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Article: Conservation Treatment of a Leather Binding: The Louise Hanson-Dyer Book of Autographs

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## Conservation Treatment of a Leather Binding: The Louise Hanson-Dyer *Book of Autographs*

### INTRODUCTION

Due to the fragile state of its spine, the Louise Hanson-Dyer *Book of Autographs* came to the Grimwade Centre for conservation treatment in 2017. Louise Hanson-Dyer (1884–1962) was significant for her patronage of culture and the arts in Australia and known internationally for her publication of finely printed music scores such as the *Editions de l'Oiseau-Lyre* of the 1930s (Davidson 1994).

Her *Book of Autographs* (fig. 1) is one of the most important cultural artifacts within the University of Melbourne collections, containing personalized inscriptions, art works and poems by prominent Australian and international artists. Notable entries include a handwritten poem by James Joyce and paintings by artists such as Arthur Streeton and Dora Meeson (fig. 2). Louise Hanson-Dyer commissioned the *Book of Autographs* from Wal Taylor who was a prominent bookbinder active in Sydney in the 1930s (*Art in Australia* 1925). The book is currently housed in the Music Library of the University of Melbourne (Tregear 2008).

### PHYSICAL DESCRIPTION OF THE ALBUM

The album has been bound in vegetable tanned goat skin leather with an enhanced natural grain pattern, typical of Moroccan leather (fig. 3). The front board has been highly decorated with tiny gemstones, intricate leather onlays and gold leaf tooling. The panels between the raised bands on the spine are gilded with a laurel leaf pattern and a single gold line each side of the bands. The text block has gilt edges with a repeated floral motif gauffered pattern on all three edges. This is a large bookbinding, measuring 38 cm high, almost 30 cm wide and 6 cm in depth. A decorative art object in its own right, the binding both reflects and protects the rich cultural content between its covers.

The book is thought to have been originally bound blank with the dedications, illustrations and poems specially inscribed to Louise Hanson Dyer added over time. In terms

of the binding style, the content suggests a classification of the book as an album despite not having an album's typical structural features such as stub guards and other compensators to allow for inclusions. This book was used as an autograph book for visitors to sign in whatever manner they chose, in keeping with the definition of a type 1 blank book as an album structure (Horton 1999). In this instance, the spine is treated in the tight-back style, revealing five raised sewing supports beneath the spine leather which are used to attach the boards using laced-on return board attachments.

The text block comprises 32 sections, sewn on five raised hemp cords that are 'laced-on return' through the boards. The various dedications and illustrations have been created using pen, ink, watercolour and gouache. More recently, sheets of interleaving tissue have been inserted to protect the friable media from abrasion and loss. The album leaves are protected by endpapers constructed from gray watered-silk doublures inlaid within a border of gray and blue goat skin leather with matching gray silk flyleaves lined with handmade paper. The corners of the leather frame of each doublure are decorated with a floral motif of mauve and blue goatskin onlay pieces.

### CONDITION ASSESSMENT OF THE ALBUM

Given the significance of both the bookbinding and inscriptions, the conservators hoped their initial examination would support their desire for introducing the least amount of new material during the conservation treatment. The aim was to conserve the integrity of the original binding and ensure the book could be safely handled within the reading room of the Music Library, as well as occasional display.

The inscriptions and artworks in the text block were examined thoroughly, and all appeared in good condition. These pages would only require dry-cleaning with a soft brush and smoke sponges to remove surface dirt. The condition of the binding was essentially sound, as both boards were mostly attached to the text block and the album could be opened with care onto book supports. However, as the inscriptions and artworks were mostly located in the first third of the volume,



Fig. 1. The Louise Hanson-Dyer *Book of Autographs*, before conservation treatment.

this is where much of the structural damage to the binding was concentrated that required conservation treatment.

The sewing was broken in several places from the front endpaper through the first five sections of the text block. This damage along with further areas of weak sewing had caused a disturbance of the decorative gauffered gilt-edge pattern (fig. 4), as several sections were no longer in alignment. Along with the sewing damaged, the front board was no longer attached, as the laced-on sewing supports were broken and only held on by the covering leather. The watered silk front flyleaf had 'shattered' promoting tears and losses to the silk and

would continue to be damaged if left untreated and not re sewn into the text block.

Of concern also was the degradation of the decorated covering leather. This damage appeared typical of acid decay combined with poor handling practices of the album. The signs of acid decay here included the weak, shortened or powdered leather fibers; a red colour change within the corium layer of the leather from the highly reactive phenol groups in this condensed tanned leather; and a distinct smell of sulphate contamination (Wouters and Claeys 1996). The leather



Fig. 2. (a) Pen and ink and gouache sketch by Arthur Streeton. (b) Watercolor by Dora Meeson.



Fig. 3. (a) Front board decoration and gauffered tail edge. (b) Detail of onlays and gemstones.

along the first third of the spine had lateral cracks that were pronounced when the book was open and the spine placed under tension. Acid decay and poor handling practices also promoted areas of delamination of the grain-corium junction layer of the leather (fig. 5) at the board joints and tears at the head and tail caps.

#### *Examination of the Covering Leather*

Samples of fibers were taken from the locations in need of repair and tested using a Fiber Cohesion Assessment (FCA) (Larsen, Vest, Poulson and Kejser 1996; Ruzicka, Zyats, Reidell and Primanis 2006). This test was used to determine the strength of the leather deep within the fiber structure for an indication of the level of intervention required to stabilise

the damage at the test sites. The conservators chose the FCA technique because it requires only a very small sample of leather fibers from the corium layer for examination and does not require specialist equipment. Rankings were given corresponding to the following framework of using the published rating scale and actions developed by one of the authors<sup>1</sup>:

- *Rank 1*: Fibers very coherent, few loose fibers and little powder when scraping
  - *Action*: Clean, box, return to suitable storage, monitor
- *Rank 2*: Fibers are coherent and slightly powdery when scraping
  - *Action*: Can be safely repaired without consolidation treatment



Fig. 4. Gauffered edge misalignment and damaged tailcap leather.

- *Rank 3*: Fibers loosely coherent and powdery when scraping
  - *Action*: Can be repaired only with consolidation treatment
- *Rank 4*: Fibers not coherent and very powdery when scraping
  - *Action*: Will not respond to treatment, replace.

Each fiber set was teased apart using the blunt side of a scalpel blade and a dissecting needle onto a white ceramic tile

(fig. 6). Individual fibers were then examined under a light microscope and the condition compared to the ranking characteristics listed previously. Of interest to the conservators was the degree of damage to the leather fibers at the head and tailcap and board joints where conservation treatment was required. Samples taken from the board joints were rated 2, whereas the endcaps were rated 3.

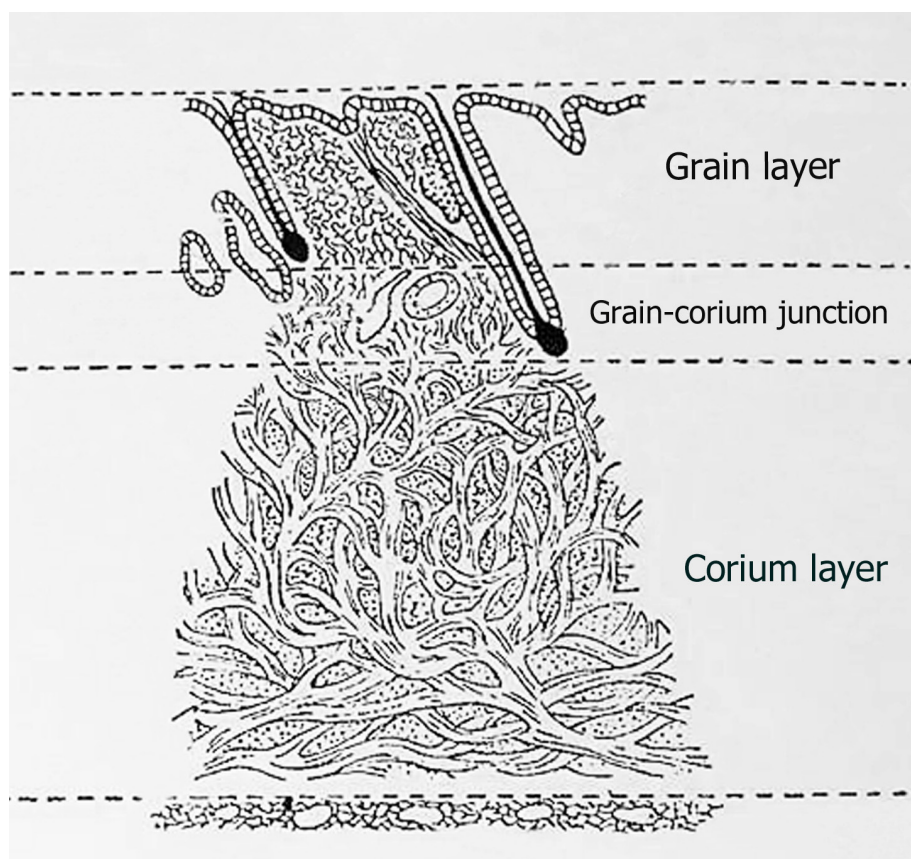


Fig. 5. Fiber structure of mammalian animal skin used for bookbinding leather showing main fibre layers. Adapted from Sharphouse (1971).

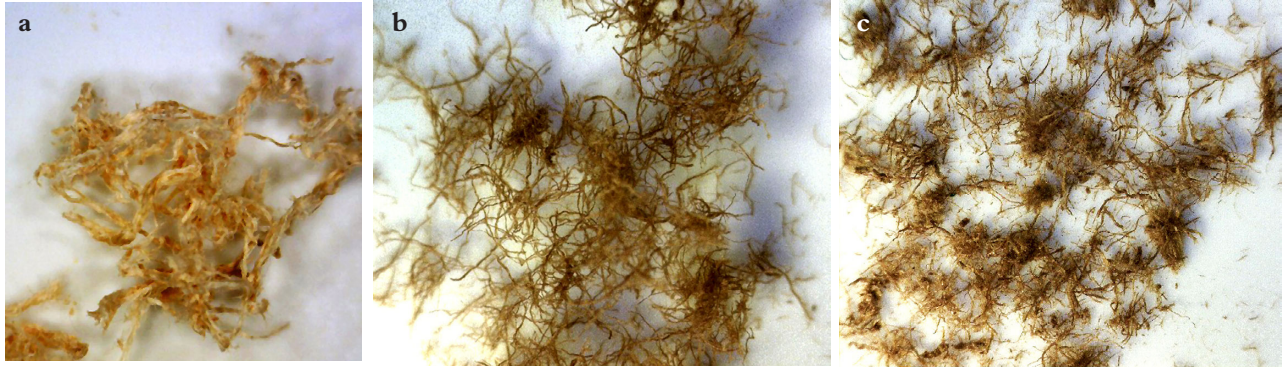


Fig. 6. (a) Ranking 1: new leather. (b) Ranking 2: board joint leather. (c) Ranking 3: tailcap leather.

Results of the FCA examination revealed that the leather on both the board joints and spine retained enough coherence and would therefore respond to consolidation and mechanical repair. This meant that rebacking of the spine was not necessary. The conservators now felt confident in focusing the conservation treatment of the leather to only the most degraded areas of leather on the spine and board joints. The proposed conservation treatment of the leather included the following:

- Consolidating flaking and powdery areas of leather on the spine
- Consolidating weakened leather fibers in areas needing repair
- Re-adhering lifted areas of the leather along the spine to ensure correct tight-back flexing when book is opened
- Attaching sutures to consolidate split areas of the spine leather
- Replacing losses to the endcaps with infills of new archival leather.

The proposed treatment of the leather minimised the introduction of new material and avoided subjecting the structural and decorative elements to unnecessary risk presented by the traditional rebacking process.

#### *Examination of the Text Block Sewing*

Due to the broken sewing and damaged spine leather, the leaves of the book were carefully opened on a book support during the examination. The sewing through the front endpaper and first five sections were found to be either broken or loose and at risk of becoming completely detached over time. As these sections had slipped forward, the gauffered edge decoration had also become disrupted.

In addition to the broken sewing shown in figure 7, numerous sections throughout the text block were starting to slip forward. This was due to the deterioration of the adhesive

layers between the leather, spine lining and back folds of the sections. This resulted in the flesh side of the spine leather being revealed between certain gutters and a loosening of the sewing creating a 'slumping' forward of some sections. This was significant at the gutters between sections 4 and 5 and 5 and 6 with prominent gaps showing between pages 61 and 62 and 77 and 78. These are all areas containing important illustrations or inscriptions, and frequent poor handling may have contributed to this damage.

From the visual examination, it was evident that the sewing structure did not require full replacement. The conservators judged that only the broken sewing needed replacing, the front board reattached and any loose sewing could be strengthened in situ provided safe access could be gained to the back folds. Consideration was given to the reduction of risk by ensuring no strain was placed on the board attachments or sewing during the treatment by constructing an adjustable cradle to support the book during all stages of the treatment.

#### CONSERVATION TREATMENT OF THE ALBUM

##### *Consolidation of the Leather*

Before proceeding with the treatment, the leather covers were cleaned with a soft brush under vacuum to remove fine deposits of degraded leather fiber dust. Only areas of the leather with signs of acid decay were consolidated with a 2% solution of hydroxypropyl cellulose in isopropanol (Knight 2016; Steere 2017) applied with a fine brush under magnification. This was left to dry overnight before a temporary facing tissue was applied around the repair areas of the spine by brushing a 3% solution of hydroxypropyl cellulose in isopropanol directly through 7.3 g/m<sup>2</sup> Tengu tissue. This was reversed at the end of the treatment with the same 3% solution.

##### *Repairing the Sewing and Board Attachment*

Prior to undertaking the repairs to the original supported sewing structure, the pages were cleaned with smoke

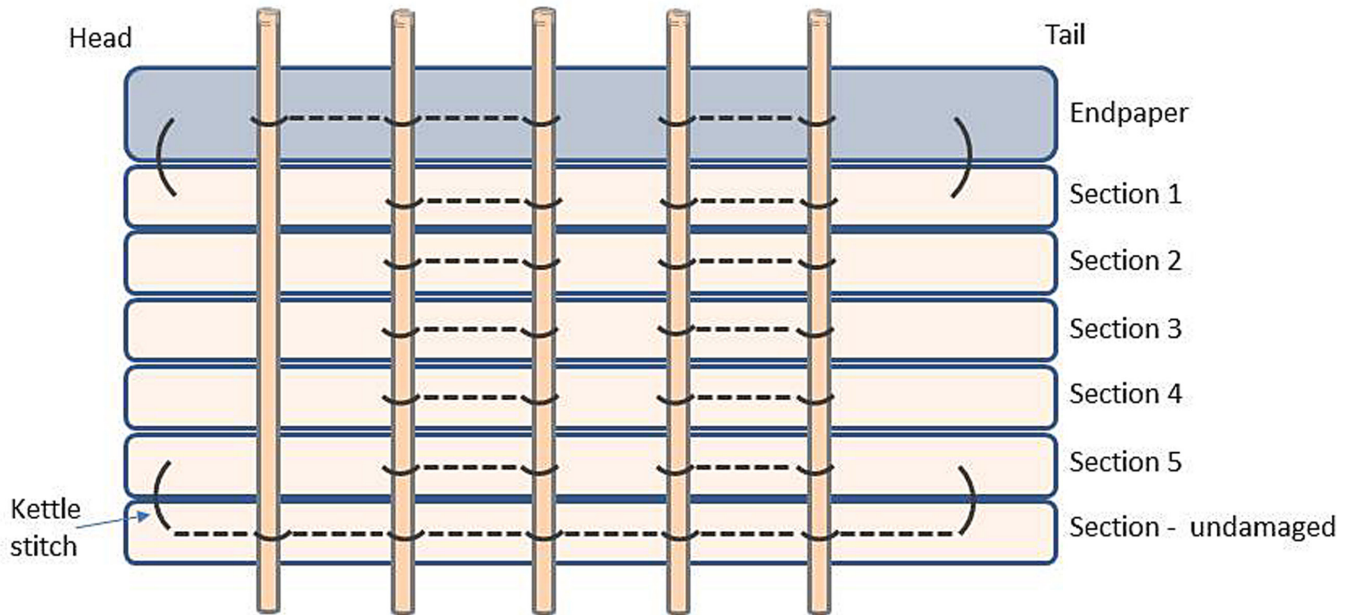


Fig. 7. Configuration of broken sewing to first third of the text block.

sponge (avoiding the friable media) and gutters brushed out with a soft brush under vacuum. Access to the back folds of the sections was required to address the damage to the sewing, and this was achieved by releasing the remaining sewing along the first five sections while ensuring the front board remained well supported. (fig. 8) Loose debris from the degraded areas of the original spine lining was also cleared from the exposed area of sewing with a soft brush and vacuum.

The conservators found that some of the raised cords were de-plying and detaching from under the spine leather. When the book was opened, they noted the degraded adhesive attaching the raised cords to the leather was pulling the cords and causing them to unravel. Where available, the cords were retensioned by twisting and consolidating the cords with wheat starch paste, then, when dry, adhered back into place to the flesh side of the spine leather using Lascaux 498 HV acrylic adhesive. This adhesive was chosen for its low moisture content that prevents the leather from blackening during repairs (Sturge 2000).

To repair the sewing and structurally reattach the front board, cord extensions were added to the five original hemp cord sewing supports. Three cord extensions were threaded around all five of the supports and constructed of Coats Barbour 18/3 waxed linen thread and secured using reef knots (figs. 9, 10) onto which a drop of Evacon-R adhesive was added to lock them into place. To form the final cord extension or slips, each set of three extensions was twisted to form a single cord, trimmed and sized with wheat starch paste, and dried under tension using a light weight.

At this point, loose guards of 16 g/m<sup>2</sup> Japanese kozo fiber paper toned with Golden Acrylic paints were attached to the back fold of the first and fifth sections to close the gaps at the gutters on each side of these sections once the resewing was completed. The loose guards were first attached to the back folds using small beads of wheat starch paste before being resewn around the cord extensions using Coats Barbour 40/3 waxed linen thread following the original sewing configuration.

Finally, the cord extensions were trimmed and flattened to form the new slips. This was done by fanning them and sizing with paste to dry and stiffen. Each slip was then passed over the front board joint and 5 mm under the front doublure to lock the reattachment. In doing this the original board attachment was not disturbed. The new slips were then adhered with a 50:50 mixture of Lascaux 498 HV and Evacon-R and left to dry overnight in an open position. The board reattachment was stress tested the following morning by opening and slightly pulling on the front board.

#### *Repairing the Leather Spine Damage*

The leather was examined under 16x magnification using a Leica M651 microscope and identified as Moroccan goat skin. For the repairs, the conservators chose undyed, vegetable-tanned goat skin leather from J. Hewit & Sons, UK. This leather was chosen for its excellent internal strength and being tanned with hydrolysable vegetable tannins which have proven long-term durability when housed in stable storage conditions (Vidler 2015). The natural grain pattern of the

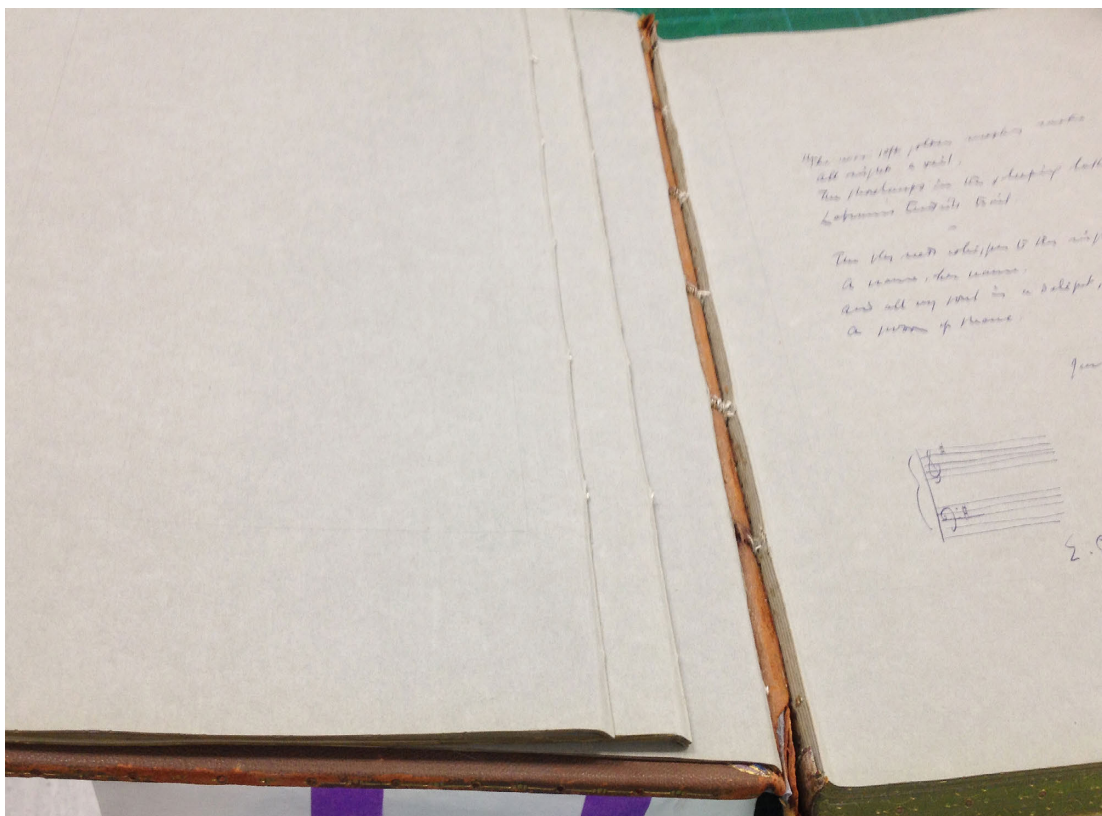


Fig. 8. Releasing the first few sections while supporting the front board attachment.

goat skin proved sympathetic to the enhanced grain pattern of the original leather covering the album. The leather was pared by hand and dyed to suit using conservation standard Selladerm tri-chromate leather dyes.

During the repair process, Lascaux 498 HV was used for attaching new leather directly onto aged leather due to its lower water content. This is more suitable in comparison with wheat starch paste and Evacon-R, whose high water content can promote staining and blacking. Unbound components within aged leather (e.g., tannins, nontannins and previous dressings) are easily solubilized in water, leaving a dark deposit on the surface of the leather as the adhesive dries (Kite, Thomson and Angus 2006).

The repairs to the leather began by applying reversible small sutures of 2.5 g/m<sup>2</sup> *Tengujo* repair paper to the flesh side of the splits in the spine leather. These repairs were attached using a 3% solution of hydroxypropyl cellulose in isopropanol. These realigned and consolidated the splits in the leather. The exposed flesh side of the spine leather was then lined with a 19 g/m<sup>2</sup> Japanese kozo fiber paper and adhered with Lascaux 498 HV as a reversible barrier layer. During this process, the degraded areas of the spine lining along the back folds of the text block were also replaced with a reversible barrier layer of the same

paper. The incorrect profile of the spine in this area was then adjusted with a layer of Hahnemuelle 150 g/m<sup>2</sup> paper using a 50:50 mixture of Lascaux 498 HV and Evacon-R for strength and flexibility. This profile correction would also improve the flexing along the spine when the album was opened.

The leather repairs were made to both endcaps using a three-stage process (fig. 11):

- (1) Leather repair pieces were placed between the original spine leather and back folds, then tacked in place against the original leather using Lascaux 498 HV.
- (2) Linen cord was placed inside the new leather cap pieces and adhered into place using wheat starch paste.
- (3) The grain side of the new leather cap repairs were softened using wheat starch paste before a 1:3 mix of wheat starch paste, and Evacon-R was applied to adhere the turn-ins and set the caps in their final positions. The repair areas were then wrapped in a bandage and left to dry overnight under tension.

The next stage was repairing the large lateral split that extended from the final panel to the tailcap of the spine. By observing the mechanical action of the split when opening and



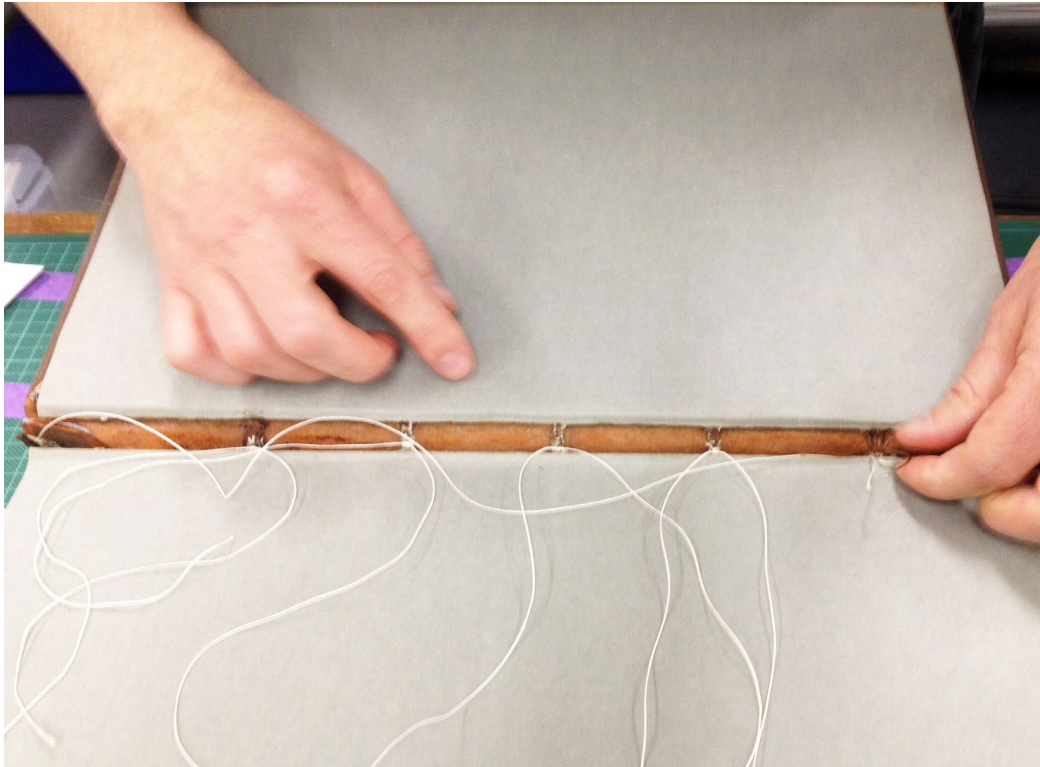


Fig. 9. Creating sewing extensions with unbleached linen thread.

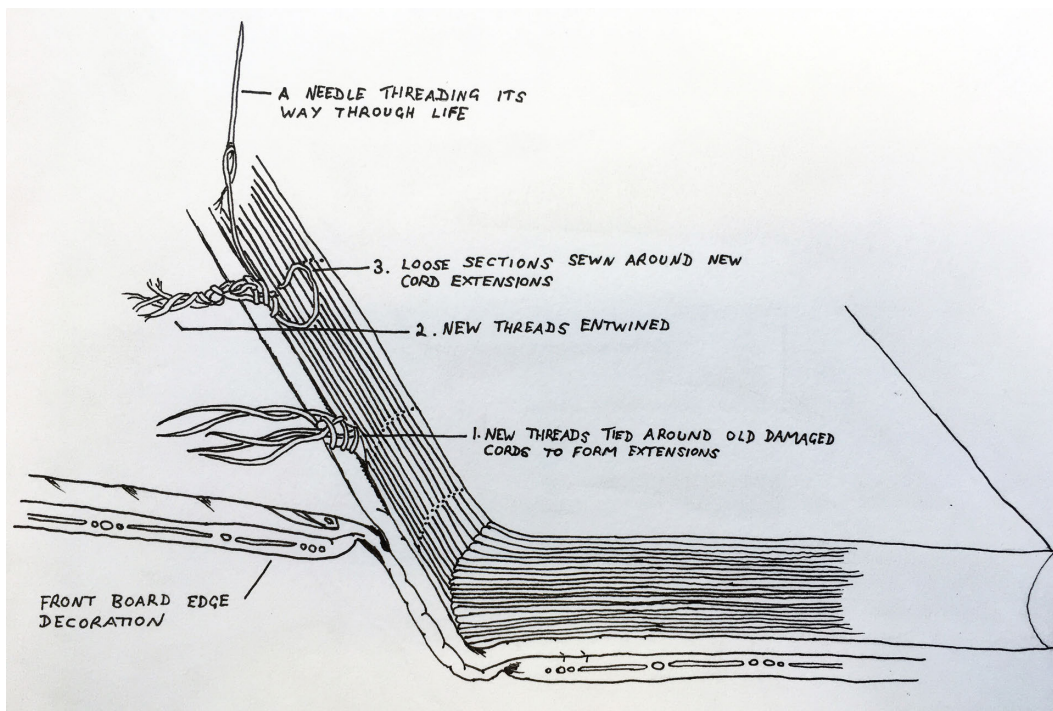


Fig. 10. Sequence of operations for cord extensions board reattachment. Diagram by Peter Mitchelson.



Fig. 11. Replacing missing headcap leather.

closing the book, it was determined that eight small reinforcing sutures could be inserted using unbleached aero linen and Lascaux 498 HV to realign and strengthen this area (fig. 12). Once the split was aligned and the sutures adhered in place, the area was kept under tension by wrapping in a crepe bandage with a Bondina barrier and left for 24 hours for the adhesive to dry.

Initially, this repair seemed stable; however, when the book was closed during a subsequent stage of the treatment with four sheets of Mylar inside, these inserts created too much swelling as the book was closed, which added pressure on the spine, popping the repairs open. Although undesirable, this demonstrated that the initial leather rating was correct, as the original leather did not split further and retained its internal strength, whereas the new repair was the first to fail, leaving the original material undamaged. Nevertheless, this incident was a reminder of the fragility of the binding and the limits to which it could be subjected to stress when opened. By reapplying the repair in the same way, but with the joint under slightly less tension, a greater degree of movement was achieved for the spine when opening the book.

The original binding style was a tight back, and over time, small voids developed where the leather had separated from the backs of the sections in the spaces between the raised bands. To address this, approximately 4 mL of Lascaux 498 HV was injected by syringe into these areas and then bandages were wrapped around the book and left under tension overnight to set.



Fig. 12. Inserting aero linen sutures.

Numerous minor lateral splits remained visible along the spine with hollow spaces or adhesive voids beneath. Small strips of 25 g/m<sup>2</sup> Japanese kozo paper were applied with Lascaux 498 HV and worked into these spaces, then shaped before leaving to dry (fig. 13). Small lengths of toned 5 g/m<sup>2</sup> *Tengu* paper were also applied at a few sites along the joints and endcaps bridging areas of minor splitting. These repairs were later toned using SC7400 tinted with a mix of burnt sienna and burnt umber-light Golden Heavy Body acrylics (Bennett 2018) to reduce the visibility of the repairs on such a highly decorative leather cover. The conservators chose to use the Golden acrylic for toning all of the repairs due to their proven stability within 100 years of gallery lighting conditions.

#### *Repairing the Silk Flyleaf*

Initially, the silk endpapers and detached front corner piece of the shattered silk was carefully cleaned with a soft brush to reduce surface dirt. Further cleaning was not possible due to the brittleness and fragility of the shattered silk. When deciding on the conservation treatment of the silk, the conservators sought advice from in-house textiles conservator Marion Parker.

Being unable to source a similar material, Parker suggested repairing the silk using pre-prepared adhesive film on Stabiltex with 20% 1:1 Lascaux 303-498 HV in deionised water. The Stabiltex was applied as a lining to each of the damaged flyleaves using a heated spatula at 80°C. Those areas where the original silk had been lost were infilled by applying toned paper to the Stabiltex using a heated spatula. The paper used was a 7.3 g/m<sup>2</sup> *Haini Tengucho* tissue toned with Golden Acrylic paints to achieve a suitable color match (figs. 14 and 15).



Fig. 13. Inserting Japanese repair paper infills.

#### CONSERVATION HOUSING

The realigned gilt edges of the text block were gently dry-cleaned again using smoke sponge to remove deposits of surface dirt before the book was rehoused in a cloth-covered,

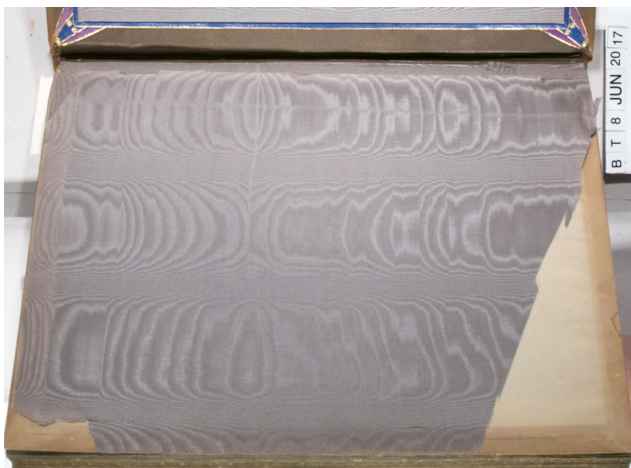


Fig. 14. Watered silk front flyleaf, before conservation.



Fig. 15. Watered silk front flyleaf, after conservation.

drop-spine box (fig. 16). The specifications of the box included the use of conservation standard adhesives and materials such as an internal lining of 9-mm-thick, chemically inert, Plastazote foam. The lining in the base of the box has a cut-away which allows for a hand to be safely inserted beneath the book. This facilitates easier removal of the album, reducing future damage when handled. Before housing, the box was left open to dry and off-gas to remove any residue volatile compounds created by the combination of construction materials and adhesives used in the boxmaking.

#### CONCLUSIONS

The success of this conservation treatment depended upon two factors: being able to access the broken sewing structure and knowing the condition of the original leather. The conservators

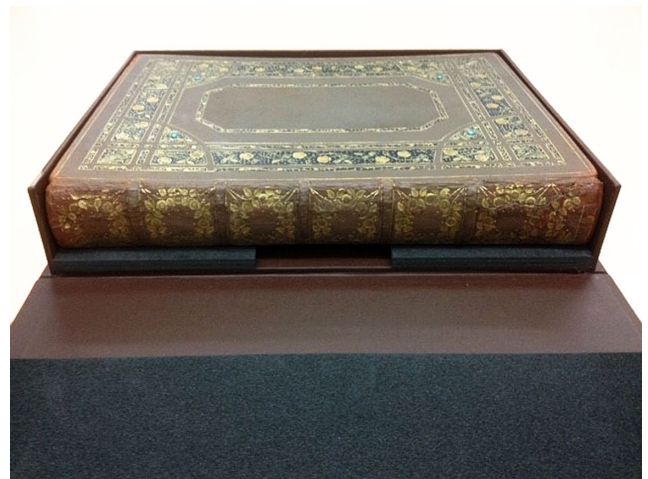


Fig. 16. Housed in drop-back box.



Fig. 17. Realignment of the gauffered edge.

were able to safely access the underside of the spine behind the back folds of the first five sections to perform the sewing repairs in situ. This was achieved by releasing these sections while supporting the front board and allowed the following:

- Extending the sewing slips to reattach the front board
- Attaching guards to the back folds to close gaps in the gutters
- Repairing the sewing in situ while realigning the decorative gauffered edges (fig. 17)

- Attaching reversible barrier layers to the flesh side of the spine leather to realign the torn spine decoration
- Correcting the spine profile to accommodate the dimensions of the spine leather when the book is open and under the most stress.

An understanding of the condition of the original leather at the repair sites informed the choice of different treatment options available to the conservators. Significantly, the FSA indicated that the original leather was sufficiently strong and



Fig. 18. Completed conservation of the leather spine.

meant that a full rebacking of the spine was not necessary. This averted the potential risk of damaging the highly ornate decoration on both the spine and boards during the conservation treatment (fig. 18).

Finally, the use of small structural repairs took into consideration the future handling and significance of this book. The album is housed in a special collection reading room within the Louise Hanson-Dyer Music Library and always handled under the supervision of trained staff using book supports and not subjected to high use, so more robust repairs were not required. Given the significance of this book as a protective and decorative object, the conservators were satisfied that they chose the most ethical approach, conserving the integrity of the original binding by minimising the introduction of new materials, retaining the original decorative elements for the enjoyment of future readers.

#### ACKNOWLEDGMENTS

The project was initiated by Louise Hanson-Dyer librarian Dr. Jen Hill, and the Miegunyah Fund generously provided the funding for this conservation treatment.

The team of conservators who assisted or consulted on this project include Karen Vidler, Peter Mitchelson, Libby Melzer, Marion Parker, Jordi Casasayas, Adele Barbara, Lois Waters, and Danielle Woodward. Editing help was received from Talia Eilon.

#### NOTE

1. Karen Vidler recently developed this framework of treatment actions for the FCA based on her ongoing research into leather deterioration and treatment methods. She passes on this framework in her teaching practice.

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#### SOURCES OF MATERIALS

- Airplane Linen (Unbleached) 200 g/m<sup>2</sup>, Klucel G (Hydroxypropylcellulose), Lascaux Acrylic Adhesives 303 HV and 498 HV, SC7400 Sold as SC6000 (Acrylic Polymer and Wax Emulsion), and Stabiltex
- Talas  
<https://www.talasonline.com>
- Fair Goat Skin (Restoration) Grade II  
J. Hewit & Sons Ltd., UK  
<https://www.hewitonline.com>
- Golden Heavy Body Acrylic Paints  
Golden Artists Colors  
<https://www.goldenpaints.com>

Japanese Repair Papers and Tissues  
Hiromi Paper Inc.  
<https://hiromipaper.com>

Natural Linen Thread (Waxed) 18/3, 40/3  
Ratchford Ltd., UK  
<https://ratchford.co.uk/product-category>

Selladerm Leather Dyes  
Leather Conservation Centre, UK  
<https://www.leatherconservation.org>

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Her *Book of Autographs* (fig. 1) is one of the most important cultural artifacts within the University of Melbourne collections, containing personalized inscriptions, art works and poems by prominent Australian and international artists. Notable entries include a handwritten poem by James Joyce and paintings by artists such as Arthur Streeton and Dora Meeson (fig. 2). Louise Hanson-Dyer commissioned the *Book of Autographs* from Wal Taylor who was a prominent bookbinder active in Sydney in the 1930s (*Art in Australia* 1925). The book is currently housed in the Music Library of the University of Melbourne (Tregear 2008).

### PHYSICAL DESCRIPTION OF THE ALBUM

The album has been bound in vegetable tanned goat skin leather with an enhanced natural grain pattern, typical of Moroccan leather (fig. 3). The front board has been highly decorated with tiny gemstones, intricate leather onlays and gold leaf tooling. The panels between the raised bands on the spine are gilded with a laurel leaf pattern and a single gold line each side of the bands. The text block has gilt edges with a repeated floral motif gauffered pattern on all three edges. This is a large bookbinding, measuring 38 cm high, almost 30 cm wide and 6 cm in depth. A decorative art object in its own right, the binding both reflects and protects the rich cultural content between its covers.

The book is thought to have been originally bound blank with the dedications, illustrations and poems specially inscribed to Louise Hanson Dyer added over time. In terms

of the binding style, the content suggests a classification of the book as an album despite not having an album's typical structural features such as stub guards and other compensators to allow for inclusions. This book was used as an autograph book for visitors to sign in whatever manner they chose, in keeping with the definition of a type 1 blank book as an album structure (Horton 1999). In this instance, the spine is treated in the tight-back style, revealing five raised sewing supports beneath the spine leather which are used to attach the boards using laced-on return board attachments.

The text block comprises 32 sections, sewn on five raised hemp cords that are 'laced-on return' through the boards. The various dedications and illustrations have been created using pen, ink, watercolour and gouache. More recently, sheets of interleaving tissue have been inserted to protect the friable media from abrasion and loss. The album leaves are protected by endpapers constructed from gray watered-silk doublures inlaid within a border of gray and blue goat skin leather with matching gray silk flyleaves lined with handmade paper. The corners of the leather frame of each doublure are decorated with a floral motif of mauve and blue goatskin onlay pieces.

### CONDITION ASSESSMENT OF THE ALBUM

Given the significance of both the bookbinding and inscriptions, the conservators hoped their initial examination would support their desire for introducing the least amount of new material during the conservation treatment. The aim was to conserve the integrity of the original binding and ensure the book could be safely handled within the reading room of the Music Library, as well as occasional display.

The inscriptions and artworks in the text block were examined thoroughly, and all appeared in good condition. These pages would only require dry-cleaning with a soft brush and smoke sponges to remove surface dirt. The condition of the binding was essentially sound, as both boards were mostly attached to the text block and the album could be opened with care onto book supports. However, as the inscriptions and artworks were mostly located in the first third of the volume,



Fig. 1. The Louise Hanson-Dyer *Book of Autographs*, before conservation treatment.

this is where much of the structural damage to the binding was concentrated that required conservation treatment.

The sewing was broken in several places from the front endpaper through the first five sections of the text block. This damage along with further areas of weak sewing had caused a disturbance of the decorative gauffered gilt-edge pattern (fig. 4), as several sections were no longer in alignment. Along with the sewing damaged, the front board was no longer attached, as the laced-on sewing supports were broken and only held on by the covering leather. The watered silk front flyleaf had 'shattered' promoting tears and losses to the silk and

would continue to be damaged if left untreated and not re sewn into the text block.

Of concern also was the degradation of the decorated covering leather. This damage appeared typical of acid decay combined with poor handling practices of the album. The signs of acid decay here included the weak, shortened or powdered leather fibers; a red colour change within the corium layer of the leather from the highly reactive phenol groups in this condensed tanned leather; and a distinct smell of sulphate contamination (Wouters and Claeys 1996). The leather



Fig. 2. (a) Pen and ink and gouache sketch by Arthur Streeton. (b) Watercolor by Dora Meeson.



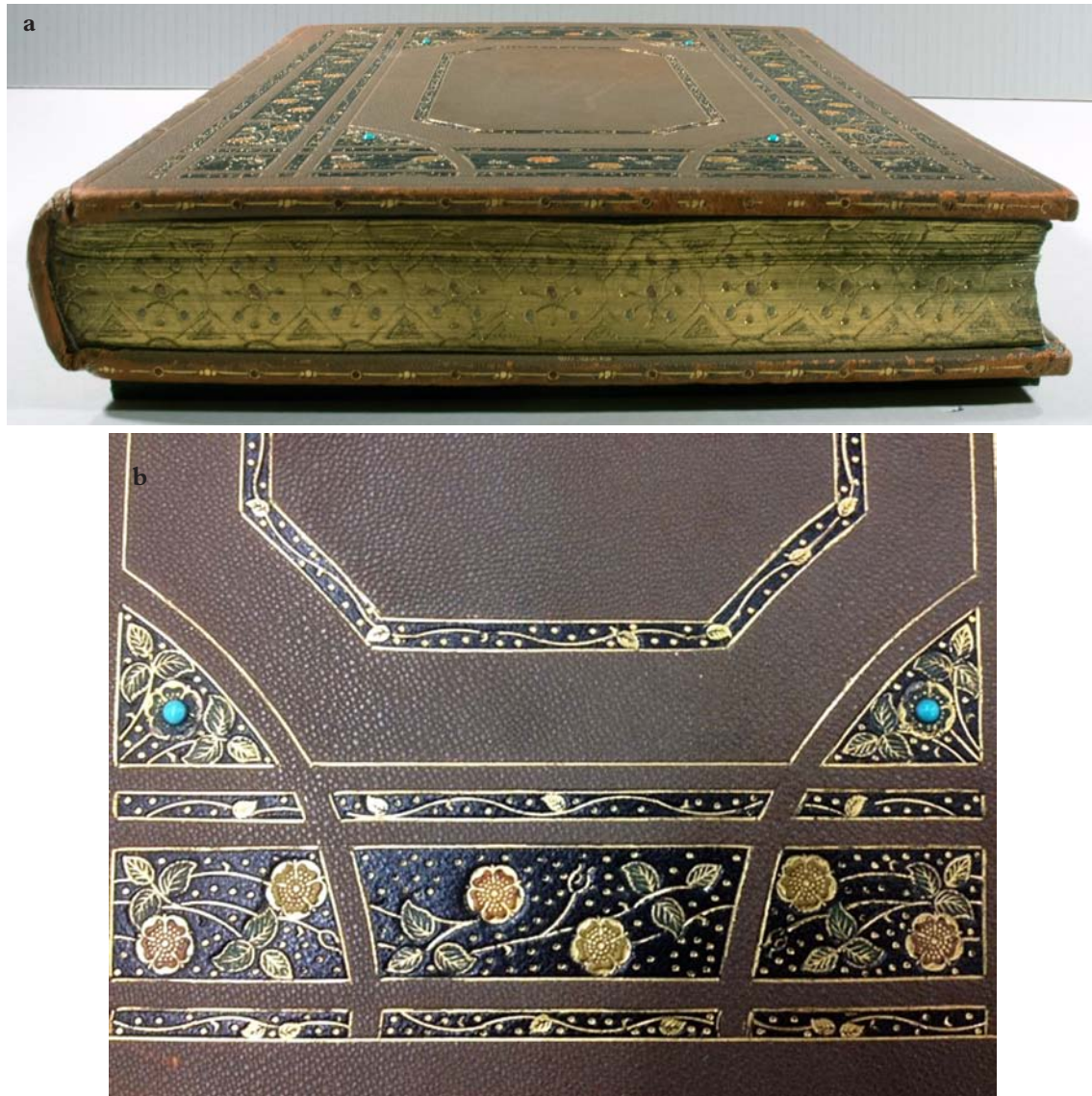


Fig. 3. (a) Front board decoration and gauffered tail edge. (b) Detail of onlays and gemstones.

along the first third of the spine had lateral cracks that were pronounced when the book was open and the spine placed under tension. Acid decay and poor handling practices also promoted areas of delamination of the grain-corium junction layer of the leather (fig. 5) at the board joints and tears at the head and tail caps.

#### *Examination of the Covering Leather*

Samples of fibers were taken from the locations in need of repair and tested using a Fiber Cohesion Assessment (FCA) (Larsen, Vest, Poulson and Kejser 1996; Ruzicka, Zyats, Reidell and Primanis 2006). This test was used to determine the strength of the leather deep within the fiber structure for an indication of the level of intervention required to stabilise

the damage at the test sites. The conservators chose the FCA technique because it requires only a very small sample of leather fibers from the corium layer for examination and does not require specialist equipment. Rankings were given corresponding to the following framework of using the published rating scale and actions developed by one of the authors<sup>1</sup>:

- *Rank 1*: Fibers very coherent, few loose fibers and little powder when scraping
  - *Action*: Clean, box, return to suitable storage, monitor
- *Rank 2*: Fibers are coherent and slightly powdery when scraping
  - *Action*: Can be safely repaired without consolidation treatment



Fig. 4. Gauffered edge misalignment and damaged tailcap leather.

- *Rank 3*: Fibers loosely coherent and powdery when scraping
  - *Action*: Can be repaired only with consolidation treatment
- *Rank 4*: Fibers not coherent and very powdery when scraping
  - *Action*: Will not respond to treatment, replace.

Each fiber set was teased apart using the blunt side of a scalpel blade and a dissecting needle onto a white ceramic tile

(fig. 6). Individual fibers were then examined under a light microscope and the condition compared to the ranking characteristics listed previously. Of interest to the conservators was the degree of damage to the leather fibers at the head and tailcap and board joints where conservation treatment was required. Samples taken from the board joints were rated 2, whereas the endcaps were rated 3.

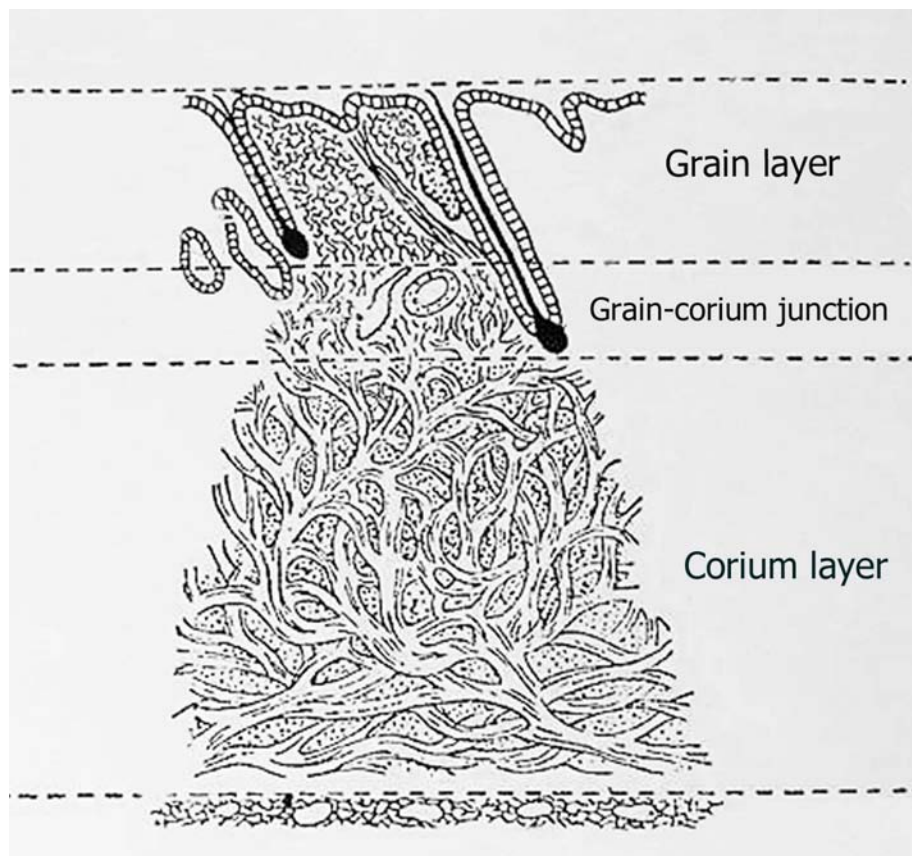


Fig. 5. Fiber structure of mammalian animal skin used for bookbinding leather showing main fibre layers. Adapted from Sharphouse (1971).

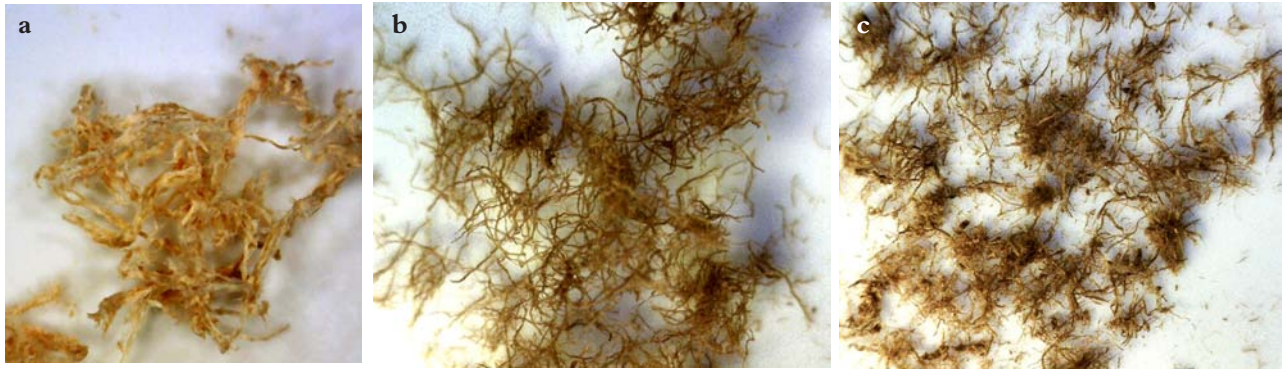


Fig. 6. (a) Ranking 1: new leather. (b) Ranking 2: board joint leather. (c) Ranking 3: tailcap leather.

Results of the FCA examination revealed that the leather on both the board joints and spine retained enough coherence and would therefore respond to consolidation and mechanical repair. This meant that rebacking of the spine was not necessary. The conservators now felt confident in focusing the conservation treatment of the leather to only the most degraded areas of leather on the spine and board joints. The proposed conservation treatment of the leather included the following:

- Consolidating flaking and powdery areas of leather on the spine
- Consolidating weakened leather fibers in areas needing repair
- Re-adhering lifted areas of the leather along the spine to ensure correct tight-back flexing when book is opened
- Attaching sutures to consolidate split areas of the spine leather
- Replacing losses to the endcaps with infills of new archival leather.

The proposed treatment of the leather minimised the introduction of new material and avoided subjecting the structural and decorative elements to unnecessary risk presented by the traditional rebacking process.

#### *Examination of the Text Block Sewing*

Due to the broken sewing and damaged spine leather, the leaves of the book were carefully opened on a book support during the examination. The sewing through the front endpaper and first five sections were found to be either broken or loose and at risk of becoming completely detached over time. As these sections had slipped forward, the gauffered edge decoration had also become disrupted.

In addition to the broken sewing shown in figure 7, numerous sections throughout the text block were starting to slip forward. This was due to the deterioration of the adhesive

layers between the leather, spine lining and back folds of the sections. This resulted in the flesh side of the spine leather being revealed between certain gutters and a loosening of the sewing creating a 'slumping' forward of some sections. This was significant at the gutters between sections 4 and 5 and 5 and 6 with prominent gaps showing between pages 61 and 62 and 77 and 78. These are all areas containing important illustrations or inscriptions, and frequent poor handling may have contributed to this damage.

From the visual examination, it was evident that the sewing structure did not require full replacement. The conservators judged that only the broken sewing needed replacing, the front board reattached and any loose sewing could be strengthened in situ provided safe access could be gained to the back folds. Consideration was given to the reduction of risk by ensuring no strain was placed on the board attachments or sewing during the treatment by constructing an adjustable cradle to support the book during all stages of the treatment.

#### CONSERVATION TREATMENT OF THE ALBUM

##### *Consolidation of the Leather*

Before proceeding with the treatment, the leather covers were cleaned with a soft brush under vacuum to remove fine deposits of degraded leather fiber dust. Only areas of the leather with signs of acid decay were consolidated with a 2% solution of hydroxypropyl cellulose in isopropanol (Knight 2016; Steere 2017) applied with a fine brush under magnification. This was left to dry overnight before a temporary facing tissue was applied around the repair areas of the spine by brushing a 3% solution of hydroxypropyl cellulose in isopropanol directly through 7.3 g/m<sup>2</sup> Tengu tissue. This was reversed at the end of the treatment with the same 3% solution.

##### *Repairing the Sewing and Board Attachment*

Prior to undertaking the repairs to the original supported sewing structure, the pages were cleaned with smoke

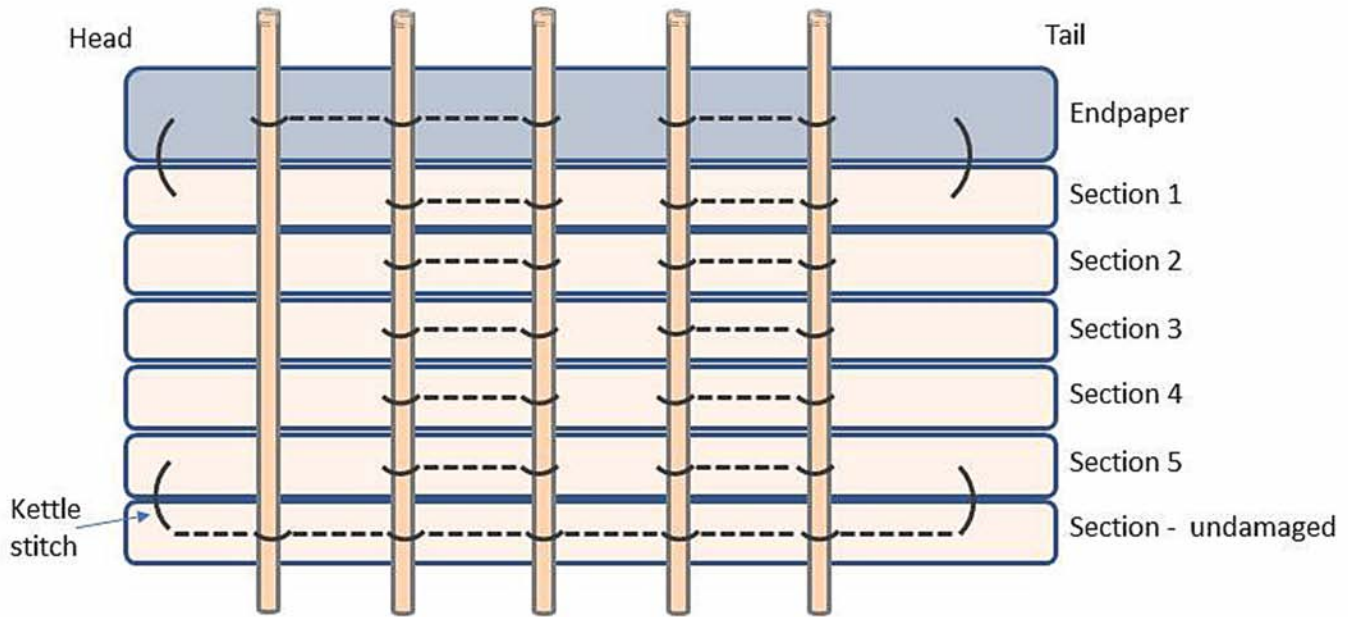


Fig. 7. Configuration of broken sewing to first third of the text block.

sponge (avoiding the friable media) and gutters brushed out with a soft brush under vacuum. Access to the back folds of the sections was required to address the damage to the sewing, and this was achieved by releasing the remaining sewing along the first five sections while ensuring the front board remained well supported. (fig. 8) Loose debris from the degraded areas of the original spine lining was also cleared from the exposed area of sewing with a soft brush and vacuum.

The conservators found that some of the raised cords were de-plying and detaching from under the spine leather. When the book was opened, they noted the degraded adhesive attaching the raised cords to the leather was pulling the cords and causing them to unravel. Where available, the cords were retensioned by twisting and consolidating the cords with wheat starch paste, then, when dry, adhered back into place to the flesh side of the spine leather using Lascaux 498 HV acrylic adhesive. This adhesive was chosen for its low moisture content that prevents the leather from blackening during repairs (Sturge 2000).

To repair the sewing and structurally reattach the front board, cord extensions were added to the five original hemp cord sewing supports. Three cord extensions were threaded around all five of the supports and constructed of Coats Barbour 18/3 waxed linen thread and secured using reef knots (figs. 9, 10) onto which a drop of Evacon-R adhesive was added to lock them into place. To form the final cord extension or slips, each set of three extensions was twisted to form a single cord, trimmed and sized with wheat starch paste, and dried under tension using a light weight.

At this point, loose guards of 16 g/m<sup>2</sup> Japanese kozo fiber paper toned with Golden Acrylic paints were attached to the back fold of the first and fifth sections to close the gaps at the gutters on each side of these sections once the resewing was completed. The loose guards were first attached to the back folds using small beads of wheat starch paste before being resewn around the cord extensions using Coats Barbour 40/3 waxed linen thread following the original sewing configuration.

Finally, the cord extensions were trimmed and flattened to form the new slips. This was done by fanning them and sizing with paste to dry and stiffen. Each slip was then passed over the front board joint and 5 mm under the front doublure to lock the reattachment. In doing this the original board attachment was not disturbed. The new slips were then adhered with a 50:50 mixture of Lascaux 498 HV and Evacon-R and left to dry overnight in an open position. The board reattachment was stress tested the following morning by opening and slightly pulling on the front board.

#### *Repairing the Leather Spine Damage*

The leather was examined under 16x magnification using a Leica M651 microscope and identified as Moroccan goat skin. For the repairs, the conservators chose undyed, vegetable-tanned goat skin leather from J. Hewit & Sons, UK. This leather was chosen for its excellent internal strength and being tanned with hydrolysable vegetable tannins which have proven long-term durability when housed in stable storage conditions (Vidler 2015). The natural grain pattern of the

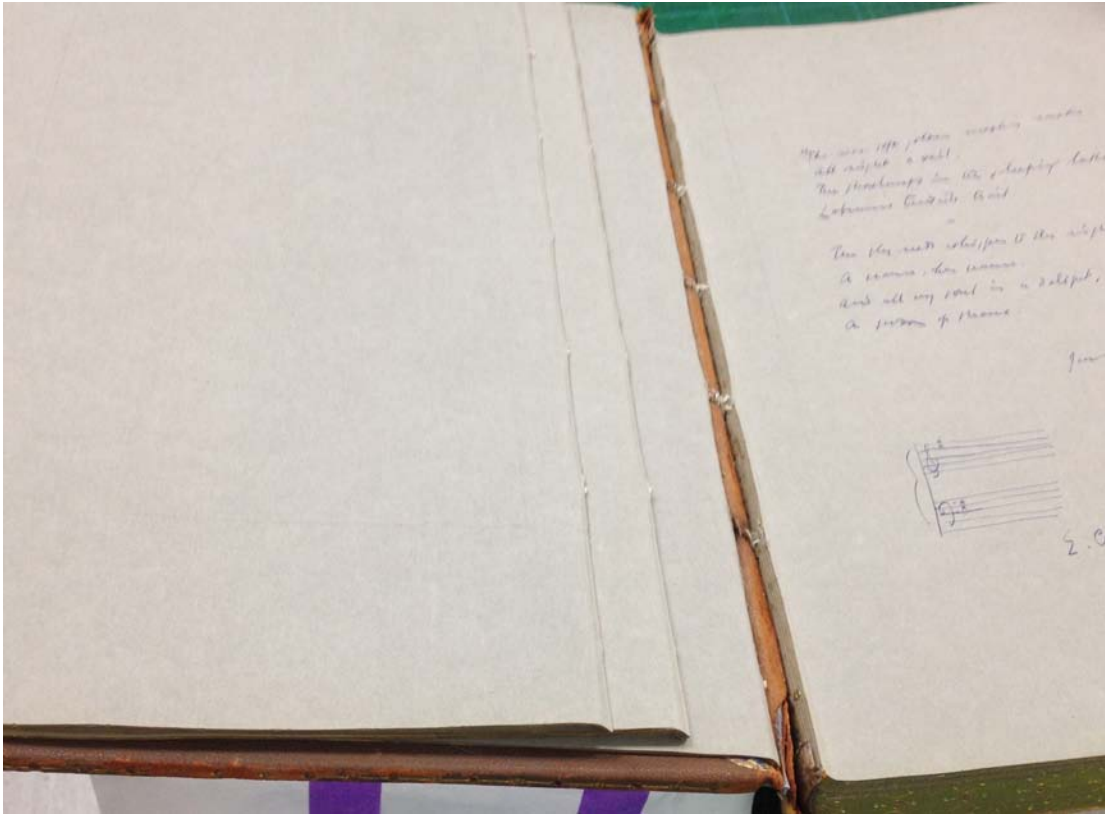


Fig. 8. Releasing the first few sections while supporting the front board attachment.

goat skin proved sympathetic to the enhanced grain pattern of the original leather covering the album. The leather was pared by hand and dyed to suit using conservation standard Selladerm tri-chromate leather dyes.

During the repair process, Lascaux 498 HV was used for attaching new leather directly onto aged leather due to its lower water content. This is more suitable in comparison with wheat starch paste and Evacon-R, whose high water content can promote staining and blacking. Unbound components within aged leather (e.g., tannins, nontannins and previous dressings) are easily solubilized in water, leaving a dark deposit on the surface of the leather as the adhesive dries (Kite, Thomson and Angus 2006).

The repairs to the leather began by applying reversible small sutures of 2.5 g/m<sup>2</sup> *Tengujo* repair paper to the flesh side of the splits in the spine leather. These repairs were attached using a 3% solution of hydroxypropyl cellulose in isopropanol. These realigned and consolidated the splits in the leather. The exposed flesh side of the spine leather was then lined with a 19 g/m<sup>2</sup> Japanese kozo fiber paper and adhered with Lascaux 498 HV as a reversible barrier layer. During this process, the degraded areas of the spine lining along the back folds of the text block were also replaced with a reversible barrier layer of the same

paper. The incorrect profile of the spine in this area was then adjusted with a layer of Hahnemuelle 150 g/m<sup>2</sup> paper using a 50:50 mixture of Lascaux 498 HV and Evacon-R for strength and flexibility. This profile correction would also improve the flexing along the spine when the album was opened.

The leather repairs were made to both endcaps using a three-stage process (fig. 11):

- (1) Leather repair pieces were placed between the original spine leather and back folds, then tacked in place against the original leather using Lascaux 498 HV.
- (2) Linen cord was placed inside the new leather cap pieces and adhered into place using wheat starch paste.
- (3) The grain side of the new leather cap repairs were softened using wheat starch paste before a 1:3 mix of wheat starch paste, and Evacon-R was applied to adhere the turn-ins and set the caps in their final positions. The repair areas were then wrapped in a bandage and left to dry overnight under tension.

The next stage was repairing the large lateral split that extended from the final panel to the tailcap of the spine. By observing the mechanical action of the split when opening and



Fig. 9. Creating sewing extensions with unbleached linen thread.

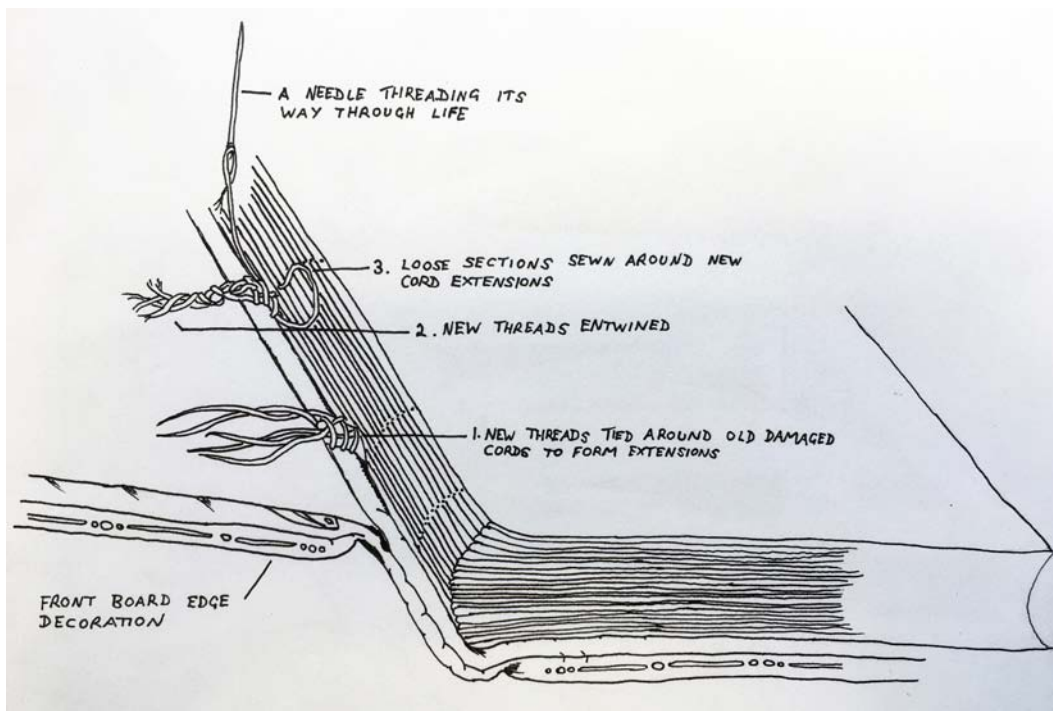


Fig. 10. Sequence of operations for cord extensions board reattachment. Diagram by Peter Mitchelson.



Fig. 11. Replacing missing headcap leather.

closing the book, it was determined that eight small reinforcing sutures could be inserted using unbleached aero linen and Lascaux 498 HV to realign and strengthen this area (fig. 12). Once the split was aligned and the sutures adhered in place, the area was kept under tension by wrapping in a crepe bandage with a Bondina barrier and left for 24 hours for the adhesive to dry.

Initially, this repair seemed stable; however, when the book was closed during a subsequent stage of the treatment with four sheets of Mylar inside, these inserts created too much swelling as the book was closed, which added pressure on the spine, popping the repairs open. Although undesirable, this demonstrated that the initial leather rating was correct, as the original leather did not split further and retained its internal strength, whereas the new repair was the first to fail, leaving the original material undamaged. Nevertheless, this incident was a reminder of the fragility of the binding and the limits to which it could be subjected to stress when opened. By reapplying the repair in the same way, but with the joint under slightly less tension, a greater degree of movement was achieved for the spine when opening the book.

The original binding style was a tight back, and over time, small voids developed where the leather had separated from the backs of the sections in the spaces between the raised bands. To address this, approximately 4 mL of Lascaux 498 HV was injected by syringe into these areas and then bandages were wrapped around the book and left under tension overnight to set.

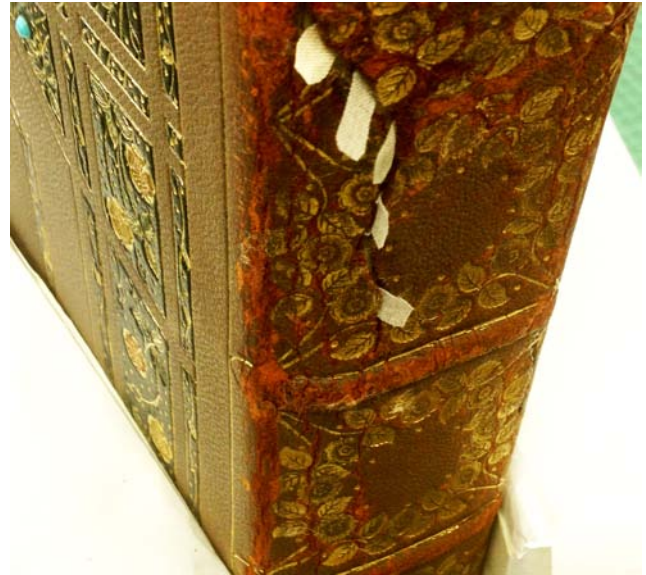


Fig. 12. Inserting aero linen sutures.

Numerous minor lateral splits remained visible along the spine with hollow spaces or adhesive voids beneath. Small strips of 25 g/m<sup>2</sup> Japanese kozo paper were applied with Lascaux 498 HV and worked into these spaces, then shaped before leaving to dry (fig. 13). Small lengths of toned 5 g/m<sup>2</sup> *Tengu* paper were also applied at a few sites along the joints and endcaps bridging areas of minor splitting. These repairs were later toned using SC7400 tinted with a mix of burnt sienna and burnt umber-light Golden Heavy Body acrylics (Bennett 2018) to reduce the visibility of the repairs on such a highly decorative leather cover. The conservators chose to use the Golden acrylic for toning all of the repairs due to their proven stability within 100 years of gallery lighting conditions.

#### *Repairing the Silk Flyleaf*

Initially, the silk endpapers and detached front corner piece of the shattered silk was carefully cleaned with a soft brush to reduce surface dirt. Further cleaning was not possible due to the brittleness and fragility of the shattered silk. When deciding on the conservation treatment of the silk, the conservators sought advice from in-house textiles conservator Marion Parker.

Being unable to source a similar material, Parker suggested repairing the silk using pre-prepared adhesive film on Stabiltex with 20% 1:1 Lascaux 303-498 HV in deionised water. The Stabiltex was applied as a lining to each of the damaged flyleaves using a heated spatula at 80°C. Those areas where the original silk had been lost were infilled by applying toned paper to the Stabiltex using a heated spatula. The paper used was a 7.3 g/m<sup>2</sup> *Haini Tengucho* tissue toned with Golden Acrylic paints to achieve a suitable color match (figs. 14 and 15).



Fig. 13. Inserting Japanese repair paper infills.

#### CONSERVATION HOUSING

The realigned gilt edges of the text block were gently dry-cleaned again using smoke sponge to remove deposits of surface dirt before the book was rehoused in a cloth-covered,



Fig. 14. Watered silk front flyleaf, before conservation.



Fig. 15. Watered silk front flyleaf, after conservation.

drop-spine box (fig. 16). The specifications of the box included the use of conservation standard adhesives and materials such as an internal lining of 9-mm-thick, chemically inert, Plastazote foam. The lining in the base of the box has a cut-away which allows for a hand to be safely inserted beneath the book. This facilitates easier removal of the album, reducing future damage when handled. Before housing, the box was left open to dry and off-gas to remove any residue volatile compounds created by the combination of construction materials and adhesives used in the boxmaking.

#### CONCLUSIONS

The success of this conservation treatment depended upon two factors: being able to access the broken sewing structure and knowing the condition of the original leather. The conservators



Fig. 16. Housed in drop-back box.





Fig. 17. Realignment of the gauffered edge.

were able to safely access the underside of the spine behind the back folds of the first five sections to perform the sewing repairs in situ. This was achieved by releasing these sections while supporting the front board and allowed the following:

- Extending the sewing slips to reattach the front board
- Attaching guards to the back folds to close gaps in the gutters
- Repairing the sewing in situ while realigning the decorative gauffered edges (fig. 17)

- Attaching reversible barrier layers to the flesh side of the spine leather to realign the torn spine decoration
- Correcting the spine profile to accommodate the dimensions of the spine leather when the book is open and under the most stress.

An understanding of the condition of the original leather at the repair sites informed the choice of different treatment options available to the conservators. Significantly, the FSA indicated that the original leather was sufficiently strong and



Fig. 18. Completed conservation of the leather spine.

meant that a full rebacking of the spine was not necessary. This averted the potential risk of damaging the highly ornate decoration on both the spine and boards during the conservation treatment (fig. 18).

Finally, the use of small structural repairs took into consideration the future handling and significance of this book. The album is housed in a special collection reading room within the Louise Hanson-Dyer Music Library and always handled under the supervision of trained staff using book supports and not subjected to high use, so more robust repairs were not required. Given the significance of this book as a protective and decorative object, the conservators were satisfied that they chose the most ethical approach, conserving the integrity of the original binding by minimising the introduction of new materials, retaining the original decorative elements for the enjoyment of future readers.

#### ACKNOWLEDGMENTS

The project was initiated by Louise Hanson-Dyer librarian Dr. Jen Hill, and the Miegunyah Fund generously provided the funding for this conservation treatment.

The team of conservators who assisted or consulted on this project include Karen Vidler, Peter Mitchelson, Libby Melzer, Marion Parker, Jordi Casasayas, Adele Barbara, Lois Waters, and Danielle Woodward. Editing help was received from Talia Eilon.

#### NOTE

1. Karen Vidler recently developed this framework of treatment actions for the FCA based on her ongoing research into leather deterioration and treatment methods. She passes on this framework in her teaching practice.

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#### SOURCES OF MATERIALS

- Airplane Linen (Unbleached) 200 g/m<sup>2</sup>, Klucel G (Hydroxypropylcellulose), Lascaux Acrylic Adhesives 303 HV and 498 HV, SC7400 Sold as SC6000 (Acrylic Polymer and Wax Emulsion), and Stabiltex
- Talas  
<https://www.talasonline.com>
- Fair Goat Skin (Restoration) Grade II  
J. Hewit & Sons Ltd., UK  
<https://www.hewitonline.com>
- Golden Heavy Body Acrylic Paints  
Golden Artists Colors  
<https://www.goldenpaints.com>

Japanese Repair Papers and Tissues  
Hiromi Paper Inc.  
<https://hiromipaper.com>

Natural Linen Thread (Waxed) 18/3, 40/3  
Ratchford Ltd., UK  
<https://ratchford.co.uk/product-category>

Selladerm Leather Dyes  
Leather Conservation Centre, UK  
<https://www.leatherconservation.org>

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