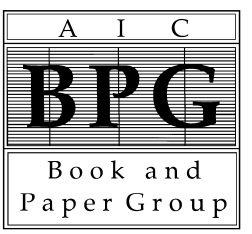
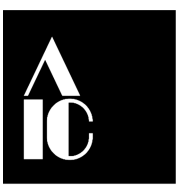
The Book and Paper Group ANNUAL

VOLUME FORTY-FOUR 2025

The American Institute for Conservation of Historic and Artistic Works





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ANNUAL

VOLUME 44 2025

Papers presented during the Book and Paper Group Session, AIC's 53rd Annual Meeting, May 27–31, 2025, Minneapolis, Minnesota

When Outreach Reaches Back: The Treatment and Retreatment of Katsukawa Shunshō's Abalone Fishergirl With an Octopus
AMANDA BURR 1

Keeping the Wolf from the Door: Remediating the Effects of Pressure-sensitive Tape While Preserving Artistic Intention
MARY HAMILTON FRENCH 9

The Ties That Bind: Communication, Collaboration, and Cross-Disciplinary Professional Development in the Service of Library Special Collections
KIMBERLY KWAN, ELIZABETH RYAN, AND AUDE GABORY 21

Abstracts presented during the Book and Paper Group Session, AIC's 53rd Annual Meeting, May 27–31, 2025, Minneapolis, Minnesota

Expanding Access: Inclusive Conservation and Education Engagement at the UK National Archives
NATALIE BROWN AND SARAH PETTER 30

Blueprint for Growth: A Journey of Architecture Designs
SANIRA KARIM GANI, PEI SHYUEN CHUA, AND TAY JAM MENG 30

Archivists and Conservators: An Unlikely Love Story
LAURA MCCANN AND WEATHERLY STEPHAN 31

Manuscripts That Multiplied: Stories from the Parchment Partnerships
FENELLA FRANCE, MEGHAN HILL, ANNA HOFFMANN, PÁDRAIG Ó MACHÁIN, AND CYNTHIA CONNELLY RYAN 31

A History of the Books in Taiwan: The Transformation of Bookbinding Formats During the Period Under Japanese Rule (1895–1945)
LOIS SU AND FEI-WEN TSAI 32

Sympathetic to Synthetics: Developing Tear Repairs for Matte Laminated Papers in Twenty-First Century Periodical Covers
CANCY CHU 33

Adhesive Kinetics: The Folding Endurance of Wheat Starch Paste, Cellulose Ethers, and Photo-Grade Gelatin
CATHERINE E. STEPHENS 33

Evaluating the Effectiveness of Alum-Tawed Parchment as a Repair Material
GWEN DEPOLO AND KATHRYN KENNEY 34

Reconsidering Klucel M: A Comparative Study of Commonly Used Cellulose Ethers in Paper Conservation
GRACE WALTERS, CHRISTOPHER BOLSER, ANDREW DAVIS, GWENANNE EDWARDS, AND KELLI STONEBURNER 34

Summaries of discussion groups at the Book and Paper Group Session, AIC's 53rd Annual Meeting, May 27–31, 2025, Minneapolis, Minnesota

Art On Paper Discussion Group 2025: Citrates In Paper Conservation
MEREDITH FRENCH AND AMY HUGHES, DISCUSSION GROUP CO-CHAIRS 35

Library and Archives Conservation Discussion Group 2025: Managing Existing Mold on Library and Archives Collections
HEATHER HAMILTON AND GENEVIEVE PIERCE KYLE, DISCUSSION GROUP CO-CHAIRS 41

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AMANDA BURR

When Outreach Reaches Back: The Treatment and Retreatment of Katsukawa Shunshō's Abalone Fishergirl With an Octopus

CRediT Statement
Conceptualization, Investigation, Data curation, Writing – original draft, Writing – review and editing, Project administration: AB

BACKGROUND

A conservation treatment can, in many cases, be conceived of as a kind of durable but temporary vessel, constructed to shepherd an object another 20, 50, or 100 years into the future before deteriorating (without causing harm) and requiring replacement. Conservators with the fortune to have worked with the same collection for decades may monitor their earlier treatments to assess how they have aged, but it is relatively uncommon to have the occasion to modify one's own earlier treatment work. The following is an example of one of these unusual cases, in which a treatment was revisited not because of catastrophe or failure, but in response to feedback received as a result of public outreach.

THE INITIAL TREATMENT

In 2018, the author was working as a Mellon Fellow in paper conservation at the Los Angeles County Museum of Art (LACMA) when an interesting Japanese woodblock print arrived in the laboratory for treatment. *Abalone Fishergirl With an Octopus* (ca. 1773–1774) by the ukiyo-e artist Katsukawa Shunshō (1726–1792) depicts an abalone fisherwoman climbing onto a rock, entangled somewhat provocatively in the tentacles of an octopus (note 1; fig. 1). Similar imagery would become a familiar subject and vehicle for erotic expression in the art of 18th and 19th century Edo, but this print is an early example that merely hints at the explicit sexuality that would be explored by later artists including Katsushika Hokusai (1760–1849), himself a student of Shunshō (Ambros et al. 2019, 10).

Abalone Fishergirl had previously been part of the famous Henri Vever collection, auctioned off by Sotheby's in four parts between 1974 and 1997. In 2003, it was donated to LACMA by computer pioneer and philanthropist Max Palevsky. The first 15 uneventful years of the print's life at LACMA had been spent in storage, but in 2018 it was selected for exhibition in *Every Living Thing: Animals in Japanese Art*, slated to run from September 22 to December 8, 2019,



Fig. 1. *Abalone Fishergirl*, recto, before treatment in 2018. Courtesy of Yosi Pozeilov.

Papers presented during the Book and Paper Group Session, AIC's 53rd Annual Meeting, May 27–31, 2025, Minneapolis, Minnesota

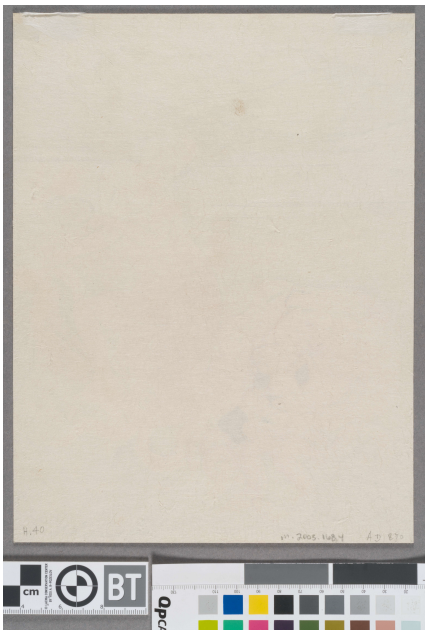


Fig. 2. *Abalone Fishergirl*, verso, before treatment, showing the overall lining with thick Japanese paper. Courtesy of Yosi Pozeilov.



Fig. 3. *Abalone Fishergirl*, before treatment, detail showing poorly repaired losses and tears. Courtesy of Yosi Pozeilov.

and co-organized by LACMA and the National Gallery of Art.

In preparation for this, treatment was needed to address significant aesthetic issues. The print had arrived at LACMA in the same condition in which it had left the Vever collection, as documented in the 1997 auction catalog (Sotheby's 1997, 55). At some point in its history, it had suffered tears and losses in the area of the octopus's head. These had been stabilized with the addition of an overall lining of thick Japanese paper that stiffened the print and increased its overall opacity (fig. 2). The lining formed fills for the losses, which had been repainted in a way that looked messy and did not correspond to the original design. The large loss at the octopus's mouth had been painted into a deranged smile, and there was overpaint in the form of crescent shapes above the octopus's eyes appearing like angry eyebrows (fig. 3). The treatment plan was to remove the lining and reduce the overpaint, to mend the tears and fill the losses with Japanese paper, and then to inpaint the new fills with watercolor. Considering that the work was a print by a well-known artist, it was assumed that it would be possible to find another, intact impression to guide the loss compensation, so treatment began in tandem with a search for another copy.

Unfortunately, *Abalone Fishergirl* proved to be much rarer than initially imagined. When online museum and library catalogs yielded nothing, Soko Furuhata, currently Senior Conservator and head of paper conservation at LACMA, contacted curators and art historians in the United States and Japan for guidance. Still, another impression of the print could not be located. This was a significant setback, but with the exhibition deadline looming, treatment needed to continue (fig. 4).



Fig. 4. From left to right: (1) the lining paper after it was removed from the print, (2) blotter washing the print, (3) after application of the new Japanese paper fills, and (4) inpainting the fills with watercolor.

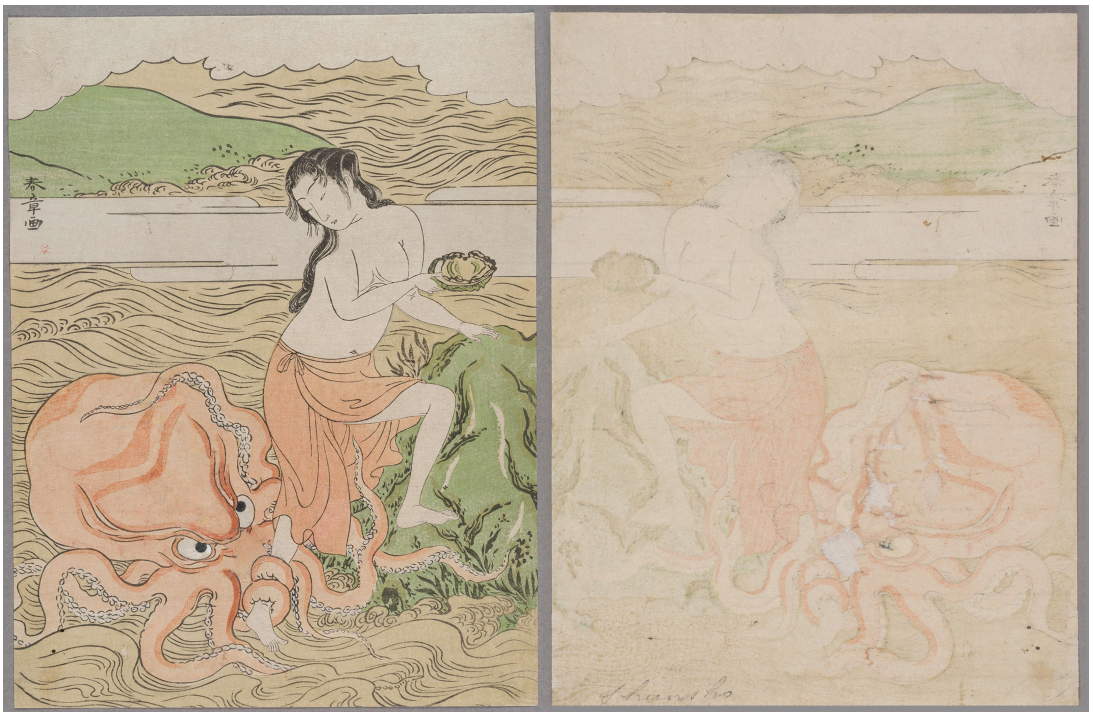


Fig. 5. *Abalone Fishergirl*, after treatment in 2018. Left: Recto. Right: Verso. Courtesy of Yosi Pozeilov.

Consultation with the curator led to a plan to inpaint the loss with intentional vagueness. The objective was to give the print an overall sense of completeness, but to allow the loss to be read as missing information without having it draw attention from the rest of the image. The result was a compromise that brought the print to an exhibitable state (fig. 5). Soon after, the treatment process was posted on LACMA's Unframed blog (Burr 2018). The post ended with an appeal to readers to contact LACMA's paper conservation laboratory with information about any other impressions of *Abalone Fishergirl* and a link to an e-mail address where leads could be sent. It was a shot in the dark, but also a kind of virtual open door through which a stranger could walk at any moment. The author left LACMA for a new position before the post was even published, imagining the *Abalone Fishergirl* project had reached its conclusion. The print went on view in the *Every Living Thing* exhibition at LACMA in 2019 as planned, and was subsequently unframed and returned to storage without incident.

AN UNEXPECTED DEVELOPMENT

On September 15, 2022, nearly 4 years after the blog post had been published, a Japanese art dealer in Venice, Italy, named Gianni Morra sent an e-mail to the LACMA paper conservation laboratory. He explained that he had an intact impression of *Abalone Fishergirl*, and he generously included a snapshot in his e-mail. It was a stunning turn of events that raised the possibility of retreatment for LACMA's impression of the print.

REVISITING THE TREATMENT

In March 2024, the author was rehired by LACMA, which provided the perfect opportunity to revisit the treatment of *Abalone Fishergirl*. In consultation with the curator, a plan was made to retreat the print in light of the new information provided by Mr. Morra. The idea was to create a thin, sheer, digitally printed fill that could be layered over the previous repair and modified with additional inpainting as needed. Inspiration was found in earlier treatments that combined digitally printed fills with traditional inpainting techniques. This included Judith Walsh's innovative removable "puzzle" fill for a 15th century German engraving, printed at 60% gray on laid paper and finished by hand with pen and ink (Freeman, Karnes, and Stratis 2017). Another very different treatment performed by conservators at the National Museum of the American Indian involved the use of laser-printed fills to recreate lost areas of quillwork in a pair of Iroquois hide moccasins. The fills were printed onto Japanese paper, which was then wrapped around a Tyvek support that had been toned with acrylic paints. The color and finish of the fills were then refined with the addition of colored pencil and acrylic mediums (Passerotti et al. 2015). A hybrid approach allows conservators to produce beautifully customized fills printed using accessible office technologies while sidestepping the challenges of color matching digital files.

The author had some experience with digital fills as part of a treatment completed in 2017 during a third-year internship



Fig. 6. *Pen and Ink Sketches of Military Life in the Union Army*. Left: Before treatment, showing the loss in lower/back board. Right: After treatment, showing the repair to the lower/back board.

at the University of California, Los Angeles Library. The object in question was a small sketchbook made by a Union Army soldier named Frederick Ransom out of a repurposed receipt book from a plant nursery (note 2; fig. 6). The treatment was complex, but part of it involved filling a loss in the lower board with blotter paper. To cover the fill, the book's marbled paper layer was reproduced by scanning an intact portion and laser printing the scan onto Japanese paper, all using the laboratory's office copier. Scanning and printing onto Japanese paper was the suggestion of Consuela Metzger, Head of Conservation and Preservation. She demonstrated how to print onto Japanese paper by first taping it onto a sheet of copier paper, a method she had first encountered in the mid-1990s while working at the Huntington Library. At that time, she explained, the conservators would print sheets of tiny "binder's tickets" bearing the Huntington logo onto Japanese paper, and these would be dated, initialed, and attached to book pastedowns to mark completed treatments (pers. comm., September 6, 2024). This activity seems to have been quickly abandoned, but the anecdote is a reminder that conservators have been tinkering with ways to integrate electrostatic printing into conservation practice for a long time.

The laser-printed fill for *Abalone Fishergirl* would need to be as thin and sheer as possible. This would enable the new fill to be layered over the existing one that had been added in 2018, rather than subjecting the print to another invasive treatment to remove and replace it. To create the necessary thin fill, a piece of tengujo (7.3 gsm) was taped onto copier paper, the Venetian impression of *Abalone Fishergirl* was scaled to the size of LACMA's print, and the image was printed onto the prepared copier paper using the office laser printer (a Canon ImageRunner Advance DX C58401) (fig. 7).



Fig. 7. Left: A small square of 7.3 gsm tengujo taped to a sheet of 11 × 8.5 inch copier paper. Right: The same sheet after printing using the Canon ImageRunner Advance DX C58401.



Fig. 8. Sample prints on 7.3 gsm tengujo. Left: Sample made using a laser printer (Canon ImageRunner Advance DX C58401). Right: Sample print made using an inkjet printer (Epson SureColor P800).

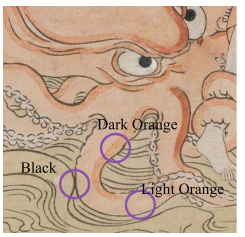
Several colleagues suggested that inkjet printing might be a better option than laser printing because the pigment-based inks would be more lightfast than the toner used in laser printing. To test this, inkjet- and laser-printed samples were created. LACMA's Managing Photographer and imaging specialist Yosi Pozeilov generously made several inkjet test prints using an Epson SureColor P800 and the Epson UltraChrome HD eight-color pigment ink set, which is advertised specifically for its high print permanence ratings. In general, inkjet printing onto tengujo was tricky, as the print heads would catch paper fibers as they moved across the surface, causing ink bleed and irregularities. Attaching the tengujo to matte photo paper yielded cleaner results than glossy paper, but the process remained finicky. The inkjet prints also had a very different character than the laser prints (fig. 8). This difference is most striking under the microscope. In the laser print, the lines of the design are relatively well defined with clean edges, but the surface also has an intensely mechanical appearance due to the toner being laid down in a regular pattern of diagonal lines. In contrast, the inkjet print appears more painterly, with the ink flowing along paper fibers to create diffuse, meandering lines (fig. 9).

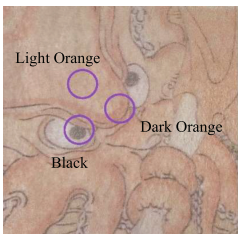
To address the question of relative light stability, LACMA's Assistant Conservation Scientist Kyna Biggs performed microfade testing (MFT) using a Whitmore MFT on samples of tengujo that had been both laser and inkjet printed. An additional sample of tengujo painted out with watercolor was also tested, as well as the original woodblock print. For each, the orange color and the black color were analyzed. The MFT curves obtained were then compared to those of the ISO Blue Wool standards (table 1). For the woodblock print, both the light and dark orange were found to be moderately light sensitive, fading between Blue Wool 2 and 3, whereas the black was somewhat light sensitive, fading at about the same rate as Blue Wool 3. For the watercolor sample, both the orange and black were found to be moderately light sensitive. Interestingly, for both the inkjet print and the laser print, all colors tested were found to be somewhat light sensitive,

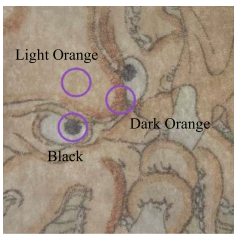


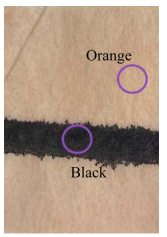
Fig. 9. Photomicrographs showing sample prints on 7.3 gsm tengujo. Left: Sample print made using a laser printer (Canon ImageRunner Advance DX C58401). Right: Sample print made using an inkjet printer (Epson SureColor P800).

Table 1. Results of MFT Produced by Kyna Biggs, Assistant Conservation Scientist, LACMA









Light Sensitivity	M.2003.168.4			Laser Print			Inkjet Print			Watercolor (Schmincke)	
	Dark Orange	Light Orange	Black	Dark Orange	Light Orange	Black	Dark Orange	Light Orange	Black	Orange (Naples yellow reddish + Venetian red)	Black (True ivory black)
Extremely light sensitive (fading rate without UV faster than BW1)											
Very light sensitive (fading rate without UV between BW1 and BW2)											
Moderately light sensitive (fading rate without UV between BW2 and BW3 – could show perceptible change in appearance after 100,000 ftc hours)	X	X								X	X
Somewhat light sensitive (fading rate without UV between BW3 and BW5 – could show perceptible change in appearance after 300,000 ftc hours)			X	X	X	X	X	X	X		



Fig. 10. Sample prints made using a laser printer (Canon ImageRunner Advance DX C58401). Left: The 7.3 gsm tengujo at 100% opacity (too dark/dense). Center: The 5 gsm tengujo at 100% opacity (too muddled). Right: The 7.3 gsm tengujo at 70% opacity (perfect).

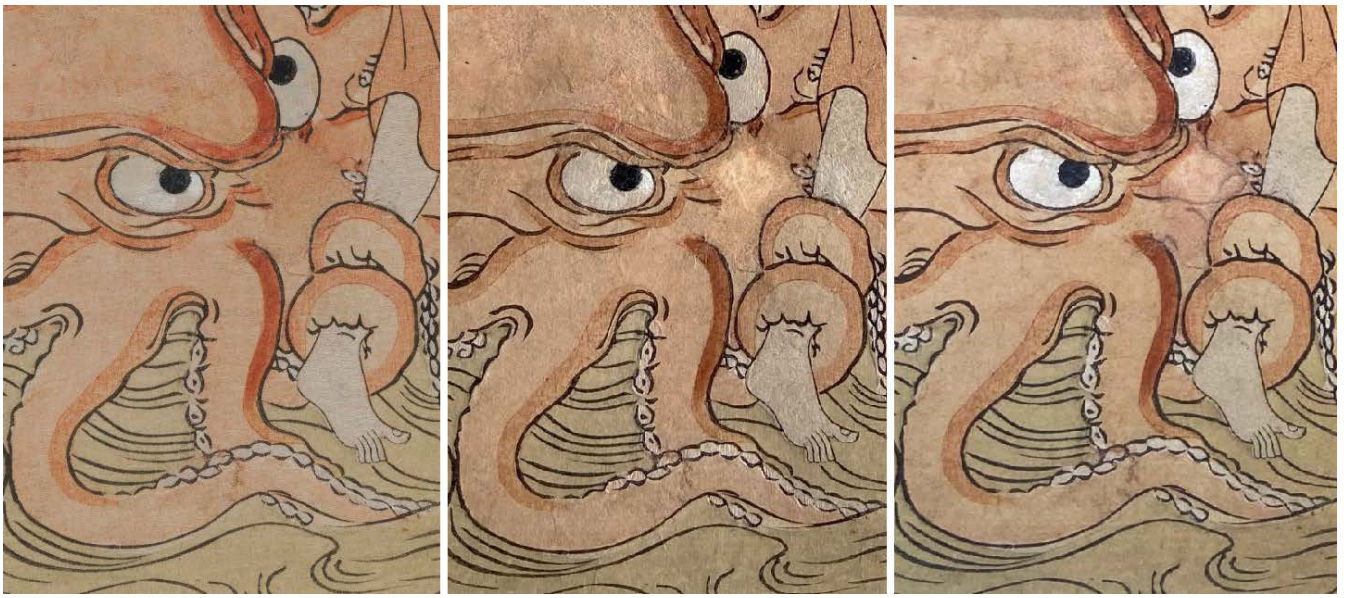


Fig. 11. Left: Detail of the fill prior to retreatment. Center: Detail of the fill after previous inpainting (watercolor) was partially lifted. Right: Detail of the retreated area after application of laser-printed fill (before additional inpainting).

fading below Blue Wool 3. It was expected that the pigment-based inkjet inks would outperform the laser printer toner when it came to light stability, but at least in this case, there was no significant difference.

With the MFT results in mind, the laser-printed fill was determined to be the best option, as it would provide better image clarity. The fills had been printed onto 7.3 gsm tengujo; however, these fills were too dark to allow for layering. To achieve a more sheer image, 5 gsm tengujo was tested, but it was found that paper this thin has large voids between fibers that cause the image to lose legibility. A better solution was to return to printing on the 7.3 g tengujo, and instead reduce the opacity of the image to 70% (the 70% opacity was chosen with the thinking that 5g tengujo has about 70% of the fiber density of 7.3 g tengujo). The result was sheer enough to layer while maintaining intelligibility of the linear design (fig. 10). The fill was shaped to the area of the loss in the woodblock print. Using a micro swab dampened with water, some of the watercolor from the earlier fill was lifted. Then the new printed fill was pasted in place over the earlier one (fig. 11). The final step was to augment the printed fill with additional watercolor. This hybrid approach combining printing and hand-applied color was an efficient way to harmoniously integrate the digitally reproduced missing elements. The watercolor not only adjusted the color of the printed fill but also softened its mechanical character. Under the microscope, the diagonal line pattern of the toner is still visible (fig. 12), but the watercolor has obscured it enough that under normal viewing conditions, the fill blends in seamlessly (fig. 13).

The odyssey of this print highlights the role that the Internet played in its iterative transformation. Conservators are increasingly expected to present their work in digestible bites on social media. This can be a challenge, as the kind of communication incentivized by platforms like TikTok and Instagram emphasize brevity, simplicity, and entertainment, characteristics almost antithetical to conservation work, which tends to be slow, subtle, and rife with imperfect solutions that can be hard to explain.

The outcome of this project is a reminder that it may be possible for conservators to use the tools of online outreach in ways that truly benefit their work. Much as office printing technologies have been adapted in ways that could not have been imagined by their inventors, conservators have the opportunity to find uses for social media that not only broadcast their



Fig. 12. Photomicrograph detail of the retreated area after treatment, showing the fill adjusted with additional watercolor.



Fig. 13. *Abalone Fishergirl*, after treatment in 2025. Courtesy of Yosi Pozeilov.

achievements and inform the public but also elevate a conservator's values of information exchange and collaboration.

ACKNOWLEDGMENTS

Los Angeles County Museum of Art: Soko Furuhata, Janice Schopfer, Erin Jue, Hollis Goodall, Rika Hiro, Yosi Pozeilov, Kyna Biggs, Laura Maccarelli, Chi-Young Kim, and Elsa Thyss; Lella and Gianni Morra; University of California, Los Angeles Library: Consuela Metzger, Octavio Olvera, and Genie Guerard; Kyoto University: Kenkō Suzuki.

NOTES

1. *Abalone Fishergirl With an Octopus* (M.2003.168.4), Katsukawa Shunshō (1726–1792), Japan, ca. 1773–1774, color woodblock print, 25.0 × 18.9 cm. Los Angeles County Museum of Art.

2. *Pen and Ink Sketches of Military Life in the Union Army*, bound manuscripts collection (Collection 170/645). UCLA Library Special Collections, Charles E. Young Research Library, University of California, Los Angeles.

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SOURCES OF MATERIALS

Tengujo 5 g: Tengucho/Tengujo 5 g (MMN-1), 100% Thai Kozo machine made in Kochi, Japan. Hiromi, https://hiromi-paper.com.

Tengujo 7.3 g: Haini Hidaka Tengucho ROLL 7.3 g (HID-4), 100% Japanese Kozo cooked in ash, machine made by Hidaka Washi in Kochi, Japan. Hiromi, https://hiromipaper.com.

Watercolor: Schmincke Horadam watercolor, H. Schmincke & Co. GmbH & Co. KG, https://www.schmincke.de/en.

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MARY HAMILTON FRENCH

Keeping the Wolf From the Door: Remediating the Effects of Pressure-Sensitive Tape While Preserving Artistic Intention

CRediT Statement
MHF: Conceptualization, Formal analysis, Investigation, Methodology, Project Administration, Resources, Visualization, Writing – original draft, Writing – review & editing

INTRODUCTION

Peter and the Wolf is a composition familiar to many; the lighthearted musical tale has delighted generations of children around the world and often serves as a young person's first experience with classical music. The manuscript score, created by its composer for the 1938 North American premiere, has an important place in music history. Now held in Special Collections at the Boston Public Library (BPL), it is the earliest known existing manuscript copy of *Peter and the Wolf* and contains evidence of the rehearsal process prior to its early performances.

Pressure-sensitive tape has been applied liberally throughout the manuscript, both to affix slips of paper to the surface of each page and to secure the attachment of the leaves to the text block (fig. 1). The adhesive of the tape is discolored and failing, not only causing damage to the paper but also risking loss of taped-on information. A typical approach to pressure-sensitive tape is to remove the tape carrier and adhesive, then resecure materials with Japanese paper and wheat starch paste. However, the tape had been applied to add English translations to the score during the rehearsal process and showed a degree of intentionality in its use. Additionally, musical dynamics and other annotations were written on top of the tape in blue pencil (fig. 2), so the tape was now part of the music.

This represented a significant ethical dilemma. Removing the tape would erase both information and historical context, but leaving it in place would allow further degradation and loss in the future. Treatments needed to carefully balance the current and future needs of the manuscript with preserving as much historical evidence as possible. Significant testing was carried out prior to beginning work using an assortment of materials and techniques to best accommodate these competing needs.

Papers presented during the Book and Paper Group Session, AIC's 53rd Annual Meeting, May 27–31, 2025, Minneapolis, Minnesota

Peter and the Wolf

Sergei Prokofiev composed *Peter and the Wolf* in 1936 and conducted it at its premiere shortly thereafter at the Moscow Conservatory with the Orchestra of the Moscow Philharmonic Society. Natalya Sats, the director of the Central Children's Theater in Moscow, commissioned the piece to both educate and entertain the theater's young audience. *Leitmotifs*, or recurring musical themes associated with characters in the story, are employed throughout the piece to introduce children to classical music and demonstrate the individual instruments that make up an orchestra (Robinson 1985).

The libretto, or text of the work, tells the story of a young boy who sets out to explore the meadow near his house despite the remonstrations of his grandfather to stay at home. His grandfather worries that the wolf in the forest may harm Peter; his grandson views this as a challenge, cleverly figuring out how to trap the wolf to stop it from attacking local wildlife. On the surface, it is a lighthearted tale of a child's adventure. However, it was also meant to serve as an allegory that promoted new Communist ideals. Peter's youthful bravery and hard work are celebrated, whereas his fearful grandfather is used as a foil to caution listeners against the timidity and stubbornness of older, pre-Bolshevik generations.

The first performance of *Peter and the Wolf*, held on May 2, 1936, was not noteworthy. Natalya Sats intended to narrate it, but she was ill and the substitute narrator was inexperienced and had insufficient practice time. The piece was met with a better reception at a second performance later that month. Just under 2 years later, *Peter and the Wolf* received its North American premiere at Symphony Hall in Boston on March 25, 1938. Prokofiev guest conducted the Boston Symphony Orchestra and Richard Hale narrated the piece, with great acclaim (Boston Symphony Orchestra 1938).

History of the Manuscript

This manuscript, used at the North American premiere, is an autograph score, meaning that it is written in Prokofiev's



Fig. 1. Pressure-sensitive tape was used throughout the manuscript to hinge facing pages to each other and add English translations to the score.

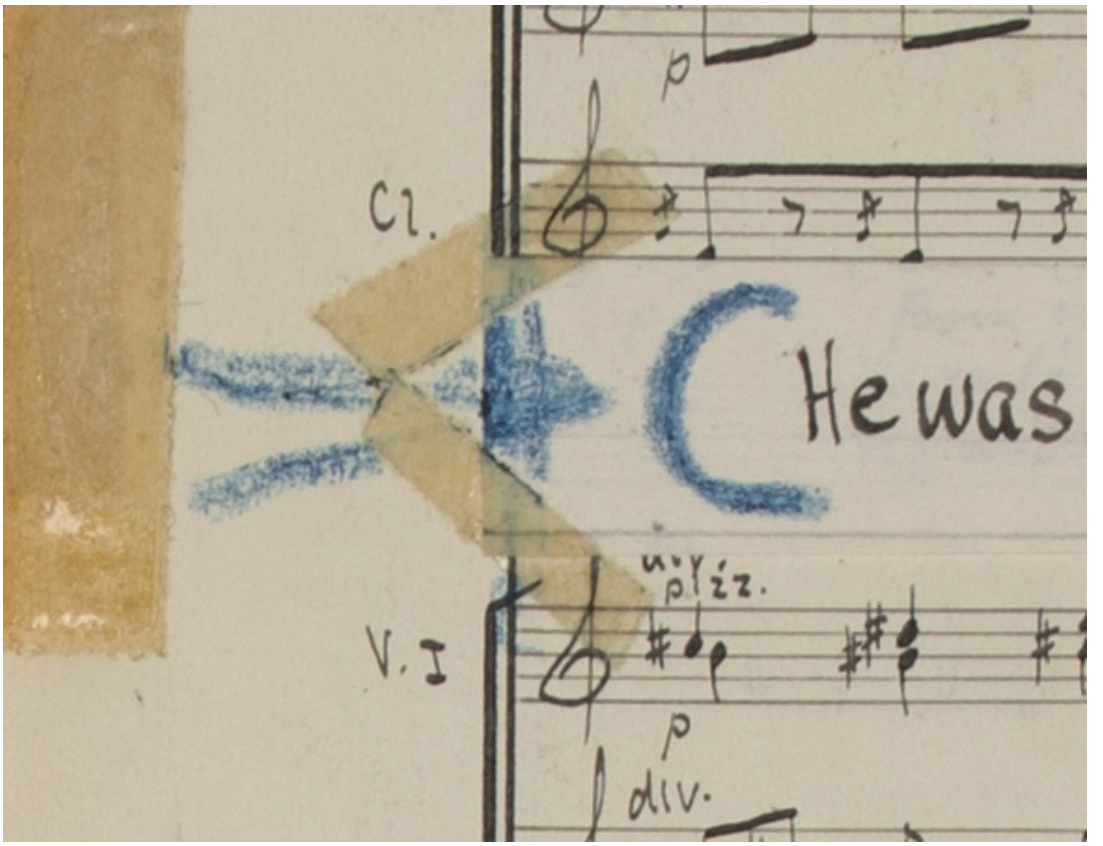


Fig. 2. Blue pencil was used by the conductor to mark up the score during the rehearsal process; in some instances, the pencil marks extended onto the surface of the tape carrier.

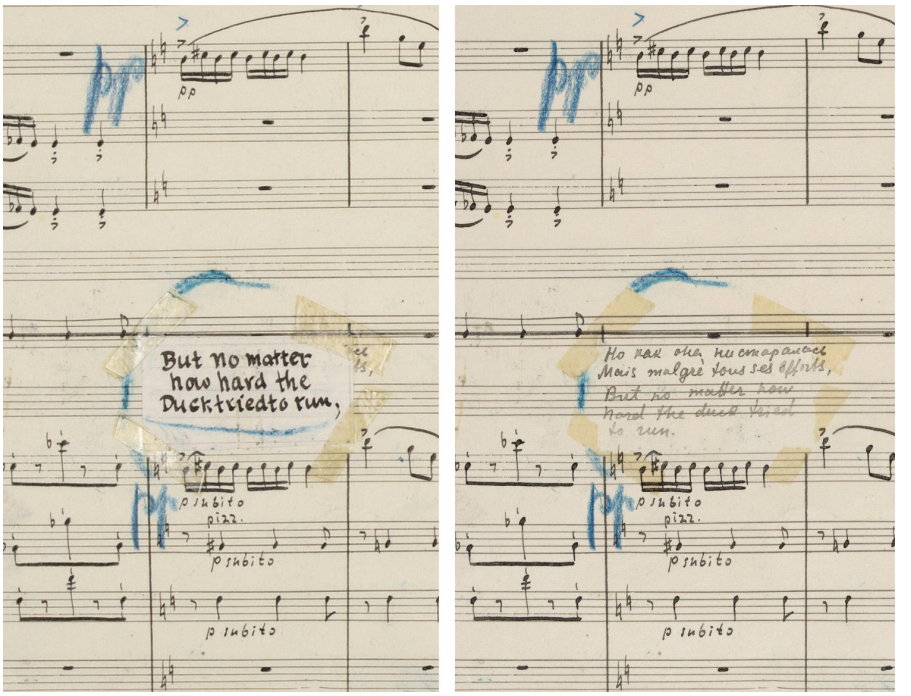


Fig. 3. Left: English translations of the text in an unknown hand were taped into the score. Right: Once the paper slips were removed, Prokofiev's original Russian, French, and English text was revealed.

hand. It is neatly executed in black pen with no signs of editing, a piece ready for performance, not a working draft. As a finished score, it is likely not the earliest iteration of the piece. However, there are currently no known primary source manuscripts that predate it, likely due to the turbulent political environment during Soviet-era Russia (McAllister and Guillaumier 2020). The score is therefore the oldest version of *Peter and the Wolf* still known to exist.

An addendum in pencil featuring the leitmotifs associated with the story's characters was attached to the front of the score with textile tape. It is written in an unknown hand, and it is unclear at what point it was added to the manuscript. An examination of the binding reveals that the addendum was taped to the first page of the music prior to the score being bound, evidence in favor of being an early addition to the work. Opening the piece with an introduction to the instruments in the orchestra featuring the narrator and principal players of each section has been a part of the performance since the North American premiere (Smith 1938). However, the text in the score's addendum matches neither the spoken words of the recordings produced by the Boston Symphony Orchestra with its conductor, Serge Koussevitzky, in 1939 and 1950, nor the order in which the instruments are introduced. The arrangement of leitmotifs in this penciled addendum most closely matches the order described in newspaper coverage the day after the North American premiere (Durgin 1938).

The staff paper that this addendum is written on is printed with the text "Paramount Pictures Inc., West Coast Studios, Music Department, Library Division." During a trip to Hollywood, Prokofiev visited the Walt Disney Studios on February 28, 1938, to play the piano score of *Peter and the Wolf* for Walt Disney (Smith, n.d.). While in California, he also visited Paramount Pictures and received a lucrative offer to compose for this studio, although he eventually declined and returned to Moscow to be with his family (Robinson 2007; Bartig 2013). It is possible (although not certain) that Prokofiev acquired the staff paper in February or March of 1938 just before the North American premiere of *Peter and the Wolf* while being courted by Paramount Pictures. The label on the staff paper, the order of the leitmotifs, and the prebinding use of pressure-sensitive tape point toward the possibility that this addendum was created specifically for the North American premiere of this piece.

The score is heavily marked with notes for the conductor, including musical "dynamics, cues, phrasing, tempo indications, and metronome markings" (Boston Public Library, n.d.-a). These annotations are in Serge Koussevitzky's hand and were likely made during rehearsals when he conducted *Peter and the Wolf* in 1939, 1940, 1948, or 1950 (Boston Symphony Orchestra, n.d.-b). The first-ever recording of Peter and the Wolf was made in 1939 by the Boston Symphony Orchestra under Koussevitzky, as was a 1950 recording with Eleanor Roosevelt narrating (Young 1990). The score was likely used to conduct these noteworthy performances as well.

English translations in an unknown hand are taped over the original text written in Russian, French, and English (fig. 3).

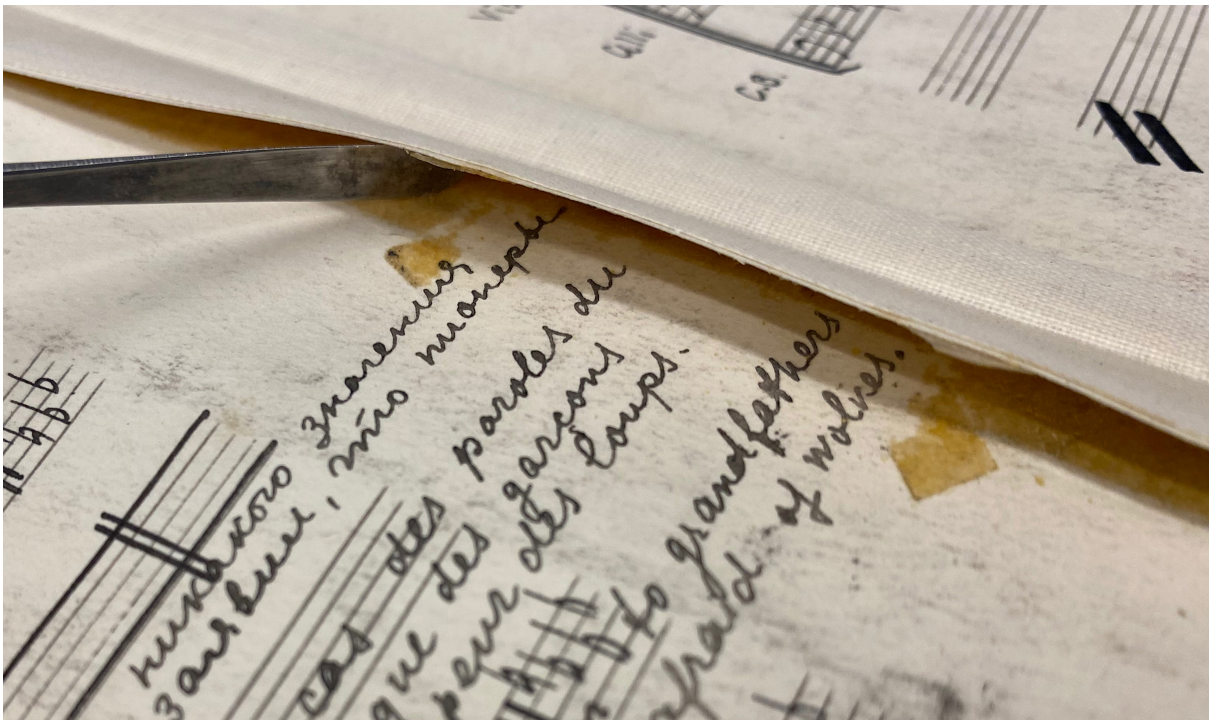


Fig. 4. Textile hinges were used to attach sections of the manuscript to each other. The cloth obscures both text and pressure-sensitive tape and was therefore a later addition to the score.

Koussevitzky's annotations are written over the tape holding these translations to the score, so the translations were probably added after the North American premiere conducted by Prokofiev, but before Koussevitzky's subsequent performances. The text underneath these translations is in Prokofiev's hand. Cramped and small, the original text is difficult to read, and the larger English lettering was likely introduced to improve legibility.

The manuscript now resides at BPL after being donated to Special Collections by Olga Koussevitzky, the wife of Serge Koussevitzky, in 1966 (Digital Commonwealth 2024). It is not clear how or when Prokofiev's manuscript came into Serge Koussevitzky's possession. The most likely explanation is that Prokofiev, a friend and compatriot, gave him the manuscript as a present following the North American premiere in March 1938. As Koussevitzky was the conductor of the Boston Symphony Orchestra at the time, this could have been a gesture of thanks for the invitation to guest conduct the orchestra.

Following his international tour in 1938, Prokofiev returned to the Soviet Union and remained there until his death in 1953 (Nestyev and Taruskin 2025). Koussevitzky, having left Russia in 1920, never returned to his home country. This would have made an in-person exchange of the manuscript difficult after the two last saw each other in 1938 (Boston Symphony Orchestra, n.d.-c). Koussevitzky owned the musical publishing company *Éditions Russes de Musique,* which published works by Prokofiev, and it is possible that he acquired the score through his business. However, it seems somewhat more likely that he had already obtained it directly from Prokofiev at the time of the North American premiere.

CONSERVATION ISSUES

The manuscript showed the usual condition issues one might expect in a score from the 1930s. The binding consists of two uncovered millboards attached along the spine with a thin strip of black cloth; these binding materials were acidic, dirty, and fragile. Board corners were creased and worn, and the textile was splitting along the joints. The textbook consisted of several sections sewn individually in a pamphlet style. Sections were attached to each other and to the binding with textile hinges (fig. 4).

The text block consists of a handwritten musical score in black ink with extensive annotations in blue, red, and graphite pencil. English translations on slips of paper were taped to the page over the original text. The text block was slightly dirty, there were tears in some of the pages, and the pressure-sensitive tape adhesive was discolored and failing. Some of the tape's adhesive was still tacky and had migrated out from underneath the tape carrier, which caused facing pages to stick together. The pencil was particularly friable where it had been written onto the slick surface of the tape carrier. Where the tape adhesive failed, the tape carrier and paper translation slips

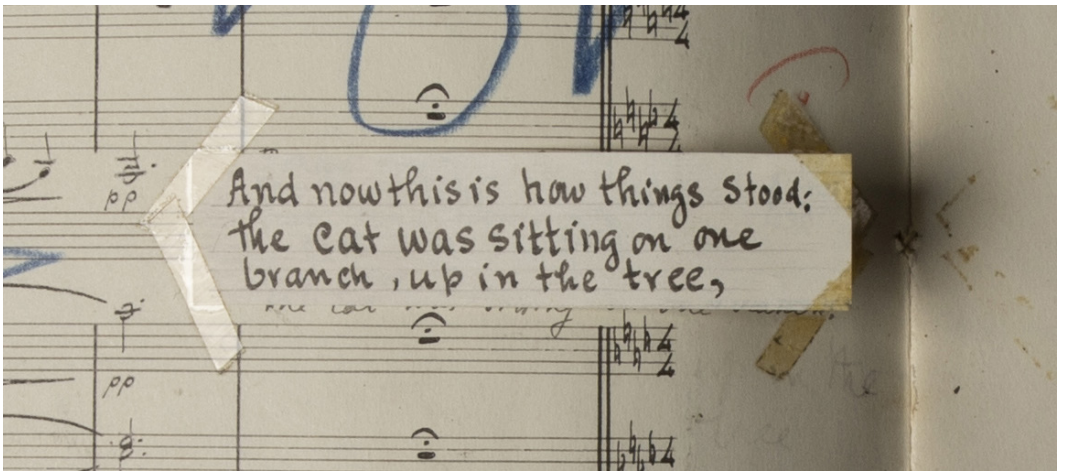


Fig. 5. Some tape adhesive had failed, leaving the paper slips partially or fully detached and several pieces of tape carrier missing.

were loose and at risk of disassociation. While none of the paper slips were missing, some pieces of tape carrier were, and this meant that some historical context had been lost (fig. 5).

CREATING A TREATMENT PLAN

Treatment Goals and Ethical Considerations

The primary goal of treatment was to prepare the manuscript for digitization and display in an exhibition celebrating the 150th anniversary of Koussevitzky's birth and the 100th anniversary of the start of his tenure at the Boston Symphony Orchestra. Given the significance of *Peter and the Wolf*, both curator and conservator felt that the manuscript would be used frequently in the future and wanted to ensure that the object was stabilized for reading room access. No treatment decisions are ever made in a vacuum, and that was particularly true for this project. The BPL's curator of music, Jared Rex, was an invaluable source of information on the manuscript's history, as well as the social and musical context surrounding its creation. Knowing which pieces of the manuscript were original to the object's creation and which were added as later modifications helped inform the treatment plan considerably.

As described previously, pressure-sensitive tape applied extensively throughout the manuscript was not only causing damage to the paper but also putting the translation slips in a particularly precarious position (fig. 6). Pressure-sensitive tape with deteriorating adhesive is often removed by conservators to limit the damage it causes. In addition to the adhesive discoloring and embrittling the paper underneath, when the adhesive loses its tack it is no longer serving its original function. However, this tape was applied in rehearsal or in preparation for a performance, if not by the composer, then at least early in the score's life based on the annotations that are written on top of the tape. Not only was it part of the object's history, but it also contained valuable information about the rehearsal process and notable early performances of the work.

The treatment plan needed to incorporate the preservation of the tape and the writing on its surface while also mitigating damage caused by the adhesive. After research, conversations with the curator and other conservators, and significant thought, it was decided to remove the tape temporarily from the manuscript so that the adhesive on the tape carrier, paper slips, and text block could be reduced. The media on top of the tape was exceptionally friable and susceptible to loss; a consolidant needed to be applied to the media to protect it during treatment and during future patron handling. Finally, a new adhesive would be used to reattach the tape carrier and paper translation slips to the pages.

Deciding upon this course of treatment also created an opportunity to digitize previously hidden sections of text. The English translation slips were taped over the score's original text in Russian, French, and English. As this text had been inaccessible since the manuscript's creation, the

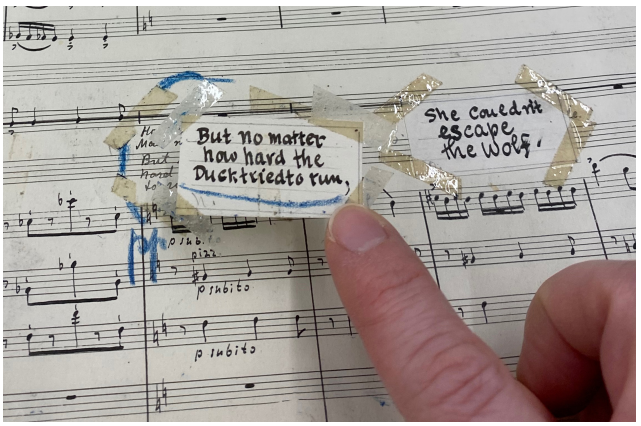


Fig. 6. This paper translation slip was detached from the text block, putting it at significant risk of disassociation.

contents of this material had not previously been studied. Providing access to this text to scholars—albeit as a digital surrogate—was another reason to choose this more interventive treatment. Digitization was proposed in two rounds to fully capture both iterations of the manuscript. After the first round of treatment, the manuscript would be digitized to capture the information underneath the taped-on paper slips. Then, the text would be reattached to the score and a second round of digitization would occur to record the object in its treated state.

Given the lengthy time estimate of this treatment plan, it was decided not to treat the binding as it was relatively stable in its current form. Additionally, the tape pieces applied to the gutter between facing pages were not treated. This tape was not serving a structural purpose and did not contain writing, so the conservator and curator decided to prioritize the treatment of only the tape applied to the paper translation slips.

MATERIALS TESTING

Consolidating media on slick, transparent surfaces and reattaching the tape carrier to paper were nonstandard treatments, so several materials and techniques needed to be tested prior to beginning work. The conservator tested adhesive removal solvents, consolidants for the friable media on tape carrier pieces, and adhesives and application methods for readhering the tape carrier to paper. Materials needed to have the correct optical properties, be reversible, and have relatively good durability.

Adhesive Removal

Solvent testing was carried out on the original tape, as it was not possible to create samples with the exact adhesive at the same stage of deterioration. The first solvent tested, isopropanol, worked well. Because isopropanol has comparatively fewer health and safety issues than other solvents typically used for tape removal and can be disposed of easily, it was selected for treatment. Testing revealed that the adhesive on the tape carrier was best removed by complete immersion in isopropanol. A solvent gel poultice was used on the adhesive on the manuscript to limit solvent dispersion and minimize the risk of the ink bleeding into the surrounding paper.

Media Consolidation

To create samples for testing, modern pressure-sensitive tape was applied to sheet music facsimiles and then checkmarks were drawn on top of tape and paper with colored pencil. Five different consolidants were tested: 2% Klucel G in isopropanol, 5% Paraloid B-72 in ethanol, 5% Selvol in deionized water, 4% methyl cellulose in deionized water, and 5% gelatin in deionized water. Consolidants were brushed onto the surface of the tape with a soft brush and then allowed to dry completely. Samples were examined to assess whether the consolidant was visible on the surface of the tape. Durability was tested by rubbing the surface of the tape with a finger to mimic handling in a reading room setting. The consolidant that passed both the optical and durability tests was immersed in a solvent bath to test that the consolidant could be successfully reversed if necessary.



Fig. 7. A mixture of 5% Paraloid B-72 in ethanol was the strongest and most friction resistant of the consolidants tested, but it had a slightly milky, dull appearance when applied to the tape carrier and was therefore not used in treatment.

As expected, none of the water-based consolidants were suitable for use on plastic. The 5% Selvol in water beaded up on the surface of the tape and would not form an even film, so it was immediately ruled out. The 4% methyl cellulose in water and 5% gelatin in water both formed cohesive films, but when they dried, they made the tape carrier dull and slightly less transparent. When tested for durability, the consolidants were removed easily with gentle rubbing, taking the media along with them. Paraloid B-72 had the strongest durability of all consolidants tested but had decreased sheen and a slightly milky appearance, which made it unsuitable for use in this context (fig. 7). The 2% Klucel G was selected for consolidation treatment, as it had the correct optical properties, was resistant to rubbing, and could be fully reversed in a solvent bath without also removing the media that it was protecting.

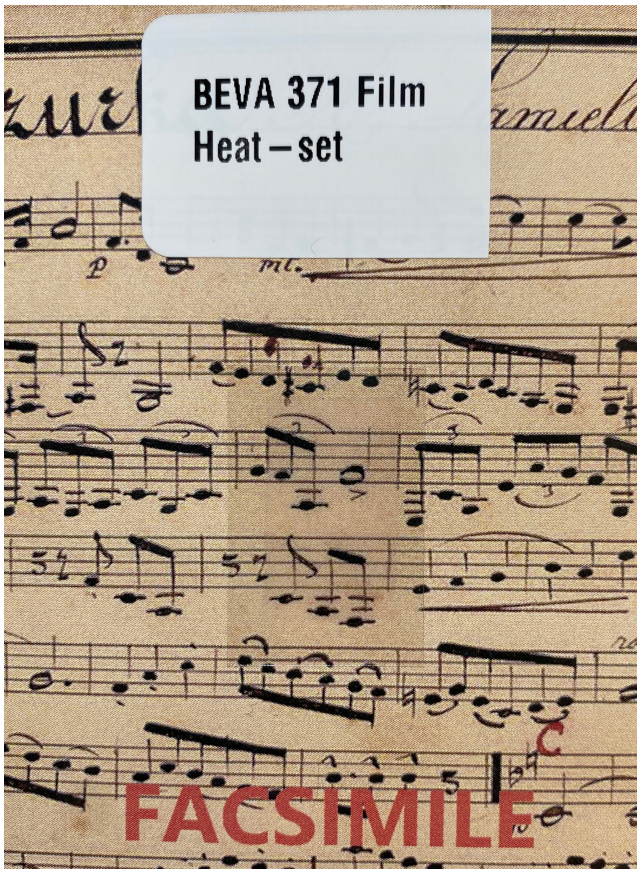


Fig. 8. BEVA 371 film performed well during testing, as it appeared completely transparent underneath the tape carrier and bonded well to both paper and plastic.

New Tape Adhesive and Application Method

Three different adhesives were assessed to determine suitability for readhering the tape carrier to the leaves of the text block: BEVA 371 film, Lascaux 498 HV in liquid and film forms, and Jade 403 PVA in liquid and film forms. A 2-mil archival polyester film (Mylar) was used as a substitute for the tape carrier, and samples were applied to facsimile sheet music. Liquid adhesives were brushed onto the surface of the Mylar, which was then applied to the sample paper and dried under weight. Films were sandwiched between paper and Mylar, and a tacking iron was used to apply heat over a release layer of Hollytex.

Liquid applications of the Lascaux 498 HV and Jade 403 PVA were deemed unsuitable, as the Mylar adhered poorly to the surface of the page and brush strokes were visible through the plastic. Film applications of these two adhesives had a better overall appearance than their liquid forms but similarly poor adhesion. The Mylar could be peeled away from the surface of the paper with little effort. Lascaux 498 HV and PVA films were not easy to work with, as they tended to distort when peeled off the backing material that had been used to cast the films. In contrast, BEVA 371 film was easily cut to the exact size of the tape carrier, formed a completely transparent film, and adhered the sample carrier to the surface of the paper reasonably well (fig. 8). Further testing also revealed that it was straightforward to reverse, should that become necessary in the future.

Heat settings on the tacking iron were also tested to determine the lowest possible temperature needed for adhesion. The tacking iron was turned on from cold to the desired setting and allowed to preheat for 10 minutes prior to testing each heat level. The lowest heat setting did not activate the BEVA 371 film at all, whereas a medium low heat resulted in poor adhesion. Medium-high heat caused good adhesion between Mylar and paper, but the sample carrier began to cockle. High heat resulted in the sample carrier cockling and the adhesive yellowing significantly (fig. 9). Medium heat proved to be the ideal setting, causing the BEVA 371 film to adhere well to both paper and plastic without any noticeable negative effects.

CONSERVATION

Documentation

Prior to beginning work, the score's condition was carefully documented. In addition to a written report, the binding and all pages were photographed. Having an image of each page prior to treatment was essential for guaranteeing that the many pieces of tape carrier and translation slips were reattached in their correct places.

Surface Cleaning

The text block and binding were cleaned with vulcanized rubber sponges to remove surface dirt. There were many penciled annotations throughout the text, and these were avoided when carrying out the surface cleaning. Surface dirt was ingrained in the paper, so cleaning resulted in little visual change to the score.



Fig. 9. On the highest setting, the tacking iron discolored the BEVA 371 film.



Fig. 10. Tape carrier was lifted from the text block manually using a microspatula, approaching from underneath the paper slip.

Tape Carrier Removal

Tape carriers were removed manually with a microspatula. It was easiest to approach the tape carrier by sliding the spatula underneath the paper translation slips toward the corners, then sliding the spatula outward along the taped areas of the text block (fig. 10). Each detached slip of paper was placed into a polyethylene specimen bag, which was labeled with its originating page number. Tape carrier pieces were placed into smaller, labeled bags. Each of these bags was inserted into the larger bags containing their corresponding paper translation slips (fig. 11). This helped group materials together so that they could be easily and accurately reunited at the end of the project. There were many, many pieces of tape carrier and paper slips, so keeping everything organized was essential.

Media Consolidation

Friable media on the surface of the tape carrier was consolidated after removing the paper translation slips from the text block but before removing the tape carrier from the paper



Fig. 11. Translation slips and tape carrier pieces were placed in labeled polyethylene bags to help keep them secure and organized during conservation and digitization.

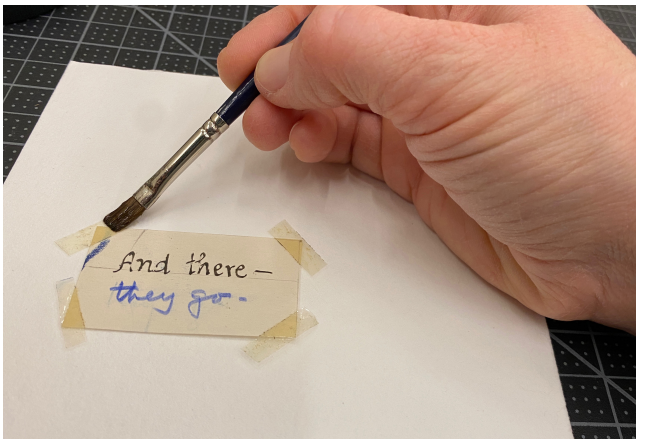


Fig. 12. A mixture of 2% Klucel G in isopropanol was brushed across the surface of the tape carrier to consolidate friable blue pencil marks.

translations. This minimized the amount of solvent in contact with the ink in the text block while not risking the accidental removal of friable pencil from the tape during adhesive reduction. A mixture of 2% Klucel G in isopropanol was applied with a soft sable brush over the entire surface of the tape carrier and air dried before treatment proceeded (fig. 12).

Reducing Tape Adhesive

After the media was consolidated, excess adhesive was removed from the tape carrier and reduced from the pages. Not all adhesives had reached the same stage of deterioration, so the removal/reduction technique depended on whether the adhesive had hardened or was still tacky. Tacky adhesive was removed using a crepe eraser. Adhesive on the paper was quickly and easily removed, although some residue remained where the adhesive had sunk into the paper fibers. Removing adhesive from the tape carrier was substantially more difficult, as it was challenging to grasp a small piece of tape carrier while moving the eraser across its surface. Additionally, the adhesive tended to smear against the carrier instead of being lifted by the eraser. To help improve the eraser's grip, the adhesive was dusted with a small amount of wheat starch powder (fig. 13).

The yellow, hardened adhesive was much easier to remove than the tacky adhesive. Pieces of tape carrier were immersed in an isopropanol bath for several minutes until the adhesive dissolved. Any excess adhesive was removed with a cotton swab rolled across the surface of the carrier. A mixture of 2% Klucel G in isopropanol was also used to remove adhesive from the back of tape carrier pieces with friable media on their top surfaces. This was done to prevent loss of consolidant in a solvent bath and to minimize risk to the friable media. The same Klucel G solution was also used as a poultice to remove the adhesive from the paper so that the solvent could be delivered to a targeted area (fig. 14). The staining was reduced, although not eliminated, using

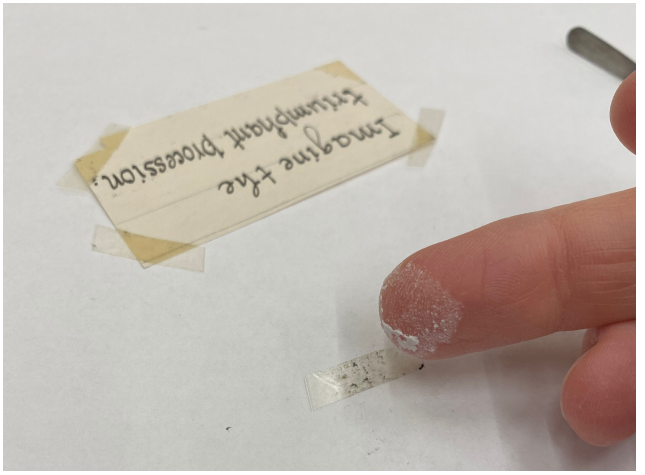


Fig. 13. Wheat starch powder was applied to tacky tape adhesive to aid in adhesive removal by increasing friction against the eraser.

this method (fig. 15). Due to the adhesive's proximity to inked media, it was decided to not risk using solvents with a suction platen.

Digitization

At this point in the project, the score of *Peter and the Wolf* was sent to the BPL's Digital & Online Services Department for the first round of digitization to capture the newly revealed areas previously covered by English translations. Underneath the paper slips were words written in Russian, French, and English by Prokofiev. This information had not previously been accessible, and imaging will allow researchers to analyze the text as it was originally written for the piece's North American premiere.

After the first round of digitization, the manuscript was returned to BPL's Conservation Lab for the last portion of treatment. The expectation was that the manuscript would return for a second round of digitization immediately after conservation was complete. However, an upcoming exhibition deadline meant that timing would be tight, if not impossible. Instead of rushing treatment or digitization, the decision was made to focus on finishing treatment and preparing the score for exhibition. A second round of digitization will occur once the exhibition is deinstalled. For now, the initial images of the manuscript are available on the Digital Commonwealth website (note 1).

Readhering the Tape Carrier

After imaging, the paper translation slips were reattached to the text block using the original pieces of tape carrier and BEVA 371 film. Tape carrier pieces were first laid out next to their paper translation slips. Indentations in the tape carrier that corresponded to the corners of the paper slips, as well as adhesive outlines on the text block, helped determine the original locations of each particular piece (fig. 16). Pieces of BEVA 371 film were trimmed to dimensions slightly smaller than those of the original tape carrier pieces so that if the adhesive migrated during the heat application, it would not spill out from underneath the carrier. As each piece of tape carrier had a unique size and shape, it was necessary to custom cut the BEVA 371 film to match individual pieces rather than cutting batches of film to standard sizes.

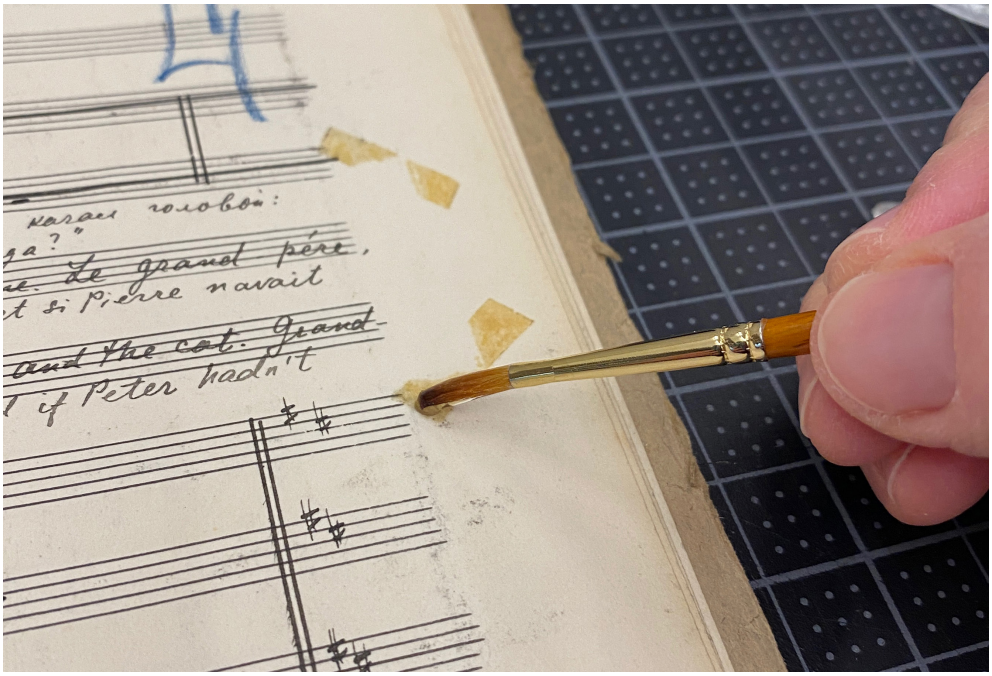


Fig. 14. A mixture of 2% Klucel G in isopropanol was brushed onto dried tape adhesive so that it would soften before removal.

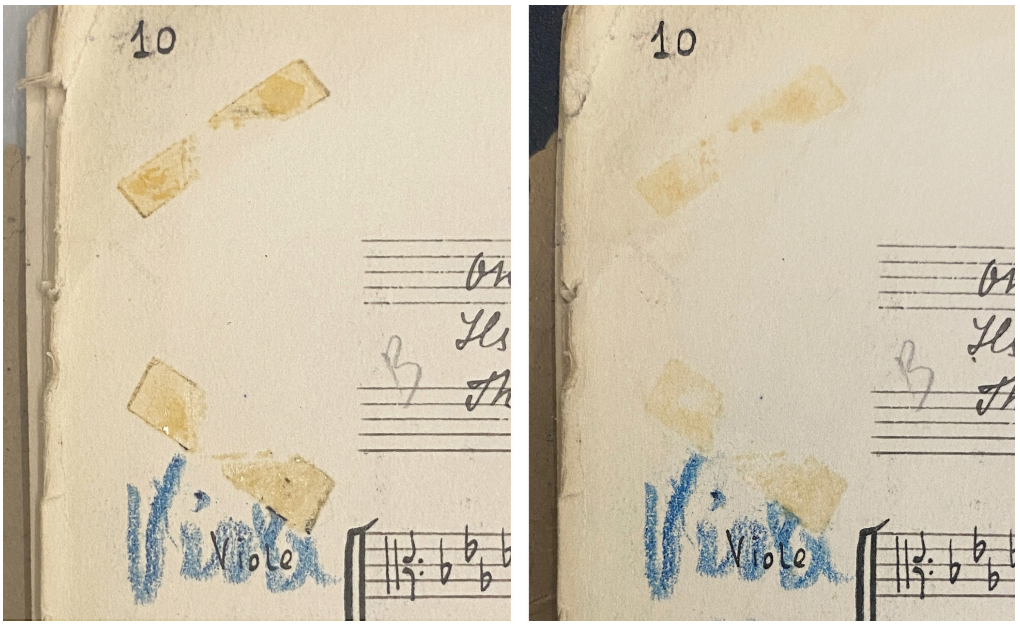


Fig. 15. Tape adhesive before (left) and after (right) removal with a 2% Klucel G in isopropanol poultice. Although staining has not been fully eliminated, most of the adhesive has been removed, which will hopefully mitigate the possibility of further discoloration and damage to the paper.

Paper translation slips were placed onto the pages and positioned using the adhesive stains and preexisting pencil marks to align them properly. Once positioned, the slips were held in place with glass weights (fig. 17). The transparency of the glass helped the conservator quickly check alignment during treatment.

BEVA 371 film was gently pressed into place on the underside of the tape carrier, then the film and carrier were positioned over the paper slips and text block. Indentations in the tape carrier, adhesive stains on the text block, and pencil marks on the carrier and paper helped with alignment. A Hollytex release layer was placed on top of the materials and then lightly tacked in place with a tacking iron on medium heat. After checking once more to ensure correct tape placement, the tacking iron was again used to activate the adhesive. A brass weight was placed on top of the tacking iron to help apply even pressure to the film and carrier and prevent the tape carrier from slipping out of place while under the iron (fig. 18).

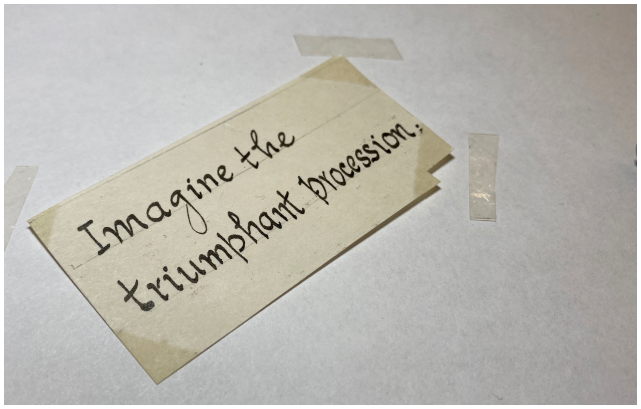


Fig. 16. Tape carrier pieces were matched to their original locations on the text block and paper slips using visual cues such as paper indentations in the tape carrier, pencil marks, and the size and shape of adhesive stains.

CONCLUSIONS

So often, pressure-sensitive tape is something that has been applied well into a book or document's life and usually as

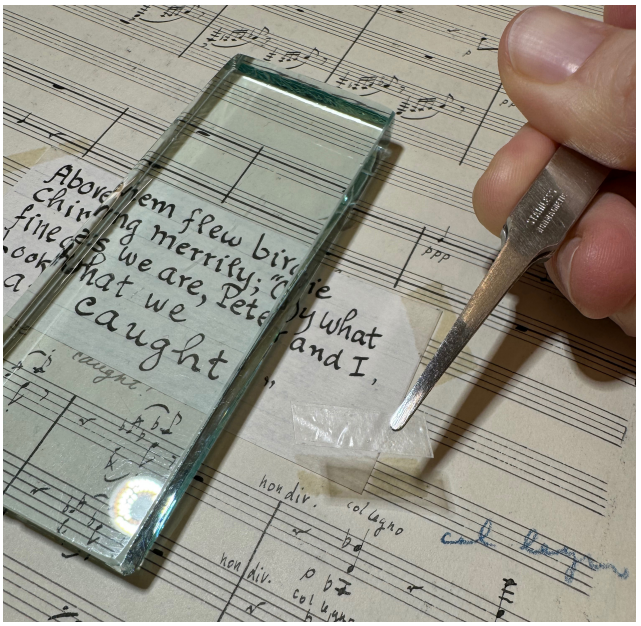


Fig. 17. Glass weights were used to hold the paper translation slips in place while tape carrier pieces were readhered.

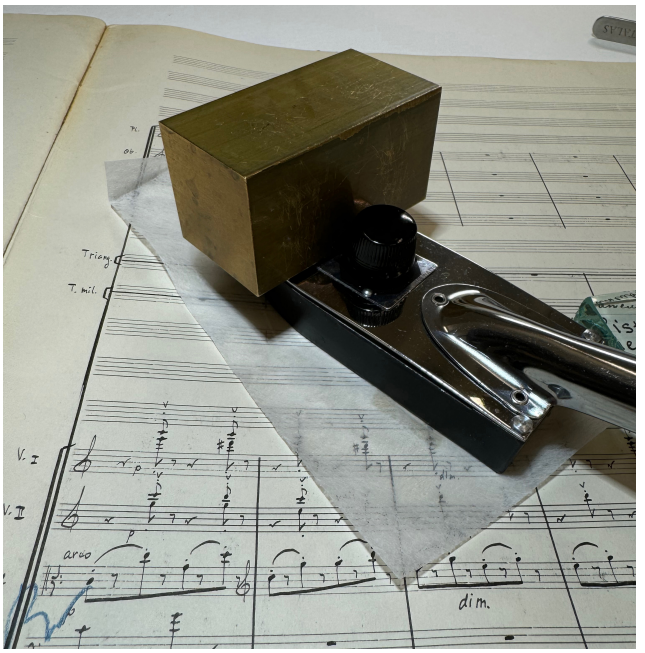


Fig. 18. To ensure even, firm pressure, a brass weight was placed on top of the tacking iron while tape carrier pieces were readhered to the text block and translation slips.

a well-intentioned, if ultimately harmful, way to repair damage. As a result, it is often removed by conservators during treatment to limit further damage to the object. In this case, however, the tape in this manuscript was an integral part of its creation and history, and it also contained valuable information in the form of pencil marks across its surface. It was clear that the tape needed to remain part of the object, but adhesive failure meant that the tape was at imminent risk of loss if action had not been taken. Materials testing was key to the success of the project, particularly since the author had not previously worked with plastics. Beyond looking at the suitability of solvents and adhesives for adhesive reduction, media consolidation, and readhering the tape carrier to the paper, experimenting with different application methods helped determine the best path forward.

This treatment was able to reconcile two incompatible materials; a slick, transparent tape carrier with a porous, opaque paper, creating a strong yet reversible bond that did not compromise the original optical properties of the tape. The treatment also made it possible to digitize previously hidden text, and this information is now accessible to researchers for the first time in the book's history. The second stage of digitization will occur after the exhibition, and then the two digital versions will be available online. Overall, the manuscript is almost identical visually to its preconservation state, but with much greater long-term stability (fig. 19).

ACKNOWLEDGMENTS

Thank you to Jared Rex, curator of music at the Boston Public Library, for providing a wealth of knowledge and historical resources that were essential to forming a treatment



Fig. 19. Before conservation (top), the tape adhesive was discolored and failing, and media on the tape carrier was extremely friable. After conservation (bottom), staining was reduced, tape carrier pieces were no longer at risk of detachment, and the pencil marks were consolidated.

plan for this incredibly unique score; Rose Ingerman, digital imaging production assistant at the Boston Public Library, for digitizing the manuscript; the Associates of the Boston Public Library who provide essential support for the work of the author and her colleagues in Special Collections; and Chris Letizia, lead book conservator, and Annie Ujifusa, conservation technician, of the Boston Public Library for their thoughtful insights throughout the conservation process.

NOTE

1. The digitized score can be viewed at the Digital Commonwealth website: https://ark.digitalcommonwealth.org/ark:/50959/7w62mn77k.

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SOURCE OF MATERIALS

1-mil BEVA 371 Film; 2-mil Mylar Film; Klucel G (Hydroxypropyl Cellulose)

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The Ties That Bind: Communication, Collaboration, and Cross-Disciplinary Professional Development in the Service of Library Special Collections

CRediT Statement
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INTRODUCTION

Stanford University Libraries (SUL) comprises 20 branch libraries and centers, many with their own special collections or locked stacks materials. Over the past few years, Conservation Services at SUL has been actively reaching out to individual branch libraries to expand and standardize preservation efforts across the libraries. This article describes the recent work that SUL book conservators have done in partnership with Stanford's East Asia Library (EAL). To better conserve East Asian bound materials and deepen relationships between the departments, conservators collaborated with internal staff and external conservation peers to understand curatorial expectations, reconsider appropriate terminology and documentation practices, and develop new techniques to meet treatment priorities.

COMMUNICATION AND EXPANSION: BUILDING RELATIONSHIPS WITH EAL

Collection growth across SUL highlighted the need for a more uniform, equitable, and concerted approach to conservation, and staff changeovers gave conservators opportunities to build and strengthen relationships that could support their department's expansion. Conservators increased outreach to colleagues across SUL by visiting branch libraries and inviting library staff to tour their off-campus Conservation Services facilities. Regular on-campus office hours with subject specialists and curators were implemented to consult on care and handling recommendations and potential treatment of items. During these face-to-face conversations, curators provide relevant information on the cultural significance of their materials, as well as how they are used and stored, and conservators provide treatment, housing, and handling advice (fig. 1). This enables conservators and other SUL staff to learn from one another in the service of the collections.



Fig. 1. Aude Gabory assessing items for treatment with Zhaohui Xue, curator for the Chinese Collection, and Katherine Matsuura, former curator for the Japanese Collection, from EAL. Courtesy of Aisha Wahab.

Papers presented during the Book and Paper Group Session, AIC's 53rd Annual Meeting, May 27–31, 2025, Minneapolis, Minnesota



Fig. 2. Traditional Chinese side-stitched bindings in cloth covered wrappers from EAL awaiting treatment at the conservation laboratory.

Collaboration with EAL has offered SUL conservators a particularly stimulating learning curve.

EAL's seed collection came from the Hoover Institution Library and Archive, which started collecting Chinese and Japanese language materials in 1945 and established the East Asian Collection in 1961. Conservation Services has been supporting EAL since 2001, when it was established as a branch library, but direct outreach efforts and a shared enthusiasm for collaboration between curators and conservators significantly increased the workflow beginning in 2021. In the fall of that year, Conservation Services received their first sizable batch of items for housing and treatment from the Chinese collection, which consisted mostly of traditional side-stitched bindings in cloth-covered wrappers (fig. 2).

As book conservators at SUL were trained primarily in the traditions of Western bookbinding and conservation, they needed to learn to look at and describe East Asian materials and expand their skills to best serve these collections. Book conservators began collaborating at the bench, scheduling regular sessions to work together on East Asian material. During these sessions, they discussed treatment options, celebrated successes, and troubleshot setbacks. They encouraged and learned from each other, determining that if they were to build a steady workflow from EAL, they needed to develop a treatment protocol and a documentation form that focused on side-stitched books and their wrappers.

TERMINOLOGY AND DOCUMENTATION FORMS

Prior to 2021, book conservators at SUL were using the same treatment form for all bound formats, adapting the form to suit distinct types of bindings as needed. This was challenging, as the form was centered around Western book and paper structures, materials, condition issues, and treatments. The conservators saw their work on the East Asian collections as a case study to address documentation practices more broadly with geographically and culturally diverse collections at SUL. They were also inspired by colleagues Aisha Wahab, Kristen St.John, and Richenda Brim's 2021 paper, "Recentering the Bench," about using more inclusive and accurate descriptive terminology, addressing Eurocentric biases, and the potential for linked data in conservation documentation. The conservators wanted to be more thoughtful in the language they chose and saw this project as a way to put these ideas into practice. Using accurate terminology when talking about damage and treatment options would also improve communication with EAL staff and better serve the collections.

SUL conservators began conducting research using a variety of sources to better understand East Asian binding structures. With differences between Chinese, Japanese, and Korean binding styles, difficulty in translating terms from multiple languages, and complicated dating systems, they realized that collaboration with the conservation community, curators, subject specialists, and catalogers was needed. The formation of an AIC Wiki project to develop the Book and Paper Group's "East Asian Book Formats" page in 2021 coincided with SUL conservators' work on East Asian collection materials (Book and Paper Group of the AIC 2024). The conservators participated in this group and worked on a section about the historic evolution of East Asian binding structures. This research and the Wiki group's collective knowledge contributed to a deeper understanding of East Asian book structures and terminology. The conservators also had discussions with rare book catalogers at SUL. Many of these catalogers are subject specialists with codicological expertise from different regions of the world, with knowledge of resources that can enhance conservation documentation practices.

For example, SUL conservators learned in their research on side-stitched bindings that using the Western term *volume* to describe each separately sewn structure is not accurate in the East Asian context, where division by volume does not always translate to the separation of text into sewn structures. Based on this, they chose to use the term *fascicle*, as recommended in the literature about East Asian books (Kornicki 1998; Munn 2009, 106). This work on terminology is ongoing, with considerations of using terminology from the language of origin in mind.

While working on this project, Conservation Services was also developing a FileMaker database for their treatment documentation. SUL conservators wanted a flexible system that would be capable of recording complex information about Stanford's collections. The new database has fewer checkboxes, more room for narrative description, and the ability to create templates that can be tailored to distinct collection material types. The templates can be used to record descriptive terminology and treatment steps, then this can be adapted to the individual treatments.

SUL conservators developed a template for East Asian side-stitched books based on their research. Detailed descriptive terminology and potential treatment steps serve as a checklist to prompt observation and assessment of the



Fig. 3. Li Yu 李漁, *Zi zhi xin shu* 資治新書. Shanghai: Du shu ji cheng yin shu ju, 1894 (East Asia Library, Stanford University Libraries, Call Number: 4673 4433). Wrapper with typical damages found on many of the items sent for treatment by EAL.

various components. The examination section in the East Asian side-stitched bindings template includes features such as enclosure wrapper style, covering material, and details about side-stitched books, including the number of inner and outer stitches and endsheet construction. The condition and treatment sections follow the same format as the examination section, allowing for more efficient and accurate documentation than was possible with the earlier form.

In addition to aiding documentation, using accurate descriptive terminology informs conservation treatment by deepening the practice of observation and study. For example, some features of East Asian bindings, such as the "inner stitch," are not readily visible. Inner stitches, made of twisted paper, typically bind the text block together before outer stitches are added. Learning the meaning of this term and its structural significance in East Asian bindings is helpful in conservation assessments. If an inner stitch is intact, then a weak or broken original outer stitch may not need to be replaced since the book is adequately supported by the inner stitch.

CROSS-DISCIPLINARY TREATMENT: APPLYING TECHNIQUES FROM TEXTILE CONSERVATION TO LIBRARY AND ARCHIVE MATERIALS

Part of the SUL conservators' treatment discussions with EAL curators highlighted the importance of retaining and stabilizing wrapper enclosures along with the fascicles for continued use. The majority of these were four-sided wrappers made of paper-based board covered in cloth, with bone clasp closures. Many of them had split joints and wear on the textile clasp straps and holders that made them nonfunctional when they arrived at the Conservation Lab (fig. 3). Conservators also did treatment work on the fascicles; however, this article will only focus on the treatment of the wrappers.

For split joints and hinges on the wrappers, repair using Japanese paper and paste was a straightforward treatment procedure. Yet, the conservators were uncertain how they should stabilize worn textile clasp straps and holders, areas that need to be flexible and strong to function properly. Even though repair of these components using Japanese paper did not seem adequately stable or aesthetically compatible, the conservators did not want to completely replace damaged straps and holders with new material.

In 2021, when EAL items were treated, the conservators decided not to treat the textile components of clasp closures on items, as there did not appear to be an effective treatment option. Despite having spent a significant amount of time treating wrappers for damaged joints and hinges, the wrappers were not fully functional with untreated clasp closures and needed to be further enclosed in corrugated clamshell boxes (fig. 4). This decision was frustrating for both conservators and curator alike.

Around the same time, SUL conservators were also working on a large incoming collection of Islamicate manuscripts, many bound with textiles or with historic repairs using textiles. Their work on both collections identified a lack of treatment techniques for failing textile book components. In 2023, to fill this gap in expertise, Conservation Services invited Howard Sutcliffe, principal conservator and director of River Region Costume and Textile Conservation, to teach a workshop. The



Fig. 4. Gai Qi 改琦, Hong lou meng tu yong 紅樓夢圖詠. S.l. : s.n., 19--? (East Asia Library, Stanford University Libraries, Call Number: 5762 1412 V.1-4). Treated binding with wrapper and side-stitched fascicles in a corrugated clamshell box. Courtesy of Zhaohui Xue.



Fig. 5. Conservation Services team practicing sewn tear repairs on textile samples under the guidance of Howard Sutcliffe. Courtesy of Jill Sison.

workshop focused on textile treatment techniques applicable to book and paper conservation. Over the course of 2 days, Sutcliffe went through the basic steps of cleaning, humidifying, and flattening textiles, as well as several stitched and adhesive-based tear repair and infill techniques (fig. 5).

Sutcliffe and SUL conservators also discussed treatment approaches for several items with textile components during the workshop. This included examining a second batch of items that EAL sent over in 2023 in anticipation of the workshop, with the understanding that they would be used for trial treatment with experimental techniques. Treatment discussions were particularly interesting, as they revealed different approaches between book and textile conservators. Sutcliffe mainly works with textiles for museum display, whereas SUL conservators were considering treatment for actively used books. Their understanding of acceptable levels of intervention also differed based on treatment norms for their specialty fields. For instance, Sutcliffe's initial treatment suggestions did not take into account the amount of access to internal binding components that book conservators are comfortable gaining during treatment. However, certain book treatment approaches had become habitual for SUL conservators, and conversations with Sutcliffe yielded much needed fresh perspectives.

Like the first batch of items sent by EAL in 2021, the second batch of treatment materials sent in 2023 were side-stitched bindings in cloth-covered wrappers. Figure 6 shows

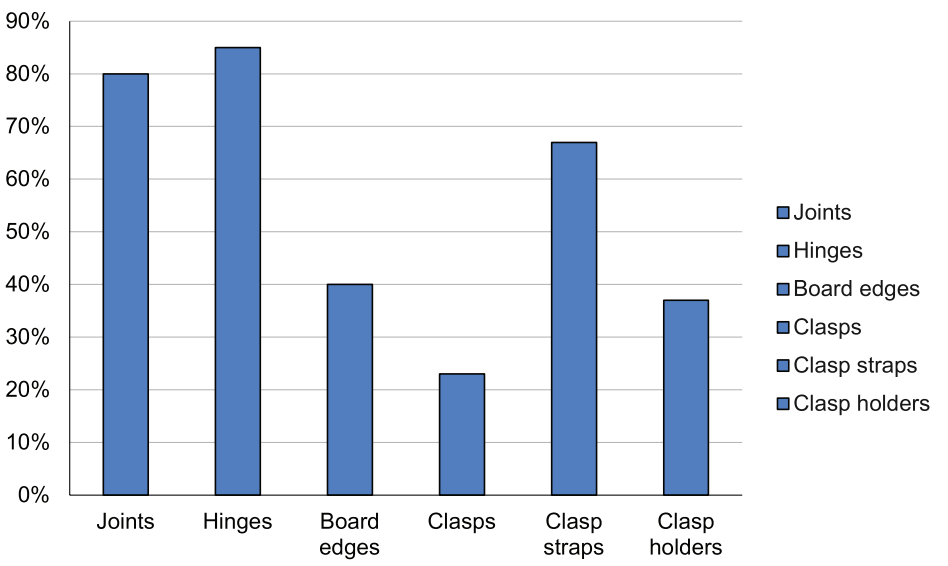


Fig. 6. Wrapper components in need of treatment for trial treatment items.

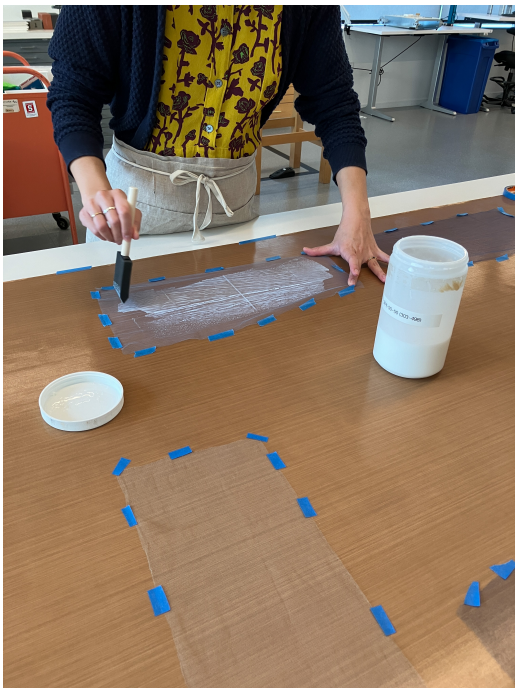


Fig. 7. Coating dyed pieces of nylon bobbinet with a Lascaux adhesive mix.

the percentage of different wrapper components needing treatment in the second batch of books. Most items had failing joints and hinges, with nonfunctional clasps due to damage of clasp straps, holders, and the clasps themselves. SUL conservators were particularly interested in testing repairs on these areas using adhesive-coated nylon bobbinet, a technique learned during the textile treatment workshop. The recommended bobbinet, sourced from Dukeries Textiles & Fancy Goods in Nottingham, UK, is a particularly fine and sheer tulle fabric with great strength and flexibility. Book conservators at SUL saw exciting potential in its use for consolidating and supporting frayed areas and loose textile parts in bindings. To prepare the bobbinet for use on the wrappers, pieces were first dyed in a range of colors similar to the wrappers using Lanaset dyes. They were then coated with a 50:50 mixture of Lascaux 303 HV and 498 HV diluted to a range of 15% to 30% in water (fig. 7). After drying, a piece of adhesive-coated bobbinet can be cut to the shape of the repair area and reactivated in place using heat. Fills or additional support material can also be added under the bobbinet to add strength to the repairs.

In trial treatments, conservators experimented with repairs on joints and clasp straps and holders using adhesive-coated bobbinet, traditional repairs using Japanese paper and paste, and a combination of the two. Figure 8 shows how frequently a type of treatment material was used for the repair of each component of the wrappers. Conservators were initially excited about the use of the bobbinet for joint repairs with heavy fraying but found that it did not adhere very well in these areas, preferring repairs using Japanese paper and paste for joints and hinges. However, they found that the adhesive-coated bobbinet was well suited for repairs on clasp straps and holders.

One example of a successful strap repair using adhesive-coated bobbinet is the treatment of 徐文弼 [Xu Wen Bi]'s 吏治懸鏡: 8卷 [*Li zhi xuan jing -: 8 juan*] China: Qing Dynasty, 1644–1912 (East Asia Library, Stanford University Libraries, Call Number: 4673 2901) (fig. 9). The lower clasp strap was torn at the folded edge, with a previous repair tacking the clasp onto the strap with thread. Because of the movement and tension required for these components to function, this previous repair was causing further tearing on the strap. The

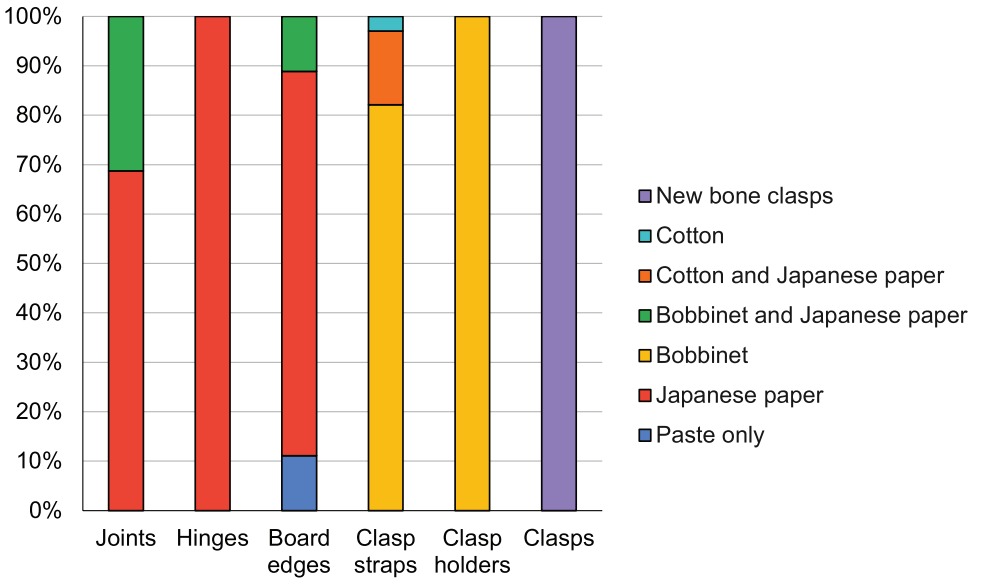


Fig. 8. Treatment materials used for each wrapper component in trial treatment items.



Fig. 9. Xu, Wen Bi 徐文弼, *Li zhi xuan jing: 8 juan* 吏治懸鏡: 8卷. China: Qing Dynasty, 1644–1912 (East Asia Library, Stanford University Libraries, Call Number: 4673 2901). Before (left) and after (right) treatment.

successful treatment of this book was carried out following these steps:

Step 1: To begin treatment, the previous repair and clasp were first removed from the strap (fig. 10). The strap pieces were then humidified and flattened, straightening out and realigning frayed threads where possible.

Step 2: A piece of adhesive-coated bobbinet was laid on top of the upper half of the strap (fig. 11). The bobbinet was cut long enough to cover both the upper and lower halves of the strap, with extensions on either side of the strap as well as where the strap is attached to the wrapper. The warmth of the conservator's fingers was used to temporarily tack the bobbinet down in place on the upper half of the strap.



Fig. 10. Detail of the clasp and the clasp strap before repair.

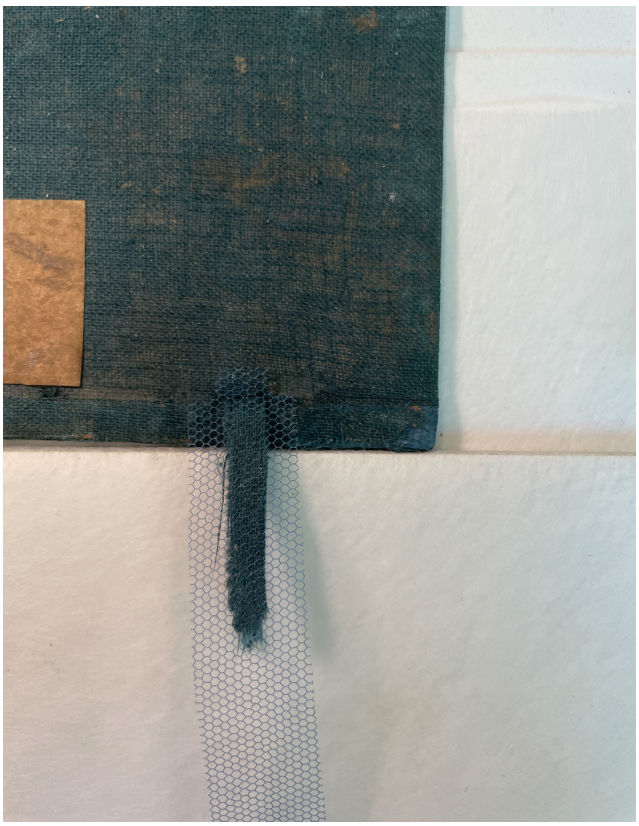


Fig. 11. A piece of adhesive-coated bobbinet on top of the upper half of the strap.

Step 3: To reinforce the strap attachment to the wrapper, an extension piece of the bobbinet was tucked into the wrapper under the covering material and set in place with heat using a small tacking iron (fig. 12).



Fig. 12. Bobbinet being tucked into the wrapper under the covering material.

Step 4: The clasp was threaded onto the upper half of the strap, with the extensions of the bobbinet folded onto the underside of the strap as needed (fig. 13). The lower half of the bobbinet was then placed over the lower half of the strap, bridging the tear between the two parts.

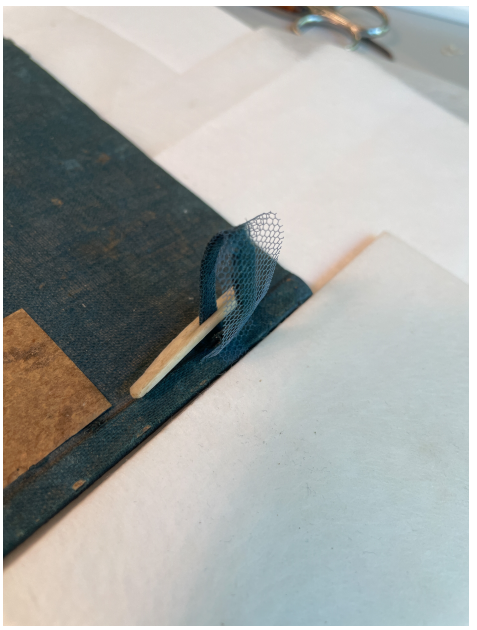


Fig. 13. The clasp threaded onto the upper half of the strap.

Step 5: The rest of the bobbinet extensions were folded around the underside of the strap (fig. 14).



Fig. 14. Bobbinet extensions folded around the strap.

Step 6: Heat was applied to set the bobbinet in place, moving the clasp out of the way as needed (fig. 15).



Fig. 15. Detail of the clasp and the clasp strap after repair.

The completed repair is visually unobtrusive, and the strap is now strong and flexible enough to be used as originally intended.

Using this method to repair damaged clasp straps and holders allows the wrappers to become functional again, and SUL conservators no longer needed to further enclose them in corrugated clamshell boxes. The successful application of textile conservation techniques on trial treatments has resulted in more regular treatment workflows from EAL. Further items from the Chinese Collection have already been identified for treatment, and conservators have also met with other EAL curators to discuss the selection of future treatment items.

Reviewing completed treatments with curators can yield helpful and sometimes surprising information on how a treatment directly impacts access. For one item that needed rebinding, conservators had a conversation with the curator for the Chinese Collection about the position of a new label. Together, they decided to place the label on the spine of the new binding. This decision seemed like a small detail to the conservators; however, the curator revealed that it had a significant impact on her work. She pointed out that traditional East Asian bindings and wrappers were intended to be stored flat, with title labels typically placed on the front board. As items at EAL need to be stored upright, front board labels make it hard to identify items on the shelves, and the action of retrieving and replacing items abrades the labels. These discussions about how treatments impact use and access will continue to inform conservation work on these collections. Considering the positive outcomes of these kinds of conversations, one of the conservators' next goals is to collaborate with EAL curators to design sympathetic enclosures for fascicles with missing wrappers or inadequate preservation enclosures. Together, conservators and curators will consider how to best integrate traditional formats with preservation best practices to design an optimal enclosure for current use and storage conditions.

CONCLUSIONS: FURTHER COLLABORATIONS WITH EAL AND BEYOND

Beyond treatment work, Conservation Services' growing relationship with EAL has also spurred more discussions with curatorial, technical, and public services staff about preservation best practices for security tags, storage, and handling. In the past year, conservators worked with EAL staff on care and handling training specific to their collection material, as well as providing guidance on exhibit display. Taken together, expanding outreach efforts, the development of documentation forms for specific types of collection materials, and the acquisition of new treatment techniques have strengthened Conservation Services' partnership with a relatively new "client" library and expanded treatment possibilities. SUL conservators view this collaboration as a model for engaging with other branch libraries, collections, and departments, addressing their unique cultural and material needs through thoughtful conservation practices.

ACKNOWLEDGEMENTS

A special thank you to Zhaohui Xue, curator of the Chinese Collection, and the rest of the East Asia Library staff for their collaboration on this project. We are deeply grateful to Howard Sutcliffe, principal director and lead conservator of River Region Costume and Textile Conservation for his expertise and guidance on textile conservation. We also extend sincere thanks to our Conservation Services colleagues Kristen St.John (former head of Conservation Services), Ryan Lieu (former operations manager), Richenda Brim, Aisha Wahab, Jill Sison, and Sarah Newton, as well as our preservation department colleague, Annemaree Rea, for their support in our work on this article.

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Abstracts presented during the Book and Paper Group Session

Expanding Access: Inclusive Conservation and Education Engagement at the UK National Archives

Natalie Brown and Sarah Petter

The Collection Care department at the UK National Archives ensures continued access to 11 million archival records. But the idea of "access" within a heritage context is changing as organizations work to become equitable and inclusive spaces. As a result, our preservation decision making is changing with this, aided by a dedicated engagement team within the department.

Historically, conservation was rarely at the forefront of public or institutional view, and to our detriment, we were often viewed as a barrier to increased access. Over the past 3 years, however, we have made a concentrated effort to shift this narrative toward one of partnership and mutual benefit, innovative heritage science and conservation practice that has wide appeal, and collective responsibility to care for our collection.

This presentation will focus on a key area of our ongoing work—supporting increased engagement with school-age children and audiences with additional needs. Through several case studies, we explore how we are trying to meet the needs of these audiences, increasing the reach of our work digitally as well as through on-site displays, and building deeper relationships through effective engagement activities based on the materiality of our collection and role of the conservator. These include the following:

- A collaboration with education researchers, teachers, museum education teams, and heritage scientists across the UK to align heritage science to the UK primary school science curricula. We investigated how heritage science can help to break down silos between the teaching of arts and sciences, creating curricula maps and lesson plans that can be led by nonspecialist museum staff and teachers.
- A collaborative research project exploring how multisensory experiences can be used to access, engage with, and understand the materiality of archival collections. Through this already impactful pilot project, we are now working with SEND specialists to center materiality in our SEND education lessons; we are also working with our outreach team to deliver enriching activities for people who have dementia based around smell; we are collaborating with PurpleStars, a group of researchers with and without learning disabilities, to develop inclusive and empowering research practices based on materiality of our collection; and creating multisensory, inclusive displays.
- Our object lessons for "high use records" used regularly by our education team to approach holistic decision making for access. Here, we bring together multiple internal and external stakeholders to create audience-driven decision-making frameworks that not only support our conservation team's work but also provide accountability and responsibility across the organization.
- A project to create lesson plans with increased tactile access for students who are partially sighted or blind. This novel project challenged our assumptions on how our records will be used.

Each case study will include an overview of the projects, focusing on the collaborative approach of each, as well as their benefits and challenges. More broadly, the presentation will also reflect on how we navigate internal relationships within a large organization with competing priorities to create these opportunities, and how we built processes to evaluate the impact of our engagement activities.

Blueprint for Growth: A Journey of Architecture Designs

Sanira Karim Gani, Pei Shyuen Chua, and Tay Jam Meng

The National Library Board and National Archives of Singapore (NAS), together with the Urban Redevelopment Agency, Singapore's urban planning authority, embarked on an extensive 5-year architecture collecting project in 2023. The momentous effort primarily seeks to encapsulate the history of prominent architecture designs in Singapore. The paper-based items included sketches on translucent tracing and butter paper, building plans, watercolor presentations, diazo prints, and printed images on copier paper.

The conservators from Archives Conservation Lab (ACL) of NAS play an essential role in this cross-functional collaborative project. Two conservators were engaged to support this project in carrying out conservation treatments and rehousing

Abstracts presented during the Book and Paper Group Session, AIC's 53rd Annual Meeting, May 27–31, 2025, Minneapolis, Minnesota

of the plans, which numbered 75,000 pages in the first round of collecting. From conceptualizing the storage of the items given their large format to formulating a decision-making matrix for conservation approaches, close consultations with the donors team in charge of the collecting was extremely important, particularly in setting up new workflows for this unique collection. A one-size-fits-all approach did not apply here, as each donated box of plans came with different conditions and required customized attention. It was imperative to streamline decision making and prioritize treatment and housing solutions for the collection that was coming to the laboratory in staggered bursts. Such efforts provided much clarity for conservators who were new to the profession, as well as for our colleagues in the donors team, so that subsequent batches of plans could be processed, conserved, and housed efficiently, with purpose and confidence.

The initial tranche of this project also culminated in an exciting exhibition, the first of a planned few, *To Draw an Idea: Retracing the Designs of William Lim Associates—W Architects*, which exhibited more than 550 multifarious design drawings covering 19 contemporary architectural projects from 1981 to 2015. ACL supported this exhibition by working closely with the curators from the planning and ideation, condition assessments, and installation stages—all of which required innovative problem solving. Every exhibition is different, and conservators increasingly must find a balance that works when working in unconventional exhibition spaces—without compromising the preservation needs of the items.

The Architecture Collection Project is an example emphasizing that the role of conservators today has transformed beyond simply providing one-off exhibition or conservation support. Collaboration with all stakeholders and partners means advocating for conservation principles, while balancing them sensibly with practicality and feasibility to ensure that objectives are met, and outcomes are achieved successfully for all groups involved. It sets the foundation for greater camaraderie among different functional groups and stakeholders, built on understanding, engagement, and synergy.

Archivists and Conservators: An Unlikely Love Story

Laura McCann and Weatherly Stephan

In this presentation, an archivist and a conservator will share their experiences working and learning together over the past decade, as well as their research on a persistent communication gap between their professions. This gap often leads to missed opportunities for collaboration that could benefit archivists and conservation, as well as the collections and the communities they serve. The gap widened in the wake of the seminal archival management article "More Product, Less Process," published by Mark Greene and Dennis Meissner in 2005, which advocated for more efficient practices to reduce backlogs and make collections more accessible. In this article, conservation activities were portrayed as excessive and unnecessary. As a result, many archivists became dismissive of conservation, leading to tensions and a sense of misrepresentation within the conservation community.

The presentation will introduce a model for integrating preventive conservation into a holistic collection management program. When building new workflows for archival accessioning and processing, the presenters worked together to proactively develop local standards for collection management. These standards address known legacy issues and improve collections care work going forward.

This model emphasizes the importance of archivists and conservators learning each other's professional ethics, standards, and training to improve communication and foster more effective collaboration, while embracing humility, curiosity, and mutual respect. This learning occurs through committee work, reading groups, collection planning meetings, after-action reviews, and events. Open discussion of our different priorities and perspectives pave the way for creating institutional programs that promote ethical, sustainable collection stewardship and have the potential for improving work experiences. The presenters will tell the stories of successes and challenges faced in their collaborations.

Manuscripts That Multiplied: Stories from the Parchment Partnerships

Fenella France, Meghan Hill, Anna Hoffmann, Pádraig Ó Macháin, and Cynthia Connelly Ryan

Multidisciplinarity draws on knowledge from different disciplines, but the context remains within those disciplines' boundaries. Interdisciplinarity analyzes, coordinates, and links knowledge between disciplines into a coherent composite. Inks and Skins (https://inksandskins.org) started as an interdisciplinary project dedicated to investigating the materiality of late medieval Gaelic manuscripts but became so much more. The diverse groups involved expanded the research scope into that of transdisciplinarity, fully integrating the industry, conservation, manufacturing, heritage science, and scholarly research into a humanities context that transcended traditional boundaries of each of the disciplines. While multidisciplinary and interdisciplinary are additive and interactive, respectively, transdisciplinary is holistic.

Sponsored by the Irish Research Council, Inks and Skins set out with the goal of increasing our understanding of the substrate (parchment) and the composition of inks and pigments used by secular scholars who created Gaelic vellum books in the period 1100–1600. The intent was to focus on one manuscript, the Book of Uí Mhaine, a large vellum manuscript of poetry and Irish tradition assembled

ca. 1390 for the Ó Ceallaigh (O'Kelly) family of Uí Mhaine in County Galway, Ireland. The synergy of more collaborating partners enriched the scope. Preservation Research and Testing Division (PRTD) Library of Congress staff, as part of a Memorandum of Understanding with University College Cork, undertook multispectral imaging (MSI) at the Royal Irish Academy (RIA). The MSI was intended to only be on the Book of Uí Mhaine. However, engagement through sharing initial processing to read text through stains led to further manuscripts added to the docket, including Ireland's oldest book, *The Cathach*, a late 6th century Psalter. Entrusting Inks and Skins with access to these precious manuscripts underlined the commitment of the RIA as partners in this innovative work.

Then the pandemic arrived, and we adapted to moving forward on collaborative research remotely. Data-sharing challenges were but one of the barriers we had to work through. Industry partners in Ireland assisted with x-ray fluorescence spectroscopy (XRF) of the RIA manuscripts and then sent the data to PRTD for interpretation. Exhausting all we could from MSI and XRF data still left challenges with understanding the organic components of the inks and pigments in the manuscripts. PRTD staff created new ink and pigment reference samples for the Center for Heritage Analytical Reference Materials. Utilizing instrumentation at the Library of Congress, we essentially worked backward to link fiber optic reflectance spectroscopy (FORS) reference curves with what we had captured from the MSI on the manuscripts. The addition of collaborators continued to expand the wealth of information extracted from the data. Connecting the MSI-processed images of the manuscripts with Trinity College conservators, parchmenters, and creators, greatly assisted our ability to recognize tears, scraping patterns, poorly prepared skins, veining, and other features related to construction techniques. Further collaborators and research partners included two doctoral fellows, archivists, calligraphers, ink makers, and Irish humanities scholars. The breadth of the collaboration was enriched by the willingness of all to listen, learn, and share ideas from diverse perspectives. The transdisciplinarity of this heritage research enabled creating new knowledge.

A History of the Books in Taiwan: The Transformation of Bookbinding Formats During the Period Under Japanese Rule (1895–1945)

Lois Su and Fei-Wen Tsai

Taiwan is a country located in East Asia, lying on the northwestern side of the Pacific Ocean and off the southeastern coast of China. Its geographic position has historically made it a crucial crossroads for trade and cultural exchange among China, Japan, and Southeast Asia. The period of Japanese rule in Taiwan (1895–1945) stands out as an era of profound multicultural interaction and significant transformation. This period was marked by modernization and infrastructural development initiated by the Japanese government. Combined with the flourishing of Taiwanese art and literature in multiple languages, the island's book publishing industry underwent a transformative evolution. This project employs both documentation of binding formats and historical research methodologies to explore the evolution of bookbinding. We have documented various bookbinding formats, including their structures, materials, and conditions, to analyze how they transformed over time and the historical reasons and impacts of these changes.

Before this era, books in Taiwan were predominantly printed and bound outside the island. The Japanese period marked a significant shift, heralding the beginning of local book publishing, printing, and binding industries. By the 1920s, there was a greater emphasis on Japanese language and culture led by the government. Influenced by movements outside the island, Chinese-language books became a means for intellectuals to express self-identity and spread new ideologies. The development of libraries also reflects the transformation. The first library established during the Japanese period was the Taiwan Library (1898). As the demand for books and Taiwan's relation to the world changed, one of the most notable aspects of this period is the transition in binding formats. Over the 50 years of Japanese rule, there was a marked shift from predominantly East Asian side-stitched bindings to a variety of Western European bookbinding styles. It is interesting to observe the shift also in Western styles from a small amount of leather or cloth bindings to mostly modern case bindings. In the later years of this period, it was also common to see a mixture of Western materials with side-stitched bindings. This is one of the first detailed studies on this subject, yet the transformation connects with broader changes in Taiwanese society during this time.

Bookbinding formats reflect the economy and cultural movements of the period, showcasing a piece of history that is often overlooked. To gain a comprehensive understanding of bookbinding practices, the project involves documenting hundreds of books from the period of Japanese rule, collected from the National Taiwan University Library, Tainan National University of the Arts Library, and the National Taiwan Library. We recorded information on binding structures and materials, and we are analyzing this data in conjunction with historical records to understand the frequency of different bindings and their relationship to social changes of the time. Additionally, we are compiling condition reports on the books to understand common deterioration, which will provide valuable insights for future conservators and enhance our understanding of bookbinding formats from this important historical period.

Sympathetic to Synthetics: Developing Tear Repairs for Matte Laminated Papers in Twenty-First Century Periodical Covers

Cancy Chu

Plastic-coated papers can be found in the covers of paperbacks, periodicals, and other commercial books of the 21st century. These books are potentially collected in libraries and archives containing contemporary print materials, likely becoming more prevalent with time. While synthetic coatings provide added strength and durability to book covers, the waterproof and adhesive-resistant properties of plastic present challenges to the application of conventional treatments for the mending or stabilization of tears. Adhering synthetic papers with wheat starch paste is likely to be unsuccessful due to the low surface energy of certain plastic coatings.

This project aimed to identify conservation materials and methods for stabilizing tears in early 21st century periodical journals with matte laminated covers, a type of synthetic-coated paper that was identified in analysis to contain polyethylene. Analytical examination of the paper was conducted with microscopy, infrared spectroscopy, x-ray fluorescence, the Photographic Activity Test (PAT), and pH testing. Next, a range of nine common conservation adhesives were trialed for adhesion to matte laminated papers with an adapted peel testing method. Successful candidates were artificially aged, tested for reversibility, and compared using visual examination, colorimetry, and gloss measurements. Adhesive candidates were then applied in more than 160 blends with varying methods of brushed wet application, precoated tissues, and cast films. Results were ranked for adhesion and visual properties to select for the most successful methods.

Results indicate that while repairs with most cellulosic adhesives are likely to fail, a strong and reversible bond can be achieved with certain synthetic polymer-based adhesives (e.g., Aquazol 500, Lascaux 303 HV, and ethylene vinyl acetate (EVA)). Performing a successful repair is dependent on blend ratios and application techniques that avoid both weak adhesion and high surface tack, the latter of which could cause blocking. Three techniques using a Japanese tissue carrier and compatible adhesive blends were refined for application, namely brushing through, brushing on, and reactivating precoated tissues with ethanol. A practical workshop for conservators and related roles was conducted to demonstrate and disseminate the techniques.

The presented tear repair techniques are proposed based on test findings on matte laminated papers and may be suitable for use with other papers containing polyethylene. Further research is needed to address additional deterioration pathways of synthetic papers, such as deformation and abrasion. There is a need for conservators to be equipped with adapted techniques for synthetic papers, as these materials can and do form part of present and prospective collections.

This project was supported by the 2022–2023 Fulbright-National Archives Heritage Science Fellowship.

Adhesive Kinetics: The Folding Endurance of Wheat Starch Paste, Cellulose Ethers, and Photo-Grade Gelatin

Catherine E. Stephens

Books are kinetic objects that perform finely engineered movements to reveal their contents. If a book's structure is broken or compromised, its information cannot be experienced in the manner that its creator intended. Loss of mechanical function is particularly disruptive for manuscripts, artist's books, photograph albums, and scrapbooks, in which unique, intimate narratives may be presented. In some ways, 19th century photograph albums present worst-case treatment scenarios to conservators; these albums tend to be both heavy and very fragile, due to inherent vice, yet these albums may be frequently requested by researchers. Furthermore, photographs are physically and chemically sensitive, and 19th century papers are often quite water sensitive, which limits treatment options. As heavy leaves and delicate hinges embrittle with age, a 19th century album may pull itself apart, posing many questions; is it possible to restore mechanical function to this album without frequent reinterventions? Which materials are best for reinforcing the connections between heavy leaves and delicate hinges? Do adhesive mixtures, such as 75% wheat starch paste and 25% methylcellulose, provide better flexibility when dry?

The preceding questions inspired this study, in which the author, a book conservator, collaborated with paper conservators, photograph conservators, and conservation scientists at the Metropolitan Museum of Art. This presentation will discuss the methodology and results of the study, in which the relative folding endurances of Jin Shofu wheat starch paste, photo-grade gelatin, and six cellulose ethers were evaluated, before and after artificial aging. Additionally, 3:1 mixtures of wheat starch paste, methylcellulose, and/or photo-grade gelatin were studied to observe the mechanical performances of these mixtures, once dry. To inform the methodology of this study, a self-selecting survey of 75 AIC Book and Paper Group members was conducted. Survey participants were asked to indicate their adhesive preferences for certain treatment scenarios, and whether they are in the habit of combining two or more adhesives to alter their wet and/or dry properties. In this study, all adhesives were prepared at concentrations that would normally be used by book, paper, and photograph conservators, or at viscosities that would allow a conservator to reline the spine of a book or repair its hinges. Strips of naturally aged

chromatography paper (pure cotton linters, manufactured in 1959) were impregnated with these adhesives and evaluated with a Tinius Olsen folding endurance machine. Although folding endurance machines do not perfectly replicate a book's normal range of motion, these machines offer insight into the effects that adhesives and sizing agents may have on the mechanical strength of a standard paper.

The surprising results of this study indicate that wheat starch paste has a much lower folding endurance than cellulose ethers with comparable bonding strengths, and that mixing two adhesives together significantly impacts the folding endurance of a standard paper, both before and after artificial aging. The author hopes that the results of this study may assist book, paper, and photograph conservators when selecting resizing agents and when repairing the flexible components of books and movable paper objects.

Evaluating the Effectiveness of Alum-Tawed Parchment as a Repair Material

Gwen dePolo and Kathryn Kenney

The selection of appropriate repair materials is a primary factor in the long-term success of interventive treatment. This is particularly challenging for parchment repairs in which we must find a material that is comparable in rigidity, color, and weight as well as compatible with the hygroscopic nature of the original parchment. When parchment repairs are needed in bound materials, these repairs must also be able to withstand repeated flexing from use. Following a 2019 cross-disciplinary workshop hosted by the Folger Shakespeare Library, "Biocodicology: The Parchment Record and the Biology of the Book," conservators at the Folger became interested in recreating an historic preparation of tawed parchment for use as a repair material. It was immediately apparent that this project would require extensive collaboration. The outline for the project included processing the skins, making sample repairs, and carrying out a suite of analytical and aging tests.

As a small independent research library, the Folger does not have the analytical capabilities necessary to evaluate the skins, nor do we have a scientist to help guide testing and interpret results, so we began reaching out to other institutions for assistance. The Folger collaborated with Jesse Mayer at Pergamena to prepare 12 skins of varying thicknesses using a historic recipe. Once the skins were prepared, conservators at the Folger worked with William Minter and the Penn State University Libraries to begin accelerated aging tests on samples from the skins. The Preservation Research and Testing Division (PRTD) at the Library of Congress has an extensive array of analytical equipment and a staff of highly trained conservation scientists. In the spring of 2024, conservators at the Folger began working with Dr. Gwen dePolo at PRTD to analyze the tawed skins. With the specific use case of the repair material in mind, the analytical testing has focused on the mechanical properties, physical properties, thermal stability, and investigating the source of a residue exuding from the skins. Dr. dePolo and Kathryn Kenney have had regular meetings about the skins, types of tests to perform, and how the results impact the usability of the alum tawed parchment as a repair material. The collaboration between the Folger Library and PRTD has proved mutually beneficial, as the methods applied to analyzing the alum-tawed skins will also be used in other parchment-related research projects that will be pursued at the Library of Congress.

This talk will discuss the benefits and challenges of a large collaborative project. We will discuss how we defined the scope and scale at an institutional level and have been able to draw on the strengths and expertise of all participants at an individual level. Specifically, we will focus on how we used our different but complementary knowledge to evaluate a potential new repair material considering usability and long-term stability.

Reconsidering Klucel M: A Comparative Study of Commonly Used Cellulose Ethers in Paper Conservation

Grace Walters, Christopher Bolser, Andrew Davis, Gwenanne Edwards, and Kelli Stoneburner

This study investigates characteristics of three cellulose ethers in the search for a stronger solvent-based adhesive to add to the options available to paper conservators. Cellulose ethers are available in various polymer chain lengths (corresponding to strength), can be water and/or solvent soluble, and often have desirable aging properties. Two of the most widely used cellulose ethers in paper conservation are methylcellulose (Methocel) and hydroxypropyl cellulose (Klucel). This research compares commonly used Methocel A4M (water soluble, long polymer chain) and Klucel G (water/solvent soluble, short polymer chain) with overlooked Klucel M (water/solvent soluble, long polymer chain). Klucel M has the potential to be a crucial tool in the toolbox of paper conservators, as it has a similar polymer chain length and adhesive strength to Methocel A4M, but has the advantage of being soluble in solvent, like the much shorter length and weaker adhesive Klucel G. Older research indicated that Klucel M is inappropriate for long-term use with collections; however, more recent research indicates that it could be an acceptable option. Using analytical techniques including accelerated aging, colorimetry and UV-vis-NIR spectroscopy, size-exclusion chromatography, Oddy testing, and the Photographic Activity Test (PAT), this study compares the adhesives Methocel A4M, Klucel G, and Klucel M and offers case studies for the use of Klucel M.

MEREDITH FRENCH AND AMY HUGHES
DISCUSSION GROUP CO-CHAIRS

Art on Paper Discussion Group 2025
Citrates in Paper Conservation

CRediT Statement
Writing, Original Draft and Writing, Review and Editing: MF and AH

INTRODUCTION

Paper conservators have long sought effective methods to remove discoloration and staining from works on paper, employing various chemical treatments that have resulted in a mix of successes and failures. As treatments done with oxidative bleaches have not proven to consistently age well, conservators have become more interested in alternatives to chemical bleaching agents, such as chelating agents. Ammonium and sodium citrate solutions have gained traction in paper conservation over the past 10 years, although they have been utilized as cleaning tools by other conservation specialties for several decades. Citrates show particular promise for addressing aesthetic concerns, namely reducing staining and brightening paper while preserving its natural tone. Ideally, these results are achieved while preserving the integrity of the cellulose and other paper components.

Despite growing interest in citrates within the paper conservation community, resources remain scarce in the literature. Few publications have systematically examined the long-term effects of citrate solutions on cellulosic objects, and their chemical mechanisms remain poorly understood. Conservators seeking treatment protocols and case studies find limited information beyond the pioneering work of Antoinette Dwan (Dwan 2015; Dwan and Stavroudis 2020), leaving practitioners navigating largely uncharted territory when considering these treatments.

This panel addressed these knowledge gaps by bringing together recently published analytical research, practical case studies, and theoretical considerations regarding the use of citrate solutions in the treatment of works on paper. Through three focused presentations followed by collaborative discussion, the event served to share emergent treatment approaches while identifying critical areas requiring further investigation. While much remains to be understood about citrate chemistry and application, the dialogue generated compelling research questions and demonstrated the potential use of these compounds as valuable tools for advancing our understanding of treatment applications in paper conservation.

SUMMARY OF PRESENTATIONS

TESTING AMMONIUM CITRATES FOR ENHANCED WASHING OF GELATIN-SIZED RAG PAPER

CRYSTAL MAITLAND
SENIOR CONSERVATOR OF PAPER AT THE WINTERTHUR MUSEUM, GARDEN & LIBRARY AND AFFILIATED PROFESSOR FOR THE WINTERTHUR/UNIVERSITY OF DELAWARE PROGRAM IN ART CONSERVATION (WUDPAC)

THERESA J. SMITH
ASSOCIATE PROFESSOR OF PAPER CONSERVATION IN THE PATRICIA H. AND RICHARD E. GARMAN ART CONSERVATION DEPARTMENT AT SUNY BUFFALO STATE UNIVERSITY

Crystal Maitland and Theresa J. Smith showcased selected aspects of their paper, "Testing Ammonium Citrates for Enhanced Washing of Paper," which was recently published in *Journal of the American Institute for Conservation* online (Venus et al. 2025). The research compared the effects of aqueous treatments on aging and on calcium and iron levels after washing for three different test papers: chromatography filter paper, a 19th century gelatin-sized rag ledger paper, and a 19th century rag unsized printing paper. The presentation at the Art on Paper Discussion Group session focused on the findings from the gelatin-sized rag paper.

Smith began by describing the experimental design. One sample of gelatin-sized rag paper was reserved as an untreated control, and all remaining samples were immersed three times

Summaries of discussion groups at the Book and Paper Group Session, AIC's 53rd Annual Meeting, May 27–31, 2025, Minneapolis, Minnesota

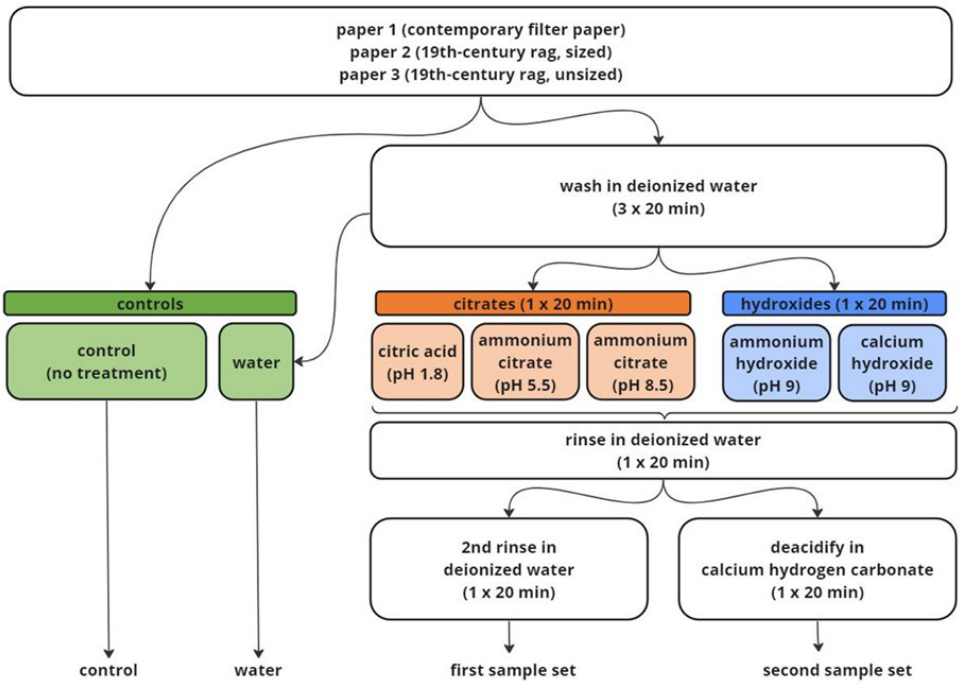


Fig. 1. Overview of the experiment: sample papers (controls, first set, and second set), each with respective treatment durations and pH values. The color coding (green: controls; orange: citrates; blue: hydroxides) is consistent throughout the following figures. Reprinted with permission from the *Journal of the American Institute for Conservation*.

in deionized (DI) water as a pretreatment step to remove soluble degradation products. From the group washed in DI water, a second sample set was reserved. The rest of the samples were immersed in one of the following five solutions: citric acid (pH 1.8), ammonium citrate (pH 5.5 and 8.5), ammonium hydroxide (pH 9), and calcium hydroxide (pH 9). All samples were rinsed in DI and then subdivided into two groups. One group received a second rinse in DI, and the other group was deacidified in a dilute calcium bicarbonate (calcium hydrogen carbonate) bath. Smith noted that the visual differences in color between the treated papers were subtle in both the aged and nonaged groups. However, the samples that received the deacidification treatment step showed that the citrate-treated papers retained the most brightness after aging. Interestingly, the pH of the citrates did not affect the level of brightness as measured by colorimetry (fig. 1). Maitland interpreted the findings regarding calcium and iron levels before and after treatment for the gelatin-sized rag ledger paper. X-ray fluorescence (XRF) spectroscopy was used to scan 1 cm^2 areas of the samples for calcium and iron, and the data were organized into box plots to assess the homogeneity of metal distribution within the samples. Prior to treatment, the XRF scans revealed a heterogeneous spread of calcium. Upon further analysis using scanning electron microscopy/energy dispersive x-ray spectrometry (SEM/EDX), it was discovered that before treatment, much of the calcium was in the form of clustered particles lodged among the paper fibers. X-ray diffraction (XRD) suggested that many of these aggregates might be calcium sulfate. After treatment, XRF scans indicated a homogeneous distribution of calcium implying the removal of the particle clusters.

All aqueous treatments, including the calcium hydroxide treatment, reduced calcium levels. This is an important finding, as even the alkaline calcium hydroxide rinse diminished the total amount of calcium in the paper. The citric acid and two ammonium citrate solutions removed the greatest amount of calcium. Rinsing in DI water followed by dilute calcium bicarbonate deacidification of treated samples was able to reestablish calcium within the papers, although not to pretreatment levels. Maitland suggested that a more concentrated calcium bicarbonate deacidification could further increase the calcium content.

Surprisingly, levels of iron detected by XRF were not affected by any of the aqueous treatments in this study. Before treatment, XRF scans showed low levels of iron homogeneously spread throughout the samples, punctuated by larger iron inclusions. Analysis performed with inductively coupled plasma mass spectroscopy (ICP-MS) indicated that iron and calcium levels in the papers treated by the research team were low relative to similar historical papers. To explain the insolubility of the iron in their study, Maitland referred to another research group that found iron ion removal occurred

in high-iron containing historical papers but not in low iron-containing historical papers (Niehus et al. 2012).

Maitland concluded with the significant finding that the addition of the calcium bicarbonate step proved to be critical to retain the molar mass and brightness of cellulose after any of the aqueous treatments in the study. Maitland, Smith, and their co-authors would like to continue this line of research by studying a wider range of papers, including higher calcium and/or iron-containing papers, different types of staining, localized citrate treatments, and the systematic analysis of the chemical products removed by wash water.

CITRATES IN PAPER CONSERVATION: A RETROSPECTIVE

MADISON BROCKMAN
PAPER CONSERVATOR, LOS ANGELES ART CONSERVATION

Madison Brockman joined the panel via a prerecorded presentation. They began by sharing a treatment experience during their graduate training that became central to their interest in exploring citrate solutions for stain reduction. When treating a Piranesi print during the second year of training at the Winterthur/University of Delaware Program in Art Conservation with classmates Emily Farek, Amber Kehoe, and Victoria Wong, under the supervision of Joan Irving, Winterthur paper conservator and affiliated professor, the group employed a series of baths designed to gradually increase in pH while simultaneously decreasing in concentration to successfully remove significant amounts of staining and discoloration from the paper support. Brockman reasoned that beginning the treatment with a higher ionic content would not aggressively strip the paper of beneficial mineral content immediately, and would allow for effective cleaning across the range of pH levels and citrate concentrations. The series of baths solubilized the tide line stains and engrained surface soiling without overly lightening the color of the support. The treatment was considered a success and did not require any further aesthetic treatments. While at the Los Angeles County Museum of Art (LACMA), Brockman conducted analysis on the aging of papers after treatment with citrates (Brockman 2020). Brockman compared Whatman filter paper and antique western paper after local and overall treatment with 1% sodium citrate at pH 7, and found no adverse effects after aging (Brockman 2020a). More recently, they investigated the effects of 1% sodium citrate at pH 7 on friable media, showing that citrates more readily lift unbound media like charcoal off paper supports during aqueous immersion treatments compared to pure water.

Brockman presented an array of treatment case studies showcasing different ways of working with citrate solutions on a wide variety of paper objects. They noted some benefits of using ammonium and sodium citrate solutions, including affordability, access, and simple preparation. Brockman specified that they prefer to use sodium citrate because it is less hazardous to handle than ammonium citrate and can be safely disposed down the drain in California (note 1). Brockman has found that citrates appear to better preserve the tonality of historical paper, as opposed to their experience with oxidative and reductive bleaches. Brockman added that citrate solutions pair well with gels, sodium borohydride, and light bleaching to remove a wide variety of stains.

Brockman presented several case studies including the treatment of a blue and yellow watercolor with foxing in the margins. The object was bathed on a 2% gellan gum slab while a 1% sodium citrate solution at pH 7 was sprayed through the margins on the front, avoiding the image area. This was followed by a rinse in filtered water. A Marc Chagall print in black ink was immersed in sodium citrate solution before light bleaching to address aesthetic damage from light exposure. This treatment nearly removed the disfiguring rectangle of discoloration, balancing the image area and the unexposed margins. Brockman explained that citrates can successfully combat light-induced discoloration when paired with oxidative or reductive bleaches. They shared a print by Pieter Bruegel in which immersion in citrate solution reduced overall discoloration of the support before a localized stain was further reduced with selective application of hydrogen peroxide. Brockman felt that the support retained a warm, aged look appropriate for a preindustrial paper.

Brockman often uses citrates in combination with gels. Less expensive gellan gum can be used for capillary washing, with a Japanese paper barrier between the gel and the object to prevent gel residues from depositing on the object. Tide lines can be locally treated with thin-cast agarose gels loaded with a citrate solution, cut to the shape of the stain. They shared treatment images of a screen print on thick paper with irregular discoloration around the margins. Immersion and treatment on a suction table were not possible, so citrate-loaded gels were used to gradually even out the staining. To prepare both gellan and agarose gels, the citrate solution is used in place of water.

Citrates may be incompatible with certain colored media. Brockman shared a test treatment of a colored crayon enlargement, the right half of which was fixed with B72 in toluene. The left remained unfixed. The bottom half of the object was treated with citrate solution and the top half was treated with water. The half treated with the citrate solution experienced a remarkable color shift, from an emerald green to a pale blue, despite the right side being fixed (fig. 2). Brockman generally avoids using citrates to treat colored media and friable media. Brockman's final remarks about citrates included tips on how to prepare them with citric acid powder and sodium hydroxide solution versus purchasing the citrate salts. They explained that pH is important to consider because the citrate will not be fully ionized in acidic aqueous solutions below approximately pH 6.4, and therefore the solution may not work as effectively as a chelator. Citric acid is only fully ionized (deprotonated) at pH 7.3 and above (Dwan and



Fig. 2. Test treatment of a crayon enlargement comparing the effect of washing in straight deionized water (top half) with washing in a citrate solution (bottom half). Despite the use of B72 applied as a fixative to the right half of the work, the bottom half that was washed in the citrate solution underwent a dramatic color change.

Stavroudis 2020). Brockman's final treatment tips included surface cleaning that they perform with a cotton swab dampened with a 1% citrate solution to reduce ingrained surface soiling. Another surface treatment Brockman recommends is using an agarose "stain stick," prepared with citrate solution in place of water (Cremonesi 2016; Brockman 2020b). Brockman's presentation illustrated many potential applications of citrates and drew attention to some limitations.

TREATMENT CHALLENGES POSED BY INORGANIC ADDITIVES IN 19TH AND 20TH CENTURY PAPERS

SARAH BERTALAN
CONSERVATOR, WORKS ON PAPER, NEW YORK, NY

In the final talk of the program, Sarah Bertalan presented a compelling argument that inorganic additives in modern papers are chemically unstable and responsible for many of the aesthetic condition problems that conservators encounter among 19th and 20th century works of art on paper. Drawing on research conducted throughout the past 15 years, originally sparked by her collaboration with Antoinette Dwan in the early days of Dwan's development and use of citrate treatments as a washing and stain reduction aid, Bertalan challenged the belief that common paper additives like metal oxides are stable (Bertalan 2015). Unlike traditional approaches to diagnosing paper condition problems that focus primarily on cellulose degradation and acid migration, Bertalan proposed that successful treatment of modern paper requires addressing the reactive inorganic components within the paper.

Bertalan's presentation provided evidence for the instability of metal oxide additives, particularly iron oxides, titanium dioxide, and zinc oxide, which were commonly used in late 19th and early 20th century papermaking. These additives, including iron oxides used for mechanical coloring of pulp (a practice acknowledged by Simon Barcham Green of Hayle Mill), may form salts in humid conditions and may undergo color-changing reactions when exposed to light and varying pH levels. The speaker demonstrated that these additives are not uniformly distributed throughout paper sheets and often concentrate at surfaces during manufacturing, creating "sensitized surfaces" that are particularly vulnerable to environmental conditions. Bertalan illustrated this with examples of prints by Degas, Cassatt, Matisse, Picasso, and Homer, and papers from Arches, Rives, and Van Gelder Zonen (fig. 3). Through visual documentation supported by documentary research and some analysis, the speaker illustrated how metal oxide additives may explain previously puzzling condition problems such as reverse foxing, mat burn, unusual staining patterns, and overall color shifts in paper. The research suggests that many condition issues traditionally attributed to poor-quality housing, humidity fluctuations, and light exposure in reaction with paper fibers or alum-rosin sizing could be attributed to chemical reactions involving unstable inorganic additives, requiring conservators to fundamentally



Fig. 3. Gray-brown staining at the mat window edge, caused by exposure of the modern paper support to unfiltered daylight. Edgar Degas, *Mary Cassatt at the Louvre: The Etruscan Gallery*, 1879–80, intaglio print.

reconsider their treatment approaches for modern paper artworks. While Bertalan's talk was not about the effects of citrate solutions per se, her research has important implications for conservators considering any chemical treatment.

SUMMARY OF DISCUSSION

The presentations inspired an engaging discussion with the attendees across a broad range of topics including the effects of citrates on media, counter ion preference, and the importance of using precise vocabulary when discussing treatment. Many questions were raised that directed the dialogue continuously back to the research potential for citrates as well as philosophical considerations about the inherent character of modern and historical papers.

The conversation began with participants emphasizing the need for specific language when discussing "citrate" treatments, as we have been using this term broadly to encompass various aqueous chelating solutions (sodium citrate, ammonium citrate, diammonium citrate, triammonium citrate), each with different properties and effects that are pH dependent. Future discussions should include the specific solution used for each treatment along with pH and concentration. A question about iron speciation directed toward Maitland and Smith's research highlighted an additional concern around the general broad use of language when discussing analytical findings. Maitland remarked that while XRF is a valuable tool, the elemental data it provides gives an incomplete picture of these inorganic materials. When we speak about calcium or iron, generally, we are not acknowledging the form or oxidation state of the element at the time of papermaking or how it may have chemically changed through aging.

This attention to scientific precision naturally led discussants to question the importance of involving the client or curatorial stakeholder when considering an irreversible treatment using a citrate solution. How can we best advise the nonconservator on the risks of the treatment? Bertalan emphasized the positive outcomes of her own discussions about treatment chemistry with stakeholders, as they have served to set expectations, demonstrate the value of our work, and can even help to build client relationships over time. Brockman sometimes invites clients back to their studio for progress updates and uses the opportunity to talk through the next steps of the treatment.

Central to these conversations was the challenge of balancing treatment benefits against inevitable material changes, particularly the removal of original components that were intentionally incorporated into papers during manufacture. The removal of calcium from paper was a recurring concern among discussants. Maitland and Smith responded to a question about binding constants for calcium and explained that citrate solutions are known to be strong chelators for calcium and relatively weak chelators for iron. In their research, they hoped to show that pH would allow for some degree of "tunability" in these solutions toward targeting the removal of iron over calcium. However, pH did not contribute to preferential removal of iron for the paper types that they studied. It seems that the ability of ammonium citrate solutions to chelate iron varies significantly depending on concentration levels of the iron—while effective at high concentrations, ammonium citrate shows limited success with the low iron concentrations typically found in historical papers. Other concerns highlighted by participants included the effects of citrate solutions on friable media like graphite and charcoal (citrates can act as deflocculants under certain conditions), experiencing unwanted tonal shifts in colored papers after treatment and natural aging, and increase in transparency of some papers.

The question of which counter ion to use—sodium or ammonium—emerged as another key consideration. While acknowledging sodium citrate as deserving study, Maitland, Smith, and co-authors had to limit their study to a single counter ion for the sake of time and resources. The team decided that ammonium was a good choice for the experimental design because it could be compared more easily to ammonium hydroxide solutions that are already well accepted in the field. The ammonium cation is volatile and evaporates from the paper substrate after treatment, leaving the acidic citrate anion behind. The volatility of the ammonium ion can also result in declining pH values over the course of a long treatment. Maitland agreed that sodium citrate should be studied to determine how detrimental it may or may not be from the perspective of fiber swelling and is curious about how we should approach the practice of rinsing objects treated with sodium citrate solutions. One participant shared their comparison of conductivity levels between ammonium and sodium citrate, noting that his sodium citrate solutions are much lower in conductivity than ammonium citrate solutions.

Related to the concern about calcium removal, participants explored the relative merits of different rinsing and deacidification approaches. Maitland and Smith rinsed using calcium hydroxide in their study, and they found that the calcium hydroxide rinse did not prevent paper darkening upon artificial aging, nor were they able to add an appreciable reserve of calcium back into the paper with this method. They showed that the ionic strength (and conductivity) of pH 8–9 calcium hydroxide solution is exceedingly low. The amount of calcium carbonate deposited using a calcium bicarbonate (calcium hydrogen carbonate) solution is still limited but provides a greater calcium reserve than calcium hydroxide. By way of some instructive charts and graphs, Maitland encouraged the audience to revisit the chapter on deacidification in *Paper and Water* (Smith 2018).

Several practitioners shared modified approaches to citrate treatment that they have found successful in their own work. One participant reported success using low concentration 0.25% ammonium citrate solutions, finding them less aggressive while maintaining effectiveness, and noted reduced

color reversion after aging compared to higher concentrations. Another participant described using citrate as a spray treatment between rinsing baths rather than full immersion, allowing for more controlled application while maintaining effectiveness for stain removal. Multiple speakers warned against using metal spray bottles with citrate solutions due to metal leaching, recommending plastic spray bottles instead.

FUTURE RESEARCH DIRECTIONS

Participants noted the difficulty of predicting which papers will react adversely to citrate treatment without extensive analysis, suggesting the need for targeted research on commonly encountered types of paper. To date, aging studies have been limited to only a few types of paper.

The panel and participants identified several other areas needing further investigation: identifying the most appropriate counter ions for citrate solutions, determining best practices for rinsing and restoring lost calcium, analyzing wash waters to better understand what materials are being removed during treatment, studying binding constants for the chelating agents with various metal ions, and systematically examining the effects of citrate solutions on 20th century art papers like the ubiquitous Arches and Rives.

The discussion concluded with recognition that citrate solutions represent powerful tools for stain reduction but their use requires careful consideration of paper type, treatment goals, and long-term effects. The combination of analytical data and extensive practical experience presented at the Art on Paper Discussion Group session offers valuable guidance for conservators considering citrate treatments and highlights the ongoing need for systematic study of these complex chemical interactions.

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Much gratitude to the presenters and co-authors for generously sharing their research and labor at the Art on Paper Discussion Group session. We are also thankful for the attendees and participants who contribute so much insight, encouragement, and value to the program. Many thanks to our colleagues, BPG program chair Morgan Adams and assistant program chair Anita Dey, for all of their support in helping to organize the session. Finally, we wish to recognize the significant contributions of María Cristina Rivera Ramos in developing the concept for this year's panel and laying the groundwork for the session.

NOTE

1. Ammonia and its salts can be harmful for plumbing systems and aquatic life. Please refer to the chemical safety data sheet prior to handling ammonium or sodium citrate, and consult your local waste regulations before disposing of any chemical.

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Library and Archives Conservation Discussion Group 2025 Managing Existing Mold on Library and Archives Collections

CRediT Statement
Writing, Original Draft and Writing, Review and Editing: HH and GPK

This open discussion took place in person on Saturday, May 31, 2025, during the AIC 53rd Annual Meeting, May 27–31, 2025, in Minneapolis, Minnesota. The moderators organized and led the discussion and recorded notes. Readers are reminded that the moderators do not necessarily endorse all 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.

INTRODUCTION

The 2024 Library and Archives Conservation Discussion Group (LACDG) Session during the AIC 52nd Annual Meeting in Salt Lake City, Utah, focused on acquisitions processes in libraries and archives, from the initial decision to acquire materials to receiving them and integrating them into our collections. One subject that garnered a lot of discussion was mold on newly acquired books, papers, and beyond. The overwhelming interest in this topic inspired this year's theme. We had three presentations from our colleagues who actively work to tackle the problem of mold that we bring into our collections, followed by a question and answer discussion.

SUMMARY OF PRESENTATIONS

A Proactive Approach to Managing Mold in Library Acquisitions

Clara Huisman, Book & Paper Conservator, University of Miami Libraries, Coral Gables, FL, chuisman@miami.edu

Credit Statement
Conceptualization, Visualization, Writing – original draft, Writing – review and editing: CH

Clara Huisman outlined the preventive measures implemented by the University of Miami Libraries' Preservation Department to mitigate mold in incoming archival collections. These measures include routine intake reviews, interdepartmental coordination, policies for accepting and remediating mold-affected materials, and participation in site visits prior to acquisition. Huisman also examined challenges in integrating preservation practices early in the intake process while balancing cost, safety, and logistical constraints. Case studies shared in the presentation illustrated the increasing role of outsourced remediation as a safer, more sustainable approach to managing biological risks amid the library's growing collections.

Effective Collaboration for Mold Remediation and Policy Development

Marieka Kaye, Director, Preservation Services, Physical Collections, University of Michigan Library, Ann Arbor, MI, marieka@umich.edu

Credit Statement
Conceptualization, Visualization, Writing – original draft, Writing – review and editing: MK

Marieka Kaye examined the challenges and solutions related to mold management in large academic libraries. The University of Michigan Library system, spanning the Ann Arbor, Dearborn, and Flint campuses, manages more than 16 million volumes in diverse facilities, including 14 buildings in Ann Arbor alone. These buildings serve multiple functions, such as open and closed stacks, study areas, event spaces, and off-site storage. Monitoring climate conditions is essential but challenging due to older Preservation Environment Monitors (PEMs) that lack real-time data, necessitating vigilant staff oversight to address potential issues promptly.

Summaries of discussion groups at the Book and Paper Group Session, AIC's 53rd Annual Meeting, May 27–31, 2025, Minneapolis, Minnesota

The library often partners with BELFOR, a vendor experienced in mold issues in sensitive environments. This partnership is essential due to the library's vast infrastructure and limited staff for in-house mold management. BELFOR provides remediation and preventative services, such as installing in situ protection during renovations to avoid relocating collections, thereby reducing risks to valuable materials. This underscores the importance of selecting trusted vendors capable of handling cultural heritage materials.

Safety protocols are a critical focus, with Kaye sharing personal experiences that highlight the need for personal protective equipment (PPE) to prevent health risks. A personal incident involving a lung infection due to inadequate protection stressed the importance of PPE, leading to a reassessment of staff exposure risks and a greater reliance on outsourcing remediation. Collaboration with the Environmental Health and Safety (EHS) division ensures adherence to best practices, facilitated by a dedicated safety specialist who conducts inspections and maintains procedural updates.

The library employs a comprehensive standard operating procedure (SOP) for mold assessment and remediation, guiding decisions on retaining or disposing of materials. The SOP is adaptable to in-house and vendor-based scenarios, offering flexibility in responding to various levels of mold challenges. A supplementary SOP exists for situations where vendor intervention is the only solution, ensuring efficient management of large, low-use material outbreaks.

Effective communication, coordination, and collaboration are vital for successful mold management. The conservation laboratory's strong ties with the library's facilities department and EHS division enable a unified approach to complex scenarios. Regular staff training in wet book rescue techniques enhances preparedness, allowing for swift responses before vendor intervention. Kaye concludes by emphasizing the necessity of having a comprehensive emergency preparedness plan in place, complete with contact information and processes, before a mold outbreak happens, and that it is crucial for protecting staff safety and the library's collections.

How Much Is Enough? Re-Examining the Mold Treatment Protocol for Works on Paper From Harvard Library's Special Collections

Eliza Spaulding, Helen H. Glaser Senior Paper Conservator, Weissman Preservation Center, Harvard Library, Cambridge, MA, eliza_spaulding@harvard.edu
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Credit Statement

Conceptualization: LB, LC, AM, KP, ES
Methodology: LB, LC, AM, KP, ES
Project administration: ES
Resources: LB, LC, AM, KP, ES
Supervision: ES
Visualization: LB, LC, AM, KP, ES
Writing – original draft: LB, LC, AM, KP, ES
Writing – review and editing: LB, LC, AM, KP, ES

On behalf of the author group, Eliza Spaulding presented "How Much Is Enough? Re-Examining the Mold Treatment Protocol for Works on Paper From Harvard Library's Special Collections." In 2024, the Weissman Preservation Center of Harvard Library formed a project team to reexamine its mold treatment protocol for works on paper. Although well defined, the protocol invited inquiry into long-standing questions, including: How much mold removal is enough to create the lowest possibility of regrowth? How can one treat paper with mold to maximize removal and minimize contamination during treatment? What equipment and procedures are necessary to ensure staff safety? In their presentation, the authors shared their current mold treatment protocol and the questions they have been investigating to think collectively through possible solutions.

Harvard Library is composed of more than 25 individual repositories, with hundreds of millions of physical and digital items. Special collections with mold are identified at all stages of their lifecycle by library stewards. To determine if they should be treated by the Weissman Preservation Center or by a vendor, conservators take into consideration the collection's rarity, the quantity of material, its condition, the library's treatment goals and timeline, staff capacity, and whether the collection can be safely treated on-site. This process is grounded in the shared goal across Harvard Library of increasing access to its collections. When special collection items with mold ultimately come to the Weissman Preservation Center, they are sealed in plastic and stored in a separate vault from other treatment projects. Treatment takes place in a dedicated room with a fume hood, a sink, and a small amount of counter space. Staff typically work in the fume hood and wear nitrile gloves. The option to wear a lab coat, earplugs, and an N95 respirator is also available.

Using a recent project from Harvard's Houghton Library, Spaulding described the authors' approach to treating works

on paper affected by mold. The collection comprises seven documents from the 16th to 18th centuries, concerning the land estates and military service of the Russian provincial nobility. Long and scroll-like, the documents were rolled up and had flattened over time. They were written in brown ink, possibly iron gall. Tideline stains indicated that the documents had been in contact with an aqueous solution. Areas of black, brown, and cream-colored mold appeared scattered throughout each document. The mold was more than a stain but was not visibly fluffy in appearance. There were several small creases, folded flaps, and tears in each document. In consultation with Houghton colleagues, the treatment goals were to reduce the mold to the extent possible, to flatten overall and reduce creases and folds to increase access to content, and to repair the most vulnerable tears so the documents could be safely handled.

Treatment began by examining the documents and taking before-treatment images in the fume hood with a smartphone. A point-and-shoot camera was also an option. Each document was then vacuumed with a Nilfisk high-efficiency particle air (HEPA) filter vacuum with a narrow tube attachment covered with a Teflon screen, and set so the suction drew particles away from the surface of the document but did not draw the document to the attachment. After the recto was vacuumed, the document was turned over and placed on a clean surface of the fume hood to vacuum the verso. After both sides were vacuumed, the fume hood surface was cleaned with a 70% isopropanol/30% deionized water solution. Each document then was selectively surface cleaned with polyurethane cosmetic sponges, blotting at a discrete area of mold and then turning the sponge to a fresh side before cleaning a new area. Sometimes a work on paper could be vacuumed a second time if surface cleaning dislodges particulates not trapped by the cosmetic sponges, but this is typically where mold remediation stops. While visual assessment provides some understanding of how much visible mold was removed, there is little understanding whether the mold was removed as efficiently and practically as possible, and in a way that minimized contamination.

After vacuuming and surface cleaning, each document was flattened between sheets of thick blotter covered with Plexiglas and weight. Once sufficiently flattened, tears were mended and loose pieces were reattached with solvent-set tissue (1.6-g NAJ toned tengucho from Hiromi Paper Inc., coated with a 5% solution of Klucel G, and dried) reactivated in ethanol to avoid exposing the brown ink and remaining mold to aqueous materials. The documents were stored flat in individual archival folders in a two-piece archival box.

The authors are currently developing a mold treatment workflow and ultimately hope to address the questions posed at the beginning of the presentation, as well as other questions that have emerged during their research. Some of these include criteria for alcohol-based treatments, and how often it is practical and meaningful to revisit mold treatment projects. Next steps may include taking photomicrographs and working in collaboration with conservation scientists to design a study to analyze the efficacy of different mold remediation treatment techniques. The authors are grateful for and welcome ongoing dialogue with the conservation community.

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QUESTION AND ANSWER DISCUSSION

After the presentations, the session moderators led a question and answer discussion. These questions, as well as the responses, are paraphrased here.

Question: How do you get staff and administration at your institution to take mold seriously, especially if there is no health and safety department?

Answers:

(Eliza Spaulding): Harvard Library staff do take mold seriously, and conservation staff are frequently called upon to respond to suspected mold incidents.

(Marieka Kaye): Wet book rescue workshops help in getting staff to take mold risk seriously. We hold wet book workshops and include as many staff as possible.

(Sarah Reidell, Penn Libraries): We created cost of ingest guidelines, which feed into donation and gift guidelines, to make clear the high cost of managing damaged acquisitions.

(Tara Kennedy, Yale Libraries): We teach a broad range of staff to identify mold and that helps a lot with buy-in.

(Morgan Adams, Columbia University Libraries): We've gained more support by including our curators and archivists in discussions. We are transparent about cost and labor around mold affected materials. We offer entry points for changes at the acquisitions stage to control these expenses.

Question: After collections have been cleaned, are you able to make them available to readers again?

Answers:

(Clara Huisman): The materials that were treated with gamma radiation (described in the presentation) are too fragile to be served to readers. Because the library was able to reformat these items, digital versions are available and the originals are restricted.

(Eliza Spaulding): Harvard Library is actively considering guidelines around making previously cleaned materials available to readers. As of now, decisions about access are made by individual collecting units.

(Marieka Kaye): Special collections have the benefit that we can restrict their use. Circulating collections go back to stacks with a physical note that they have been cleaned for mold. Withdrawing moldy materials is also not uncommon.

Question: What about active vs. inactive mold?

Answers:

(Marieka Kaye): I have to treat all mold in the collections as though it is active.

(Kathryn Kenney, Folger Shakespeare Library): To encourage our colleagues to take inactive mold more seriously, we now refer to it as "temporarily inactive mold."

Question: Have you used the ATP swab test to detect the presence of mold?

Answer:

(Eliza Spaulding): Harvard Library is not actively using the swab test to evaluate efficacy of cleaning. My understanding is that the ATB swab test is effective but needs to be used in combination with visual assessment by trained staff.

Question: Do you use an ethanol chamber or mist for treating mold?

Answers:

(Marieka Kaye): At the University of Michigan, ethanol solution delivered by mist is used in some cases.

(Eliza Spaulding): At Harvard, this method has been used in the cleaning of photos, but, so far, not in the cleaning of paper.

Question: Have you encountered recurring mold on the same books?

Answer:

(Marieka Kaye): Yes. Leaks often happen in the same places. In the case I discussed in my presentation, we had no choice but to return the affected books to the same place in the stacks. As a temporary measure, the books were placed in paper boxes that could absorb the water, should there be another water event. Eventually, a new location was found and the books were moved.

Question: Do you send books, as well as loose paper materials, to BELFOR (or another vendor) for cleaning? If so, how do you handle concerns about the security of unbound materials that are not inventoried?

Answers:

(Marieka Kaye): We have only sent books and only when there are 20 items or more.

(Tara Kennedy): At Yale, we have sent unbound paper materials to BELFOR for freeze-drying with no problems. We are comfortable with their security measures.

Question: Do you spot-check materials after they come back from the vendor?

Answers:
(Tara Kennedy): Yes, we spot check the materials before paying the BELFOR invoice.
(Marieka Kaye): The Bentley Library sent materials for gamma radiation as a precleaning measure, after which they cleaned them in-house.

Question: How do small institutions without health and safety departments get health and safety questions answered?
Answer: (Tara Kennedy): OSHA has a great program for this and will come on-site to help evaluate your situation. They are not policing you, but really providing help. Visit www.osha.gov/consultation.

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