolated (Zepf 2013). The final rare earth, Promethium (61) was not separated until WWII, during the Manhattan Project. The pace of discovery is clearly marked by the appearance of each technique, in total it has taken about 150 years to identify and discover all of the Lanthanides.

A SILENT REVOLUTION

It turns out that our modern world depends on these rare earth elements. Our growing dependency has been termed a "Silent Revolution" (Livingston 1996). One really cannot function today without being in contact with a rare earth element, especially, when it comes to technical devices. Because they have allowed many gadgets to be miniaturized, their use is found everywhere, and they are now an intrinsic part of our modern society. In any smart phone, there are at least 11 rare earth elements (Butler 2012b). Even the simple ear buds sometimes given to you on airplanes (and considered to be disposable) contain Neodymium magnets.

One ironic part of this revolution is that in our attempt to reduce dependency on imported oil, we have turned to "green" technologies that are based on rare earth elements. The predominant industries that use magnets are those producing electric cars, wind turbines, and powerful batteries. All of these use an abundant amount of these elements. The small magnets that are used in conservation do not have the same demands or large supplies as these other industries.

As a side note, each electric Toyota Prius motor requires 1 kilogram (2.2 lb) of neodymium, and each battery uses 10 to 15 kg (22–33 lb) of lanthanum. That number will nearly double under Toyota's plans to boost the car's fuel economy (Gorham 2009; Gorman 2015). The car and turbine industry is also investing in developing methods of recycling the material and how to create the same strengths with less raw ore. Research in the development of nanoparticles, the "next generation" of magnets, are being developed that use less expensive magnetic materials (Jones 2011a & b; Butler 2012b).

Now that their presence in our everyday life is confirmed, we must ask: where do they come from?

WORLD PRODUCTION AND TRADE

Access to materials has been an integral basis of permanent magnet production. The impetus for the shift to more uses of the ceramic magnet occurred during a shortage and subsequent price inflation of cobalt (a main component of Alnico, the first permanent magnet) during the Zaire wars in the

early 1970s. Rare earths, just like cobalt in the 70's, are part of present conflicts and trade issues.

Early commercial mining for rare earths started in Brazil where the ore is found mixed with the sands. This work grew especially after the discovery of a newly invented incandescent lantern mantle using Thorium, an element exhibiting low-level radioactivity (Gray 2009; Zepf 2013).

In the mid-20th century mining took off. Mountain Pass in California was the world's major source of lanthanides from the 1960s to the 1980s (Long *et a.* 2010). One of the significant products of this mine was used to produce the reds in color TVs. Domestically we supplied all of our needs, but that began to change in the early 2000s. Two influences caused the Mountain Pass mine to close: one was the decline in prices of materials imported from China, but also the mine was cited for environmental infractions (Margonelli 2009). Mountain Pass demonstrated that even in our country, where we have strict mining practices and environmental regulations, the risk for potential pollution is high.

CHINA'S RISE

During the development of rare earth magnets, especially Neodymium since the 1990's, China has become the predominant source for the rare earth ore with the largest deposits in Southeast China and Inner Mongolia (Humphries, 2013). Other countries that had mined ore could not compete with the lower prices at which China was exporting. But with the low price came the environmental hazards due to poor controls on mining methods inside China (Trout 2002; Bradsher 2009). This low cost only stayed until a 90% market hold was reached by China. But since, 2010 there has been a sharp rise in cost.

With the increase of prices, China has also now begun limiting exports, favoring their domestic customers (Inoue 2012; AP 2015). Three of their eight major mines, one of which produced 40% of China's production (Jones 2011b), have stopped production. These changes in prices and restrictions may have a silver lining. It is hoped that the newer mine locations in other countries will have better restrictions and tighter safety standards when it comes to mining and production. Searches for alternative mining locations are ongoing in Australia, Brazil, Canada, South Africa, Greenland and the US. Many of these countries were original producers, before China's current monopoly (Bradsher 2009; Gambogi 2013; Humphries 2013).

Keep in mind that there are two parts to the production of rare earth magnets. One being the mining or extraction, the other is the processing. Each has environmental repercussions that involve release of toxic chemicals, including radioactive materials and air pollution.

This global geo-political situation is how this author became aware of these issues. It is the knowledge of the processing practices and trade issues of rare earth elements that is necessary to understand that our changing shift away from fossil fuels and towards our miniaturization world may not be as "green" as we think.

ENVIRONMENT AND MINING

The environmental implications of mining and processing are immense, especially if the situation continues without properly imposed regulations. Potential environmental damage is particularly worrisome when it comes to illegally or marginally supervised mining. Various forms of lanthanide elements are found together, unfortunately also along with mildly radioactive materials, like thorium and uranium. Furthermore, the separation requires the use of toxic acids to extract the rare earth ore from the surrounding soils, and then from each other. For every ton of rare earths mined, 19 lbs fluorine, 28 lbs dust, and 2650 cubic feet of acidic wastewater result (Bradsher 2009; Cressey 2010; Hurst 2010; Butler 2012a).

All aspects of mining, refining, and recycling require proper management to retard any environmental consequences. The run-off from mining and subsequent tailings and other waste materials is known to affect farmlands below. It has been found that a mine might produce for a few years but the effects last for decades (Bradsher 2009)

Recent developments have moved some of the processing to poorer countries. An example is Australia, which has mines in several locations, recently got approval to ship their ore to Vietnam for processing. It has become a conflict between the 1st and 3rd world, the market identifying countries that are willing to accept the environmental difficulties. Another approach being considered is seeking out less populated areas like Greenland, the sea and even the Moon! (Jones 2011b; Veronese 2015 a & b)

But at what environmental cost do we obtain our supply of rare earth elements?

OPEN PIT MINING AND TAILING PONDS

Ore is typically mined with an open pit process. Three types of minerals are sought during this process: Placer sands, Monazite and Bastnasite, and recently Lujavrite now found in Greenland (Zepf 2013; Vahl & Kleemann 2014; Veronese 2015 a & b).

Consider the processing and separation of the ore to create the rare earth. The resulting wastewater from this process is held in tailing ponds containing acids and radioactive materials (Engles 2014 a & b; Payne 2015). Populations in nearby regions of China are believed to suffer from cancers and shorter life expectancies (Margonelli 2009; Butler 2012). China is able to operate about 1/3 the cost of US production because of lax environmental standards.

However, on a positive note, in the last few years companies in Japan and elsewhere have been working hard at making rare earth technologies more efficient (Inoue 2012; Gimurtu

	Alnico	***Ferrite***	***SmCo***	***Neodymium***
Use keeper for Horseshoe shape	X			
Wrap to prevent abrasion		X		
Group by size		X	X	X
Stack, orienting North-to-South		X	X	X
Place separator between			X	X
Moisture and RH sensitive			X	X
Mechanical Shock tolerance	Very resistant	Brittle and chip or crack easily	Low. Brittle and chip or crack easily. Best to separate with a cushioning material.	Very low. Brittle and chip or crack easily. Best to separate with a cushioning material. Continual snapping will lead to demagnetizing.
Demagnetizing Field (H_{ci})	Can be easily demagnetized. When repetitively placed north-pole-to-north-pole ends together, it quickly weakens itself, but can be re-magnetized.	Keep away from Rare earth magnets.	Can be demagnetized by NdFeB magnets. But they do not weaken others.	Tough to demagnetize. This also means that they can easily demagnetize other classes of magnets like SmCo or Alnico or Ferrite. Shock can demagnetize. Cannot be re-magnetized.

Table 2. Storage of Permanent Magnets by Type.

2013; Gorman 2015). Also General Electric is reverting to Alnico magnets for use in wind turbines. Scientists are also developing improvements on techniques that create less waste (Midgley 2015). These directions point to a positive resolution of our global environmental issues.

STORAGE / SAFE HANDLING OF NEODYMIUM MAGNETS

As conservators, our daily use of rare earth magnets in conservation is very limited.

In 2011, an electronic survey of ten questions was implemented, with an incredible response from all conservation specialty groups and conservators from around the globe. One question was directed at how magnets were being stored and the responses indicated a particular lack of understanding in this area. This topic will be addressed in the remainder of the paper (Spicer 2016b).

All permanent magnets require special attention for optimal and continual performance (table 2). As with any equipment, one should use them with care. Areas of concern are mechanical shock, heat, moisture, and a demagnetized field. All of these are issues of handling and environment, which conservators are especially suited to understand. Depending on the class of magnet, the care will vary slightly, but, with proper care, little decay should be noticed (fig. 1).

Coercivity (Hc) is the process where a magnetic field is reduced or eliminated. Each permanent magnet has its own coercivity rating. The higher a magnet's Hc, the greater the resistance to demagnetization (The Magnet Story 1998). Understanding the Hc of permanent magnets and other material and equipment that surrounds us is necessary when working with strong magnets. Rare earth magnets currently have the highest coercivity values. Industries that work exclusively with rare-earth magnets are quite concerned about their coercivity.

One of the survey questions focused specifically on how conservators stored their magnets. As a response, here are a few rules of thumb:

Fig. 1. Solutions for storage of rare earth magnets, showing a range of box sizes and styles. Ethafoam sheet lining placed in the boxes provides cushioning of the magnets.

- Separate the rare earths from all other types of permanent magnets.
- Provide cushioning between the magnets and prevent any shock.
- Keep away from all heat sources.

MECHANICAL SHOCK

Several magnet types are brittle and can easily fracture. This is especially the case with rare-earth magnets, when impact and tensile forces affect them. Many suppliers do not guarantee against poor handling due to this fact. Brittleness increases as the grade number increases. Since a sharp hammering, or any physical shock, can cause demagnetization, it is necessary to prevent magnets from quickly jumping to one another or dropping to the floor from a raised height. Once a magnet is broken or cracked, it is highly susceptible to moisture and corrosion. Do not attempt to use them by positioning them together or gluing them together. Chipped or cracked magnets with peeling or spalling surfaces should not be used since the protective coating has been disrupted (Campbell 1994). When a higher grade is used, a smaller size magnet might be preferred.

HEAT (TC)

Each permanent magnet has a Curie temperature (Tc) that identifies the point where the material's magnetism is eliminated. Neodymium magnets are very sensitive to temperature and have the lowest Tc of the permanent magnets; Alnico and samarium have the highest Tc values. This is one of the reasons why Alnico magnets are still used. Be sure to stay below the working temperature of each permanent magnet used.

MOISTURE

Neodymium is easily oxidized. The presence of an oxidized surface lowers the pull force of the affected layer, which allows the region to demagnetize more readily (Campbell 1994, Drak & Dobrzanski 2007). A coating of nickel-plating, or epoxy, is critical to prevent this from occurring. Blistering and spalling of the surface can be seen, more readily with two-layer copper nickel plating (Drak & Dobrzanski 2007). Even during the manufacturing process, oxidation prevention measures are required, often using a vacuum or argon gas environment. A sintered magnet is less stable than a bonded magnet against oxidation induced demagnetization corrosion (Campbell 1994; Trout n.d.). The same multiphase structure is responsible for its good magnetic strength, and also for its poor corrosion resistance. If a neodymium magnet is used in a known raised relative humidity location, a bonded-type over a sintered magnet is recommended (Drak & Dobrzanski 2007).

DEMAGNETIZING FIELD

Some types of permanent magnets influence or weaken other magnets. One such case is when ceramic (including flexible type) or samarium magnets are demagnetized by neodymium magnets. As a result, neodymium rare-earth magnets should always be stored away from other magnet types. Similarly, electronics systems that rely on magnets to hold information, such as hard drives and disks, can be altered or demagnetized by a neodymium magnet that is placed nearby. Magnetic strips on credit cards and other cards can also be affected.

Ferrite magnets can be demagnetized when their poles are alternated, a reason to carefully stack the magnets. This is especially the case with the bonded flexible type; sliding a magnet side-ways perpendicular to the polar rows demagnetizes the array. Alnico type magnets are unique in that they can be re-magnetized by realigning the internal domains via another strong magnetic field. This is not the case with other magnets, especially neodymium ones, where once demagnetized, the magnetism cannot be recovered.

Each type of permanent magnet should be segregated and spaced well outside other magnetic fields. As more magnets are concentrated together, the field increases. A safe approach is to separate each type in the work area.

REUSE OF A MAGNETIC SYSTEMS

Any successful magnetic system uses three key factors that include: 1) the strength of the magnet itself, Magnetic strength is measured in *Gauss*, the amount of force necessary to pull the magnet straight from the surface of a steel plate. 2) The receiving ferromagnetic metal. This is the material that is magnetized in this system. Magnetized regions of the receiving metal impact the magnet's strength. 3) The magnetic field distance, "the gap", is the space created by the layers in between the magnet and the receiving ferromagnetic metal (Spicer 2010, 2013a, b, c, d, 2015, 2016 a & b).

A magnetic system needs to balance the selection of key factors, while also protecting the magnet itself. A successful method is placing rare earth magnets on mounts or within materials. Keeping the magnets surround by materials aids in their longevity, preventing demagnitization from both shock and heat. These embedded magnets or ferromagnetic materials can be placed on top or within an artifact as well as used as a point fastener or as continuous pressure (FN).

Embedding magnets into a stiff material like mat, or corrugated board is an obvious approach (Ellis 2008; Holbrow & Taira 2011; Hovey 2013). At the Asian Art Museum, they have mastered including magnets within an outer boarder that supports the artifact while on display (Holbrow & Taira 2011; Spicer 2013a; Migdail 2015, 2016). They have created a modular system where block-shape magnets are embedded into strips of mat board, positioned outside of the magnetic field and become the finishing outer perimeter of the display mount and are placed over the outer edge of the artifact (fig 2).

However, conservators have also found methods for easily inserting disc shaped magnets by cutting the hole with a drill bit (Ku & Chen 2013). Their use of magnets was along the upper edge, which is especially useful for large artifacts and pair them into short section of mat board. The benefit of the smaller sections is that they can allow adjustments to the artifact during mounting.

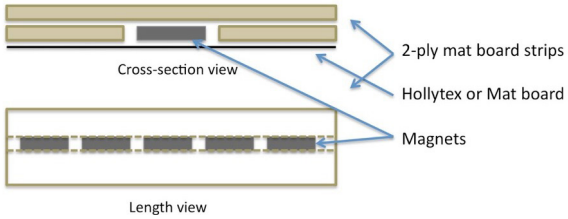


Fig. 2. The block-shaped magnets are embedded into strips of 2-ply mat board. Three sizes of mat board strips are cut; one for the top layer and two for the center layer. The center layer is composed of two longer strips with a row of alternating magnet and mat board. The layers are secured with PVA and wrapped with Hosokawa paper (Holbrow & Taira 2011).

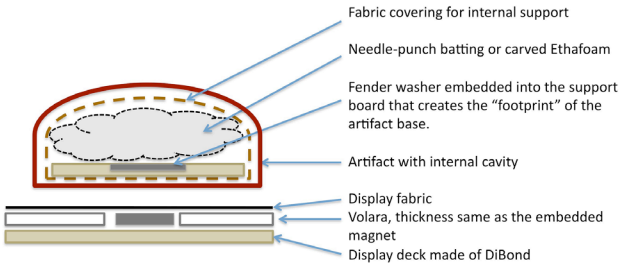


Fig. 3. The mount is made of DiBond covered with an upper layer of Volara and then covered with display fabric. The magnets are embedded into the Volara layer. The selected thickness of the magnet matches the thickness of the Volara layer (*Uncommon* Threads, Maine State Museum 2009); Inside of the artifact is an internal structure filled with batting and covered with stockinet. The footprint of the support is made with acid-free board with a metal fender washer (Carrel *et al.* 2005; Spicer 2013).

Hovey describes embedding magnets into corrugated board that then act like padding that fits inside folds or creases that are accessible. These modular shaped devices can be treated as removable and thus reusable exhibiting tools. Several other conservators have created great methods of positioning magnets within internal padding. Such devices can be made universal and used and reused (fig. 3) (Carrel *et al.* 2005; Hovey 2012; Spicer 2013a). Such approaches can also be used with sturdy materials like baskets or wooden boxes to secure to a mount. One just needs to ensure that including the thickness of the artifact and its internal support as well as supports for mounting does not take the system outside of the magnetic field distance (Maltby 1986, 1988; Carrel *et al.* 2005; Hovey 2012; Spicer 2013a).

Any modular system, during use and in storage, will benefit from having the poles of all the magnets in the same orientation. An inexpensive compass can be used to quickly show the pole direction.

CONCLUSION

The jigsaw puzzle that was started over the holidays was completed by filling in the Lanthanides. It is hoped that this introduction will entice all conservators to put another tool— rare earth magnets—in their tool box. Perhaps this will encourage conservators to develop systems to reuse magnets better, and to create reusable standardized systems for mounts. The field of art conservation will benefit greatly from using rare earth magnets. As we do so, let us in this, and in other aspects of our work, be aware of "best environmental practices" just as we do our best to follow best practices in our treatments. (fig. 4)

Fig. 4. The author after having completed the Periodic Table puzzle.

ACKNOWLEDGEMENT

The author would like to thank the organizers of the Sustainability Session at AIC 43rd Annual meeting, Mary Haude, Robin O'Hern and Melissa Tedone, and the paper conservation community who felt that this topic was important to publish.

REFERENCE

American Chemical Society. 1999. Separation of Rare Earth Elements. [online] [accessed 10/17/14] <http://www.acs.org/content/dam/acsorg/education/whatischemistry/landmarks/earthelements/separation-of-rare-earth-elements-commemorative-booklet.pdf>

Associated Press. 2015. China Drops Its Export Limits on Rare Earths, New York Times Jan. 5 2015. [online] [accessed 15 February 2015]. Available at: http://www.nytimes.com/2015/01/06/business/international/china-drops-its-export-limits-on-rare-earths.html?_r=0

Bradsher, K. 2009. Earth-Friendly Elements, Mined Destructively. *New York Times*. 25 December.

Butler, K. 2012a. Killer App, The Rare-earths that Power Microcomputer Make Our Lives Easier. But just How Toxic are the Guts of Your Smart phone? *Mother Jones*, November/December, pp. 42–7.

——. 2012b. "Your Smartphone's Dirty, Radioactive Secret" The rare earths inside microcomputers make our lives easier. But just how toxic are the guts of your smartphone?

November/December 2012 Issue. [online] [accessed 2 January 2013] Available at: <http://www.motherjones.com/environment/2012/11/rare-earth-elements-iphone-malaysia>

Campbell, P. 1994. *Permanent Magnet, Materials and Their Application.* Cambridge, UK: Cambridge University Press.

Carrel, L., Harvey, R., Ritchie, J. Schroun, M. & Spicer, G. 2005. Person communication for exhibition development and impletementation, *Uncommon Threads: Webanaki Textiles, Clothing, and Costume.* Maine State Museum, Augusta, ME. October 2009–Sept. 2010.

Cressey, D. 2010. The Rare Earth Blues. Nature News Blog. November 30 2010. [online] [accessed 9 June 2012] Available at: <http://blogs.nature.com/news/2010/11/the_rare_earth_blues.html>

Drak, M. & Dobrzański, L. A. 2007. Corrosion of Nd-Fe-B Permanent Magnets. *Journal of Achievements in Materials and Manufacturing Engineering*, 20: 1–2. [online] [accessed 8 February 2014]. Available at: <http://www.sciencedirect.com/science/article/pii/0304885395900373>

Ellis, S. 2008. Magnets for Exhibition Mounting. [online] (31 October, 2008)

Engels, J 2002-2014a. In-pit tailings storage. [online] Available at: http://www.tailings.info/storage/inpit.htm

——. 2002–2014b. What Are Tailings?—Their nature and production. [online] Available at: <http://www.tailings.info/basics/tailings.htm#>

Edge, November 15, 2010. Cutting Edge Energy Writer – [online] [accessed 10 December 2012] Available at: <http://www.thecuttingedgenews.com/index.php?article=21777>

Gorman, S. 2015. As hybrid cars gobble rare metals, shortage looms–August 31, 2009 [online] [accessed 18 March 2015] Available at: <http://www.reuters.com/article/2009/08/31/us-mining-toyota-idUSTRE57U02B20090831>

Gambogi, J. 2013. Rare Earths. *2011 Minerals Yearbook*, [ADVANCE RELEASE] September 2013. U.S. Department of the Interior U.S. Geological Survey.

Gimurtu, A. 2013. A Radical solution for the Rare Earth Supply Crunch. *Resource Investor*. July 9, 2013. [online] [accessed 10, July 2013] Available at: <resourceinvestor.com/2013/07/a-radical-solution-for-the-rare-earth-supply-cruch?ref=hp>

Gorman, S. 2015. As hybrid cars gobble rare metals, shortage looms—August 31, 2009 [online] [accessed 18 March 2015] Available at: <http://www.reuters.com/article/2009/08/31/us-mining-toyota-idUSTRE57U02B20090831>

Gray, T. 2009. The Elements, a visual exploration of every known atom in the universe. New York, NY: Black Dog & Leventhal Publishers, Inc.

Gschneidner, Jr., K.A. 2015. The Rare Earth Crisis—The Supply/Demand Situation for 2010–2015. Material Matters, Vol. 6 (2). [online] [accessed 1 May 2015] Available at: <http://www.sigmaaldrich.com/technical-documents/articles/material-matters/the-rare-earth-crisis.html>

Holbrow, K. & Taira, K. 2011. Magnet Mounts: Objects Specialty Group Conservation Wiki. [online] [accessed 27 October 2013]. Available at: <http://www.conservation-wiki.com/index.php?title=Magnet_Mounts>

Hovey, D. 2012. Short Communication: Receiver systems for object mounts: A design concept for safe installation and display flexibility. *Journal of the American Institute for Conservation,* 51(1): 51–58.

Hurst, C. 2010. The Rare Earth Dilemma: China's Rare Earth Environmental and Safety Nightmare. The Metal's Humphries, M. 2013. *Rare Earth Elements: The Global Supply Chain*. Specialist in Energy Policy, R41347, December 16, 2013 www.crs.gov

Inoue, Y. 2012. Japan to Slash Use of a Heavy Rare-earth as China Tightens Grip. Reuter, 8 Feb. [online] [accessed 8 February 2014]. Available at: <http://www.reuters.com/article/2012/02/08/us-rare-earth-japan-idUSTRE8170KN20120208>

Kean, Sam. 2010. The Disappearing Spoon, and other true tales of madness, love and the history of the world from the periodic table of the elements. New York, NY: Little Brown and Company

Ku, J. & Chen, W., 2013. Displaying and Housing an Oversized Painted Textile, A Case Study using Local Materials to Preserve a National Treasure in Taiwan. In [compiled by Sarah Stevenson] 9th North American Textile Conservation Conference, San Francisco, CA.

Jones, N. 2011a. The Pull of Stronger Magnets. *Nature*. 472(7341): 22–23. [online] [accessed 8 February 2014]. Available at: <http://www.nature.com/news/2011/110406/full/472022a.html>

——. 2011b. Sea Holds Treasure Trove of Rare-Earth Elements. *Nature.* Published on line

Livingston, J. D. 1996. *Driving force, the natural magic of magnets*. Harvard University Press, Cambridge, MA.

Long, K. R., B. S. Van Gosen, N. K. Foley, and D. Cordie. 2010. The Principal Rare Earth Elements Deposits of the United States—A Summary of Domestic Deposits and a Global Perspective, U.S. Department of the Interior, U.S. Geological Survey, Reston, Virginia: 2010, Scientific Investigations Report 2010–5220

The Magnet Story. 1998. Electronic Materials Manufactures Association of Japan (EMAJ). [online] [accessed 8 February 2014]. Available at: <http://www.magnetsim.com/magnet_story.php?menu_id=32>

Maltby, S. 1986. An Attractive Mounting System for Small Artifacts. *The IIC-Canadian Group Newsletter*, 12(2): 19–20.

——. 1988. Rubber: The Problem that became a Solution. In *The Scottish Society for Conservation & Restoration,* Preprints of the Meeting, Edinburgh: SSCR. pp. 151–7.

Margonelli, L. 2009. Clean Energy's Dirty little Secret. *The Atlantic*, May 2009. [online] [accessed 3 March 2012]Available at: <http://www.theatlantic.com/magazine/archive/2009/05/clean-energys-dirty-little-secret/307377/>

Midgley, J. 2015. Ionic liquid a perfect fit for rare earth recycling. *Chemistry World*. [26 March 2015] [online] [accessed 14April2015] Available at: <http://www.rsc.org/chemistryworld/2015/03/ionic -liquid-rare-earth-recycling>

Migdail, D. 2016. In Consideration of the Thanka. In *Textile Specialty Group Postprints,* vol. 23 Washington D.C.: AIC. *pending.*

——. 2015. A New 3M: Minimal magnet mounts. AIC TSG, Tip session, pending.

Rare earths supply deal between Japan and Vietnam, BBC News. 31 October 2010. [online] [accessed 26 April 2014] Available at: <http://www.bbc.com/news/world-asia-pacific-11661330>

Payne, C. 2015. China's massive toxic lake will make you question buying another electronic device. Inhabitat. April 3 2015. [online] [accessed 20 April 2015] Available at: http://inhabitat.com/chinas-massive-toxic-lake-will-make-you-question-buying-another-electronic-device

Spicer, G. 2009. The Re-tufting a Hunzinger arm-chair using magnets. *North American Textile Conservation Conference.* Quebec City, Canada.

——. 2010. Defying gravity with magnetism. *AIC News* (Nov. 2010) 35(6): 1, 3–5.

——. 2013a. An alternative to Velcro? Upper edge hanging methods using rare earth magnets. *Western Association of Art Conservation* 35(3): 20–24.

——. 2013b. Conservation treatment of a Hunzinger cantilevered armchair including the use of magnets to create tufting. *Journal of the American Institute for Conservation* vol. 52(2): 107–122.

——. 2013c. A Ferrous Attractions. *Inside the Conservator's Studio.* August 14, 2013.

——. 2013d. Ferrous Attraction and The Science Behind the Magic. *Inside the Conservator's Studio An Art Conservator's Journal*. [online] (31May 2013) [accessed 17 January 2014] Available at: <http://insidetheconservatorsstudio.blogspot.com/2013/05/ferrous-attraction-and-science-behind.html>

——. 2015. A magnet is only as strong as . . . *Inside the Conservator's Studio An Art Conservator's Journal*. [online] (28 May 2015) [accessed 18 June 2015] Available at: < http://insidetheconservatorsstudio.blogspot.com/2015/05/a-magnet-is-only-as-strong-as.html>

——. 2016. Ferrous Attractions, The science Behind the Magic. In *Textile Specialty Group Postprints*, vol. 22 Washington, DC: AIC. (Pending)

——. 2016b. Survey of magnet use in conservation. *E-Conservation*. (Pending) www.e-conservation.org

The Magnet Story. 1998. Electronic Materials Manufactures Association of Japan (EMAJ)

Trout, S. 1998. Understanding Permanent Magnet Materials; An Attempt at Universal Magnetic Literacy. [online] [accessed 8 February 2014]. Available at: <http://www.spontaneousmaterials.com/Papers/CW2000.pdf>

——. 2002. Rare-earth Magnet Industry in the USA: Current Status and Future Trends. *XVII Rare-earth Magnet Workshop*, Newark, DE.

——. (n. d.) The Lanthanide Myths. pp. 286-291. [online] [accessed 8 February 2014]. Available at: <http://spontaneousmaterials.com/Papers/REPMW90.pdf>

Vahl, B and N. Kleemann. 2014. Greenland in Figures. Greenland in Figures 2014, 11th revised edition · Editorial deadline: March 2014, Published by Statistics Greenland, stat@stat.gl · www.stat.gl

Veronese, K. 2015a. If We Want to Keep the Gadgets Coming, Let's Mine Greenland. *Wired,* 4 February 2015. [online] [accessed 15 April 2015] Available at: <http://www.wired.com/2015/02/gadget-rare-metals/>

——. 2015b. *Rare; The High-Stakes Race to Satisfy Our Need for the Scarcest Metals on Earth*. Promethiius Books

Zepf, V. 2013. Rare Earth Elements: What and where they are. *Rare Earth Elements.* Spinger-Verlag Berlin Heidelberg. Chapter 2.

GWEN SPICER
Spicer Art Conservation, LLC
Delmar, NY
gwen@spicerart.com

Guidelines for Authors

The *Book and Paper Group Annual* is a non-juried collection of papers pertaining to the conservation and preservation of works of art on paper, paper artifacts, books, and library and archival materials. The *Annual* compiles postprints (full text papers, summaries, or abstracts) of papers presented at the Book and Paper Group (BPG) Specialty Group sessions at the AIC Annual Meeting and independently submitted papers that are of interest to members of the BPG. Papers in the *Annual* may be of any length from a short technical tip to a full-length article.

SELECTION

The *Annual* is a non-juried publication. Authors are responsible for the content and accuracy of their submissions and the methods and materials they present.

Papers presented at the Specialty Group session of the Annual Meeting are selected by committee based on abstracts. After presentation authors have the opportunity to revise their papers before submitting them for publication in the *Annual*. There is no further selection review of these papers. The original abstracts distributed at the meeting are published if the authors do not submit either their full text or a revised abstract. Discussion Group moderators/chairs are asked to submit to the *Annual* a summary of the discussion they organize.

Independent submissions are published at the discretion of the BPG Publications Committee. The Committee considers as selection criteria the scope, intelligibility, originality, significance, and gross factual accuracy of the submission but does not attempt detailed review.

The BPG encourages authors of papers that have appeared in the *Annual* and that have scope of general interest to the conservation community to submit their articles to the peer-reviewed publication *Journal of the American Institute for Conservation (JAIC)*.

PERMISSIONS (AKA LICENSING AGREEMENT)

Authors submitting papers to the *Annual* are required to provide the BPG with written permission to print their submission and non-exclusive electronic rights to publish it online. It is the responsibility of authors to seek and obtain permission to publish from other rights holders (owners of objects described or illustrated, photographers, illustrators, or copyright holders other than the author) and to provide appropriate credits. Authors, not the BPG, are responsible for any payment of fees to such rights holders. Authors may note in the letter of permission restrictions on print or electronic publication required by the author or other rights holders, but the BPG retains the right to drop an image, text, or entire article from print and/or online publication if meeting or maintaining the specified restrictions proves impractical.

COPYRIGHT

Authors, not the BPG or AIC, own the copyright on the material they publish in the *Annual*. Authors are free to publish their own material verbatim or in revised form elsewhere. Future publishers who wish to reproduce all or parts of material published in the *Annual* must seek permission from the authors, not from BPG or AIC. When reproducing figures in your text from a copyrighted source, you are responsible for clearing permission before submitting your paper.

FORMAT

For general editorial style refer to the *Chicago Manual of Style, 16th edition*. There is also a JAIC style guide available at **www.conservation-us.org/jaic** with many formatting examples including common reference citations. Scroll down the page and look for the link "*JAIC* style guide". The guide is also available as a download-able pdf.

Please use the following guidelines when formatting your document:

- Full title and author at the top of the first page.
- At the end of the paper, list the author's name, title, affiliation, city and state, and email address.
- Number headings (1) and sub-headings (1.2) as a cue for the layout designer, the numbers will not appear in the final publication.

- Single space text, double-space before new paragraph.
- Use italics, not underlines, for emphasis.
- Do not embed figures into your word-processing document but submit each as a separate file. Indicate placement with (fig.1) in the body of the text and include a list of figures with captions at the end of the paper
- Endnotes should be kept to a minimum necessary for documentation. Do not use the automatic format function in your word processing software. Indicate placement with (note 1) in the body of the text and list the notes at the end of your paper.

IMAGES AND FIGURES

Digital files for images and figures must be submitted separately from the text of your paper. Please submit the larger source file instead of the file edited to fit your presentation at the Annual Meeting. The image resolution necessary for the print publication is 300 dpi which is usually much higher than the average web or Power Point ready image. Another helpful metric is if your image file is 1.9–9.8 MB it should be large enough for print publication. All image files will be re-sized to column width for print publication and it is *crucial* that the image files are of sufficient size and resolution. TIFF images are ideal, JPEGs are acceptable. PDFs are also acceptable for charts and graphs. Do not submit PowerPoint files.

- Name each digital file with the last name of the author and the appropriate reference number (e.g. "Smith01")
- Each image (photograph, table, chart, line art, etc.) must have a reference number within the text, (eg. "fig. 1") so that our layout designer will know approximately where to place the image when preparing the layout for the Annual.
- Captions for each figure should be numbered and listed at the end of the paper. Captions for works of art should include artist, title, date, media or materials, dimensions (in metric), and credit (including museum number).
- Captions for photographs captured under magnification or other special technology should specify the magnification and/or the technology (e.g., scanning electron microscope, UV light, etc.).
- Provide appropriate credit to the photographer or illustrator, if other than the author, in the caption or in an acknowledgments/credits section at the end of the paper.

Figures are printed in black and white in the print version of the *Annual* but may be produced in color in the online version. Please ensure that photographs, charts, and graphs remain legible when the color is stripped away.

SUBMISSIONS

Submit papers as an email attachment <elizamariegllligan@gmail.com> or through a file sharing site such as Dropbox or Google Drive. Use a common word-processing format such as MS Word or Google Docs. **The deadline is July 1, 2016.**