BIG ISSUES

Forum of UKIC Textile Section

Frontispiece: *The Tobit table carpet as found before conservation. The border along the top of the photograph has been cut and turned so that the figures read the right way up when framed.*

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Forum of UKIC Textile Section[1]

18th April 2005

The Clothworkers' Hall, London

Edited by Flora Nuttgens & Maria Jordan

[1] Now the Textile Group of ICON, the Institute of Conservation

THE INSTITUTE OF CONSERVATION

Foreword

"Big Issues" was a one day forum held by the UKIC Textile Section, now Icon Textile Group, in April 2005 at Clothworkers' Hall London.

The papers presented illustrate the ingenuity and lateral thinking required in tackling the conservation of not only large but also complex objects. Sails, carpets, cloaks, and theatre scenery all provide particular challenges.

Each conservation treatment we carry out is unique and there is always the danger that we forget, or worse, do not acknowledge, how ingenious we had to be to complete the job. Sharing experiences and remembering that one small tip could help a subsequent project is vital in keeping the profession alive and constantly progressing.

I am grateful to all the contributors and to the then UKIC Textile Section committee for their work in organising the event. Special thanks go to Flora Nuttgens and Maria Jordan for their work in compiling and editing these postprints.

Clare Stoughton-Harris
Chair – Icon Textile Group

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Providing Support for the Display of the Bullerswood Carpet

Valerie Blyth
Preventive Conservator
Victoria & Albert Museum
London

1. Introduction

The carpet was designed by William Morris and woven by Morris and Co, Hammersmith around 1889. It is on display in Gallery 125 at the Victoria & Albert Museum.

2. Display restrictions

- Owing to its enormous size, this carpet had only been displayed twice in the eighty years since it was acquired by the museum.
- It posed an enormous challenge to devise a suitable method of display for the British Galleries.
- The intention was to display the carpet vertically in the gallery with only about half of the carpet on display.
- Concerns were raised about the fibre strength and the differential fading of the displayed portion of the carpet.

3. Discussions and Tests

Staff from the Textile Conservation team, exhibition designers and curators met to discuss the restrictions of display and the inherent weakness in the carpet. While the wool yarn which forms the pile is stable and sound, the jute fibre used for the foundation weave is not. In practice, this meant that to display the carpet vertically was not in the object's best interests and the friable nature of the jute meant that stitching a support was out of the question. To resolve these issues meant looking at supporting the displayed portion of the carpet at an angle not the vertical and flat proposal.

4. Friction tests

Friction tests were carried out on suitable under-lays. "Polyester-needles" was rejected in favour of a synthetic polyester needle felt. The degree of slope was determined for the support set at 75 degrees from the horizontal. Three different support shapes were considered.

5. Fading of Dyes

Conservation Science undertook the task of devising a method of testing the fading of the dyes. Small parts of the reverse of the carpet were selected and tested for light fastness. The resulting colour changes were monitored using a UV-VIS-NIR. The reflectance spectra were then used to calculate the colour changes. This showed that the woad blue dye thought to be fugitive was in fact the most light-fast.

In the long term, a compromise may have to be reached on the amount of illumination required to view the carpet and when the carpet needs to be withdrawn from display - certainly within the next ten years.

6. Preparation and Installation

A means of supporting the rolled portion of carpet had also to be devised and consideration given to the materials used. A specially devised roller and cover were made to house to the rolled portion and an easel made to support the exposed section. This complex project involved large numbers of people from different organisations and a great deal of preparation.

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Howell, D. 1998. Unpublished report. Technical report on display issues relating to the Bullerswood carpet. V&A.

Pretzel, B. 2000. Determining the Lightfastness of the Bullerswood Carpet, Tradition and Innovation: Advances in Conservation, *Melbourne Congress Oct. 2000.*

Borley Brothers, General Engineering, 6 & 9 Church Rd, Teversham, Cambridge CB1 5AW.

Fig.1 Bullerswood Carpet

Fig.2 Bullerswood Carpet during installation

Fig.3 Carpet in Gallery 125 at V & A

A Journey with Tobias and the Angel

Ksynia Marko
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The National Trust

1. Introduction

Hardwick Hall, Derbyshire is renowned for its collection of sixteenth and seventeenth-century embroideries and needlework. Amongst these is a large needlework table carpet dated 1579, commissioned and made for Elizabeth Talbot, Countess of Shrewsbury. At that time the New Hall at Hardwick had not been built and the table carpet was probably made to furnish Bess's house at Chatsworth. The carpet is not recorded in the 1601 Hardwick inventory, but has subsequently found its home there. The borders depict a favourite story of Bess's, that of Tobit and his son Tobias and the Angel.

If we imagine this cloth covering a table, the sequence of the story would have been viewed as you walked around the table from one side to the other. The coat of arms of Talbot impaling Hardwick, for Bess and her 4th husband the Earl of Shrewsbury, is placed, as it were, in the centre of the table. The arms are flanked on either side by scrolling vines and cucumbers, animals, birds and insects. For what special occasion this carpet was made is not known, but records show that Bess imported a great deal of dyed silk from France for the purpose and metal threads were used to highlight the heraldry.

2. The Start of the Journey

In 1987 I saw the needlework for the first time, displayed in a glazed frame in a room not open to the public off Bess's bed chamber (see Frontispiece). It was evident that the carpet had had a chequered history, borne out by its condition at the start of conservation. One of the long borders had been detached, turned around and reattached in order that the images portrayed could be viewed the right way up in the frame. Several holes had been patched and there were a great many old repairs, evidence of water staining, mould growth and dust ingress. The overall colour was yellow and the linen was discoloured by cellulose degradation. Light damage was significant, but the cochineal pink of Tobit's stockings was still vivid. Plans were made to include the carpet in the new exhibition rooms at Hardwick and in December 1987, with the help of the Hardwick stonemasons and John Hartley, Furniture Conservator, it was removed for conservation. The frame itself had a plywood backing indicating that it could not have been more than fifty years old. A hand written label attached to a border fragment which had been held at the Victoria & Albert Museum says, 'Fragment from the Tobit tablecloth now framed in my sitting room,' signed, 'Evelyn Devonshire 1946'. Following the death of her husband, the ninth Duke of Devonshire, in 1938, Duchess Evelyn lived at Hardwick continuously, actively undertaking maintenance and repairs and her hand can be seen on many of the textiles.

My original estimate was for 931 hours work with the final cost to be assessed after cleaning. This assumed the retention of the majority of old repairs, the more obvious patches being presumed to have come from missing end borders, but these were subsequently identified, having been removed, possibly by Duchess Evelyn, and displayed elsewhere in the house. The end borders depict youth and age or innocence and wisdom, both relating to the story of Tobit. Classical vases of fruits and flowers and the implements of the painter and the embroiderer, whose combined skills produced this object, are also illustrated. These end borders were in a worse condition than the main piece.

Once in the studio, the two layers of lining on the reverse could be examined. It appeared that both these linings had been in place when the embroidery was altered for framing. The outer was of white cotton and tests showed that the inner lining, possibly original, was of starched and dyed linen, the dye being turmeric. The yellow dye had faded out where the silk floss was missing. Many repairs were worked through to one or both linings, so at first much of each lining was removed by cutting around the repairs. This exposed the numerous patched repairs that had been made using pieces of embroidery apparently slipped in beneath the linings. Some of these patches were also on the front face of the embroidery and small ones had been caught onto the back of the lining by mistake. Following consultation it was agreed that all the patches should be documented and removed, amounting to 305 in total. The conservation turned into an archaeological dig as more evidence of it condition and production was uncovered.

3. The Needlework

The needlework carpet on completion of conservation measures some 7 × 2.25m (22ft 9ins × 7ft 4½ins) and is worked in tent stitch in silk floss on an open-weave linen. The exact length of the original carpet is not known, but could not have been smaller and was an enormous undertaking for the household. Not only is its great size unique but the technique of canvas work, as we know it today, was relatively new in England, as is discussed in the forthcoming catalogue on the Hardwick embroideries by Santina Levey. The design was first drawn out onto the linen, evident beneath the areas where the silk floss has worn away. The linen was then cut into six main pieces to make it easier to handle, the pieces being joined together afterwards. The loom width of the linen was the width of the carpet as seen in the uncut end borders. The fabric used up by the subsequent seams between the long borders and the central section was made up with a narrow infill border being added between these sections.

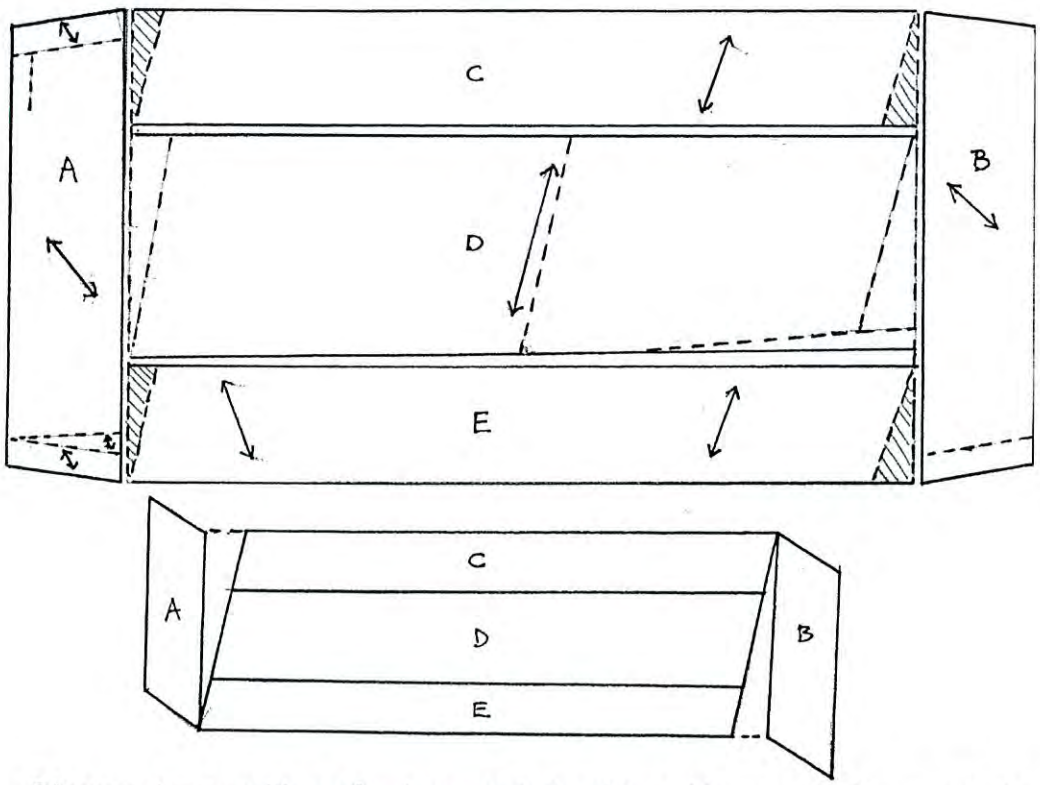

Diagram shows positions of main seams in the object with areas of adjustment to the parallelogram shape of each piece. The shaded areas are presumed, but unknown.

The embroidery would have been worked starting from the narrow end of each piece of linen, probably on a frame. The outlines of the design were worked first in dark brown silks and the colours filled in afterwards. It is evident on close examination of the reverse side that this is amateur work, the tent stitches are not regular and in some places changes direction haphazardly. A more skilled hand would have carried out the metal thread embroidery and the subtle shading of the dog and stag. It became apparent during the conservation that the pieces had never been straightened or blocked out on completion and so the embroidery would have been distorted into a parallelogram, a common result with this type of needlework. In order to make it sit properly on the table measures were taken to correct its shape; wedge shaped areas were either cut out or new pieces added. None of this was exact and the straightness of the grain did not matter. It was the final appearance that was important, or was there a rush at the end to get it finished? All these 'distortions' and eccentricities had to be accommodated during conservation.

4. Wet Cleaning

On removal of the linings the condition of some of the silk and the various shades of colour on the reverse became visible. The large areas of bare canvas on the front, where light damage had caused disintegration of the silk, proved to hold remains of undyed or pale cream silk on the reverse. This was particularly true of the coat of arms. In other areas it was evident that certain dye stuffs had actually protected the silk, i.e. brazilwood and indigotin. Thirty thread samples were collected for analysis which was carried out by George Taylor of Textile Research, York Archaeological Trust. The reds were all generally based on brazilwood, with a small amount of bright pink silk being dyed with cochineal, probably imported from America. Oranges were brazilwood and fustic. The blue and green shades were dyed with indigotin and weld and some blues with lichen purple. The black thread was based on tannin with an iron mordant. The yellows were all dyed with weld and the general mordant used was found to be alum. A repair thread was identified as indigo carmine, first produced in 1740, so it is likely that some of the earlier repairs were undertaken in the later eighteenth or early nineteenth century.

Tests were made for wet-cleaning to see if the overall yellowness could be improved. Whilst there was some staining observed during tests, this was not considered significant and some of the fragments were first successfully wet-cleaned without incident. Not so one of the long borders: on the morning after wet-cleaning, the piece was still damp and the black dye had run from the yarn used to outline the design. Much of this yarn is hidden as it crosses from one area to another and this had caused shadows so that the colours looked smudged. Through tears, Anne Amos and I re-wetted the embroidery in the hope of removing some of the staining and I struggled for a while with a stain around the head of Tobias, only to find on the reverse that he was wearing his hat! Some small improvement was made but it became evident that the embroidery could not be wet for longer than three hours. I enlisted the help of Hampton Court who had installed a large vacuum table and after exhaustive testing using wet linen, altering the strength of the suction and covering with various fabrics to keep airborne dust from being pulled back into the object, all subsequent washing was carried out there, enabling both the washing and drying to be completed in the optimum time. Colours on the front were revealed, although much faded. Worn and loose silk, though invisible on the front, remained as evidence on the reverse and the fabric became less brittle to handle.

5. Conservation Stitching

The whole carpet was conserved by supporting it onto dyed linen scrim. After experiments with various threads and stitching techniques, a fine dyed Egyptian cotton was used for laid couching. The warp of the object was aligned with the warp of the support fabric whilst the weft lay at an angle, thus

accommodating its distortion. The couching was worked along the warp grain. The fabric was kept slack in the frame to accommodate the stitching tension and to avoid any bulky build-up of excess fabric on the reverse. Working with a frame also allowed the majority of the detailed work to progress faster than working on a flat surface, due to the three-dimensional nature of the original needlework. Excess linen was allowed at either end of each piece so that the cut fragments might be re-assembled once the central sections were complete. Again after research and consultation, it was decided to try to reconstruct the full size of the carpet. This size was largely dictated by the number of scenes depicting the story of Tobit and the distance between each scene dictated by the existing layout of the extant six scenes. These six scenes turned to ten, back to eight and to ten again as more fragments were identified. It came about that the design source for the scenes had already been discovered by John Nevinson and a fruitful search at the British Museum Library and Print Department revealed a series of ten engravings (1556) after Maarten van Heemskerk (Martinus Hemskerck). These provided the pattern for the borders, the embroidery being as faithful a copy of the engravings as the medium allows. However, there remains as yet no known design source for the missing areas of cucumbers and grapes. These had to be reconstructed from evidence found within the pieces themselves and the understanding of its construction.

6. The Story of Tobit

The story of Tobit can be found in the Apocrypha. It is a story of faith, love, kindness and trust. (Scene 1, *ch2 v7-10*) Tobit hears that a man has been murdered and has been left without burial. He goes out himself to dig the grave and bury the man. When he arrives home he does not enter the house because he is unclean and goes to sleep outside. As he lays down bird droppings fall on his eyes and cause him to go blind. (Scene 2, *ch2 v11 - ch3 v1*) Tobit can no longer work to keep his family, so his wife Anna has to take on cleaning and laundry work. One day she arrives home with a goat given to her by her employer. Tobit hears it bleating and accuses her of stealing it. Anna is upset and once Tobit realises his mistake he is ashamed and prays for forgiveness. (Scene 3, *ch4 v20 - ch5 v22*) He decides to send his son Tobias on a journey to collect money that is owed to him. Tobit insists that Tobias finds a travelling companion who turns out to be Raphael in disguise.

(Scene 4, *ch6 v1-8*) Scene 4 shows Raphael's and Tobias' journey. Tobias is washing in a river and a giant fish jumps out of the water. Raphael tells him to catch it and cut out the heart, liver and gall bladder. Tobias doesn't know that Raphael is an angel but, when Raphael explains that when the heart and liver are cooked the smoke will drive away evil spirits and the gall bladder will cure a blind man if placed on his eyes, he deems him wise enough to follow his advice. (Scene 5, *ch7 v1-8*) They soon arrive at a distant relative's house where Raguel, Edna and their daughter Sarah greet them. (Scene 6, *ch7 v10 -15*) Eventually Sarah and Tobias fall in love and are betrothed, but he learns that she is cursed. Seven of her former husbands have died on their wedding night. (Scene 7, *ch8 1-10*) Raphael tells him not to be afraid but to put the heart and liver of the fish onto the fire. The devil, hating the smell, flees away up the chimney and Tobias and Sarah pray to God for their deliverance. They stay with Sarah's parents until Tobias decides he must fulfil the errand for his father and return home. (Scene 8, *ch10 v 8 -12*) They take their leave and travel back with Raphael. (Scene 9, *ch11 v1 - 9*) Tobias and Raphael go on ahead and Tobit comes out to greet them. Tobias, under the direction of Raphael, places the fish gall on his father's eyes, miraculously restoring his sight. (Scene 10, *ch11 v10 - ch12 v22*) In the final scene the family rejoices at their good fortune, recognising Raphael for who he is and Raphael, no longer needed, leaves them.

7. Reconstruction

In order to find the correct placement of the embroidery fragments the engravings were photocopied and enlarged to the right scale and used as a pattern. The oval border surrounding the individual scenes was traced from an existing one and the outline worked in a running stitch onto the linen support where the missing scenes should be. Scenes 1, 5, 6 and 10 have been reconstructed and to help with interpretation some of the missing figures have been painted onto a separate piece of linen which can be removed if necessary.

Whilst there remain large missing areas, it has been possible to place all but a dozen or so small fragments. Those that could not be placed have been kept with the object, held on the side of the support linen under net so that they can be easily removed if further fragments are found in the future. The hours spent on putting the puzzle together have not been counted but sometimes only one or two pieces were placed after a whole day of looking. Often they were placed, stitched, unstitched and repositioned as pieces came together. This part of the work was both exhilarating and frustrating and even now, as the carpet is waiting to go back on display, I know that there are pieces I want to move.

The long borders were oversewn to the main central section, but the two end borders were kept separate so that they could be simply laid in position on the display platform. In this way the exact original length of the carpet remains stated as unknown and changes can be made in the future. These borders can be removed and displayed separately again if necessary.

8. Lighting

Whilst the plan had been to line the table carpet with yellow dyed linen to emulate the original, which looked extremely good under studio lighting, it was not complimentary to the dyed linen scrim support when viewed under display lighting conditions. Because the scrim is an open weave, the colour of the lining could be seen through it and a grey-green colour proved to be the best choice. A lighting test rig was erected at the studio. It consisted of a sheet of iron-free white glass held within a metal frame with a light box above projecting over a section of the carpet. Lighting was supplied from two sources, tungsten halogen dichroics placed at the perimeter and 'daylight' flourescents in the main body of the light box. The former provided warm directional light and the latter cool ambient illumination. Both sources have high-quality colour rendering and were selected to test both optimal colour appearance and the carpet's legibility as a three-dimensional object. The overall intensity could also be adjusted to the lowest possible levels. It was agreed that the lighting that seemed to suit the carpet best was an equal mixture of the two different colour temperatures with a combined light level of around 40lux. This exercise also showed us that the thread we had used to outline the edges of the reconstructed scenes visually disappeared under the display lighting and had to be replaced by something darker and more substantial so that it would read. This saved a great deal of time as this work had only just started.

9. The Display Platform

The shaped display platform was designed to allow the carpet to have the appearance of being on a table with the borders set at an angle of 20 degrees, allowing the public to see the borders and to follow the story of Tobit. It is made from sections of anodised aluminium, which simply slot together and sit on a base within the glazed case. The stand was erected at the studio so that it could be prepared with a covering of cotton bench cloth covered in dyed linen. The carpet was placed on top and its position marked so that it can be easily unrolled onto the platform once it is in the case, without having to make too many adjustments on site. Finally the carpet was photographed, rolled and packed for transport to Hardwick where it is now due to be installed in the summer of 2005.

10. The Journey Continues

What do we understand from our interference in the private life of this object, from the unpicking and the piecing back together? It was a challenge beyond methodology and technicality that became a love affair. The fact that a skilled craftsman was commissioned to create and draw the design for members of the household to work revealed itself slowly, as did the way it was made, the variety of skills of those who worked on it and the attempts they made to correct mistakes. Throughout its 400-year life, others have also loved it and done their best to 'protect it from all manner of wet, moth and other hurt…', as Bess had requested in her will. Evidence of use in the form of candle wax has been retained to satisfy our need for contact across time with those who admired and used it. I learnt that you need a long time to look at an object before you see everything, and even then there are things it cannot tell you, like why it was made. What we do know however is that it was made under the direction and for the purposes of a rich and ambitious lady. The confident design encapsulates a celebration, a generosity of spirit in the way the branches grow and meander out from either side of the coat of arms, gathering up amidst the leaves, grapes and cucumbers an abundance of animal and insect life. The arms at the centre of this universe are themselves a powerful statement of who this lady was and the status to which she had risen. The story of Tobit with its trials and 'happy ever after' ending was much appreciated at the time, but we have almost forgotten the hidden meaning of such imagery and need help to relate it to its time and place. In contrast we can respond directly to the images of nature depicted, both real and fantastical, in our attempts to identify a fruit or flower, spot the caterpillars, dragon flies, count the snakes, birds and bees and revel in the delight of recognising the artist's palette and embroiderer's tools, these last telling their own story, their presence a bonus, their equality a challenge. This object has given up some of its secrets and allowed us to imagine the length of table it once covered, marvel at the imported coloured silks in subtle shadings and metal thread, all brilliant in the candle light, with the figures of Tobias and the angel on their never ending journey round the table. The representative faces of youth and age, of spring, winter, summer and autumn remind us of the circle of nature, the passing of time, of immortality. Whose hand plied the scissors that reduced this cloth so brutally, and where are all the still missing pieces? I envy those in the future who may find them hidden behind some other embroidery waiting to reveal its own secrets.

Postscript

The Tobit Table Carpet is now on display at Hardwick Hall. Interpretation material is available in the form of a touch screen and audio guide.

Acknowledgements

I began my journey with this table carpet nearly seventeen years ago when I was working in London. It has travelled with me to Norfolk and back and forth to London, its treatment being undertaken in no less than four studios. This year it returned to Hardwick. I would like to thank all the people who have helped me with this project over the years: they have prevented me from getting obsessive and possessive about it, for at one point I couldn't bear the idea of anyone else doing the work. To Anne Amos, Frances Hartog, Lindsay Blackmore, Lisa Dawson, Melanie Leach, Anna Todd, Eleanor Phelps and all the others, a special thank-you for all the hours they have contributed and to Jane Mathews, then the Trust's Textile Conservation Adviser, who worked with me through the initial stitch tests and for her support through the emotional trial of the wet cleaning. Thank you also to Jenny Band who made it possible to use equipment at Hampton Court Palace. The project has also involved three curators, John Chesshyre, who first entrusted me with the work but sadly was not able to see it finished, Simon Murray, who worried about its size, and Andrew Barber, who has seen it through to the end. To English

Heritage and The National Trust for funding such an open-ended project, taking in the end over 4,500 hours to complete, five times the initial estimate, work being carried out as funds became available. A final special thank-you to Santina Levey, whose love and depth of knowledge about textiles has continued to be an inspiration and has enabled a greater understanding of this object and the whole of Hardwick's collection.

Suppliers

Linen scrim
F.R.Street Ltd.
Frederick House
Frederick Way
Wickford Business Park
Wickford, Essex SS11 8YB

Egyptian Cotton Lacemaking thread 120/2 (dyed in the studio to various shades of sludge brown)
Tim Parker
124 Corhampton Road,
Bournemouth
Dorset BH6 5NZ

Solophenyl Dyes used to dye linen support and cotton sewing thread
Ciba Geigy

Linen lining and cover for display platform – Cashel, sage green 8088
Spence Bryson Linens
245 Castlewellan
Bambridge
Co Down
Northern Ireland BT32 3SG

Cotton bench cloth 640gsm for display platform
Hainsworth Textiles
Spring Valley Mills
Stanningley
Pudsey, West Yorkshire LS28 6DW

Display case design
Rodney Melville & Partners Architects
10 Euston Place
Leamington Spa,
Warwickshire CV32 4LJ

Display case and platform manufacture
Click Display Systems Ltd
1A Goodsons Mews
Wellington Street
Thame, Oxfordshire OX9 3BX

Lighting Consultant
Cannon-Brookes Lighting and Design
10 Brooksville Avenue
London NW6 6TG

Fig 1. One of ten engravings illustrating the story of Tobit, Scene 3

Fig 3. Photocopies of the engravings used to help reconstruct missing scenes and place the fragments

Fig 2. Scene 3 as depicted in the embroidery

Fig 4. Preparing the display platform in the studio before final assembly at Hardwick

A Medieval Bishop's Travelling Cloak

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The British Museum

1.1 Introduction

The voluminous cloak, which belonged to Timotheos, a fourteenth-century Nubian bishop, presented a number of challenges during conservation (Fig. 1). Much of the treatment of this large and unwieldy garment was guided and influenced by its size and three-dimensional structure, combined with the fragile and fragmentary nature of its original textile components. A brief overview will be given of the cloak's history, description and condition, including an earlier restoration. The current conservation treatment, developed through discussions of appropriate treatment options and difficulties surrounding interpretation, will then be described, with particular reference to challenges caused by the conservation of such a large object.

1.2 Historical Background

The undisturbed burial of Bishop Timotheos was discovered in 1964 during excavations carried out by the Egypt Exploration Society (Plumley 1977:3). The site of the burial was located in a stairway of the Cathedral Church at Qasr Ibrim, Egypt, a fortress city of considerable importance in Christian Nubia. The body, which lay on a thick deposit of soft earth, was fully clothed and the organic remains were remarkably well preserved. Underneath the body were two rolled paper scrolls. These were found to be letters, each measuring nearly five metres long, from the Patriarch of the Coptic Church for the enthronement of Bishop Timotheos with the date of his consecration, AD 1372. Although these scrolls provide convincing evidence of the identity of the body, there are some puzzling aspects to the burial. Bishop Timotheos was found to have one foot missing, suggesting a sudden, possibly violent death. Furthermore, he was not buried in the vestments normally used for the interment of a bishop, suggesting that the burial may have been carried out in haste.

Other textiles in which the bishop was buried, now also at The British Museum, included a cotton shroud wrapped around the body. He was clothed in a long white tunic with sleeves that had been gathered at the waist with a leather belt. Under this were trousers with a drawstring, over a textile belt wrapped around the bishop's waist. A blue cotton veil had been wrapped around the head and over the face and a fine blue and white linen handkerchief had been tucked in at the neck. The relative completeness of these garments helps to provide information on the cutting and tailoring methods of more everyday medieval ecclesiastical clothing, as opposed to finer robes and vestments which have survived in greater numbers.

2.1 The Cloak - Description

The cloak itself is conical or bell-shaped, slightly longer at the back, with an opening for the hood. The hood is square in shape with a triangular gusset at the throat opening. It was possibly a garment that was designed for comfort and protection from heat and cold when travelling (Crowfoot 1977:51). Originally, when worn, its appearance would have been colourful and impressive. In her article "The Clothing of a Nubian Bishop", Elisabeth Crowfoot writes: "the deep blue of the cloak, falling on the ground behind, would have had to be looped over the Bishop's arms when he walked, showing the blue-edged red lining and the white tunic beneath" (Crowfoot 1977:51).

The deep blue outer fabric is a finely woven wool, dyed with indigo and the brown-coloured lining is a cotton fabric that may originally have been a rich cherry red colour, as it was dyed with madder (Crowfoot 1977:46). Across the back of the cloak there is a woven silk tapestry panel in white, gold, black and pale blue, forming repeated rows of patterning. Just inside the hood and around the inside edge of the hem are the remains of a pale blue silk facing strip, cut on the bias, six centimetres deep. From the top of the hood to the hem, the cloak measures 222 centimetres and it is 165 centimetres wide.

2.2 The Cloak's Condition

When received in the Organic Artefacts Conservation Studio at The British Museum, the cloak was in an extremely fragmentary and vulnerable condition. This was partly due to decomposition fluids and environmental conditions, including possible insect activity in burial, which meant that only small fragments of the blue wool outer fabric had survived. The remaining lining fragments varied in condition but many were very brittle with ingrained soiling and staining. The woven tapestry panel was almost complete but fragile and much of the blue silk facing strip had also survived. The cloak's poor condition had undoubtedly been made worse by its size, which had subsequently led to its being folded in storage and had made handling and movement difficult.

In the late 1960s, the cloak had undergone extensive restoration work at the University Museum of Archaeology and Ethnology in Cambridge. At that time, the surviving fragments had been supported on a brown cotton fabric that, in effect, recreated the original piecing and shape of the lining of the cloak. In order to attach the fragments to this fabric, they had been adhered to an adhesive-coated, coarse nylon net. The net had been trimmed to follow the outer contours of the fragments, leaving a margin of approximately one centimetre. The net was then tacked with large stitches to the cotton support fabric, so that the textile fragments were attached by adhesive alone to the uppermost surface of the net. Therefore the surface of the lining that would have been in contact with the outer fabric and would never originally have been seen became the most visually prominent; the inside surface of the lining that would have been visible when worn was completely obscured because it was attached to the support fabric. The reverse sides of the seams in the original lining were therefore also made visible by the restoration treatment.

On examination, there were found to be some positive aspects to this earlier treatment, principally that the fragments had been carefully positioned in relation to one another and the support fabric fairly accurately pieced. However, the cotton support was not considered to be an appropriate colour or fabric quality and had become creased and discoloured. Most problematic was the aged adhesive-coated net that had become inflexible and brittle, so that in some places it was sticking to itself and in others it had failed completely so that pieces of original textile were becoming detached. It was evident that the adhesive had been very unevenly applied and many fragments were spotted with dark staining, particularly obvious on the blue silk facing strips. This adhesive was identified by James Parker, of the Museum's Department of Conservation Research and Analytical Chemistry, as a poly(vinyl) acetate thermoplastic adhesive (Parker 2001, Parker 2001).

3. Treatment Options

Due to the large overall size of the cloak and its fragmentary condition, removal from the 1960s support and separation of the fragment groups to mount them on individual supports was considered. However, despite the cloak's size and condition curators had hoped that, after conservation, the cloak would be put on temporary display with the other related textiles. Although these plans for display were later

changed, the decision was made to retain the cloak in its complete state and to prepare it for accessible storage and possible display in the future on a suitable mount.

Due to the large size of the cloak it was felt that any conservation treatment undertaken had to allow for inevitable future handling. In order to minimise handling, a mount which would allow the cloak to be opened out as far as possible and would be suitable for both storage and display, was considered. However, if the cloak were to be mounted for viewing from either front and back whilst on display, problems would be caused during storage by the extra bulk created by support and padding of the hood. Overall, size was a major problem, particularly as there were no storage areas in The British Museum at that time that could accommodate the cloak as envisaged in this proposal. The decision was therefore taken to keep the cloak whole, but to prepare it for flat storage, using as little space as possible and padding it out where necessary. A suitable mount or support could be made separately for display in the future, as necessary. Plans were made to purchase a new storage unit to hold all the related textiles.

4. Visual Interpretation and Understanding

Much discussion was involved in deciding how conservation might aid interpretation and visual understanding of the cloak, as it was felt that its appearance before conservation was extremely confusing. These discussions focused on how best to provide support for the cloak and in what way dyed support fabrics might make its appearance easier to understand.

In order to suggest more closely the cloak's original appearance, one possibility was to use a deep blue support fabric inserted between the remaining outer fabric and tapestry panel above and the lining fabrics below. However, it was decided that this would not be practical or help visual interpretation, due to the small number of fragments which now constitute the outer layers of the cloak, as opposed to the greater number and visual predominance of the brown-coloured lining fragments, which would then be largely obscured inside the blue support fabric. Instead, a more sympathetic brown-coloured support fabric than had previously been used was chosen. A transparent blue overlay fabric to match the colour of the remaining fragments of blue outer fabric was also discussed, but it was felt that this would not improve visual understanding of the cloak, as the brown lining fragments would then be obscured. Instead, a nylon net, dyed brown, was chosen as an overlay fabric. This would allow the remaining fragments to be seen as clearly as possible, whilst giving them the protection they required. It was felt that the best way to convey the original appearance of the cloak appropriately and effectively would be through the use of a replica or virtual reconstruction.

The proposed treatment therefore involved removal of the fragments from their 1960s support fabrics. These included five large fragment groups and forty dissociated pieces. Then, where possible, it was planned to remove the adhesive residues and staining. Finally, the pieces would be supported on a new dyed fabric with a transparent brown nylon net overlay. Although, as with the 1960s restoration, the surface of the lining which would originally have been visible when worn would be obscured, it was hoped that the more sympathetically coloured support fabrics would allow the original fragments to be more clearly interpreted and understood and they would benefit by being much more securely and safely supported.

5. Planning and Documentation

The process of complete dismantling and reassembly of the cloak required detailed planning with thorough documentation of all stages of the treatment. The need to retain the positioning of the many different fragments which, once detached from their support, would be even more vulnerable, was a particular concern. Additionally, a long-running and complicated project such as this was likely to

involve a number of people coming in at different stages, and it was important that the methodology could be easily interpreted and continued as necessary.

As treatment progressed, the practical benefits of thorough documentation became clear. Firstly, a seam line in the 1960s support fabric, on which there were no original fragments, was cut and the cloak opened up so that it lay flat and fully extended, at which point it measured over 3.5 metres long. A full-sized Melinex™ (clear polyester sheet) map was made by tracing around the contours of the fragments to show their exact positioning and the five large fragment groups were all carefully labelled. The map and the cloak were then turned over and the 1960s support fabric peeled away from the adhesive-coated net by gradually cutting the large tacking stitches (Fig. 2).

The fragments, which in some places were stuck very firmly, were then removed from the net. A 50:50 mixture of IMS (Industrial Methylated Spirits, ethanol / methanol): acetone was found to be effective in swelling and softening the adhesive. However, on larger fragments the technique of swabbing the fragments and gradually releasing the net was time-consuming and impractical and so, through testing, a poultice treatment was developed. A Sepiolite (magnesium silicate clay) poultice made up with 50:50 IMS:acetone was applied over a double interlayer of Bondina H3228 (non-woven polyester). The poultice was covered with polythene and left for approximately one hour before it was removed and the solvent allowed to evaporate for one hour. This allowed sufficient time for the solvent to solubilise the adhesive and the action of the evaporating solvent to draw it away from the textile and into the Bondina. This process was repeated a second time where necessary. In terms of time taken, this treatment was found to be efficient as well as effective, as the staining was slightly reduced, the imprint of the net became less visible and the fragments more flexible. This work was carried out in a fully vented fume extraction room, following appropriate health and safety guidelines.

To prepare the new support, cotton calico was dyed to an appropriate colour and was carefully pieced and stitched together. The seams in the support fabric were turned to the reverse rather than the obverse face so that they could not be seen, unlike the 1960s restoration. The fragments were then repositioned one by one on the support fabric using the Melinex™ map and seam lines as guides. The dyed nylon net overlay was positioned over the top with seams to match the support fabric and stitched into place along the seams and around the outer edges of the fragments. Support lines were only stitched through the original textile itself in the area of the tapestry-woven panel, as this required additional support. The nylon net was extended to the curved outer hem of the cloak, turned under and stitched. The brown cotton support fabric was cut to extend 7cm out from the curved hem of the cloak, to allow a handling edge (Fig. 3).

6. Handling and Movement

At all stages of the treatment, handling the cloak required particular care as well as advanced planning, and often a number of people were needed to move or turn the cloak over. Once all the fragments had been supported on the main piece of support fabric, the cloak could be returned to its original three-dimensional form. To do this, the equivalent seam line, which had been opened at the start of treatment so that the cloak could lie flat, was rejoined. The cloak had to be turned so that it lay face-down and folded in on itself. It was very difficult while the cloak was opened out flat to visualize how re-forming the three-dimensional shape and hood would work in practice. The use of a small replica was found to be invaluable in planning for this.

Conservation of the hood itself proved to be extremely complex, made more so by the fact that only one half could be worked on at a time before the entire textile had to be turned over. Even though the support treatment on the hood was carefully planned, the textile had to be turned over a number of

times to check the positioning and stitching, which could only be carried out in a carefully pre-planned order.

As the blue facing strip which was attached around the inside edge of the hood was still joined in one piece, it was clear that the hood would need to be attached in the round. However, due to the related textiles' fragmentary state, a temporary support had to be provided so that the fragments could be handled safely when positioning them on the new support fabric. A temporary facing was applied to the hood fragments that consisted of strips of un-dyed silk crepeline coated with 5% Klucel G (hydroxypropyl cellulose) in distilled water. The strips were positioned so that they could later be removed in a logical order. A gusset was cut and stitched into place on the support fabric and the hood was lifted into position, so that the fragments corresponded to the sides of the hood and the gusset support. The crepeline facing strips were then removed systematically, using IMS to release the adhesive. At the same time, the net overlay fabric was gradually rolled over the fragments and stitched in position. The edges of the hood support fabric were hemmed to correspond with the actual edges of the hood (Fig. 4).

7. Preparation for storage

Finally, the cloak was prepared for storage. Shaped pads were made to open out the hood and gusset. Rollers padded with Polyfelt (non-woven polyester) were made to open out the folded sides.

The additional forty dissociated fragments which could not be relocated in their original positions were supported as appropriate, using a combination of Melinex sleeves and card frames with Melinex windows, and placed in boxes for storage.

A large storage drawer has now been purchased to house all the related textiles (195cm wide × 140cm long × 20cm deep). Despite its large dimensions, it is still not quite long enough and the bottom and side edges of the cloak have had to be folded over.

8. Conclusion

The conservation of Bishop Timotheos's cloak was an exciting opportunity to be involved in the treatment of a large, three-dimensional, archaeological textile. Initially, mainly due to the cloak's large size and poor condition, much time was spent discussing issues surrounding visual interpretation and treatment options. During conservation, it was found that the large dimensions influenced treatment decisions and techniques in many different ways and good forward planning to avoid unnecessary handling and thorough documentation were found to be extremely important.

Acknowledgements

Amongst staff at The British Museum, the authors would like to thank James Parker, Conservation Research and Analytical Chemistry, Trevor Springett, Photographer, and members of the Organic Artefacts Conservation Section who helped at different stages of conservation. Also Mika Takami, Conservation Intern at the Textile Conservation Centre, University of Southampton, for her report on the cloak, and Yu Chin Su, Conservation Intern at the Institute of Archaeology, University of London. They would also like to thank Elisabeth Crowfoot for information provided by her and staff at the Textile Conservation Centre, University of Southampton and Abegg Stiftung, Switzerland, for their helpful discussions.

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Crowfoot, E. G. 1977. The Clothing of a Fourteenth-Century Nubian Bishop. In: V. Gervers, ed. *Studies in Textile History*. Royal Ontario Museum, Toronto, Canada, p 43.

Suppliers

Melinex™ & Polyfelt
Preservation Equipment Ltd, Vinces Road,
Diss, Norfolk, IP22 4HQ (tel. 01379 647400)

Bondina H3228 (30g) & Klucel G (hydroxypropyl cellulose)
Conservation Resources, Units 1, 2 & 4,
Pony Road, Horspath Industrial Estate,
Cowley, Oxon OX4 2RD (01865 747755)

Silk Crepeline
Paul L G Dulac & Co,
24 Ave. Joannes Musset, CP 718, 69256, Lyons,
Cedex 09, France (fax. 0033 472 5305 67)

Sepiolite (100 mesh)
Insta Business Services, AJ Lopez Co Ltd,
Unit 16, Riverside Business Park, Lyon Road,
Merton, SW19 2RL (tel. 0208 544 9980)

Fig 1. Cloak before conservation

Fig 2. The 1960s support fabric peeled away from the adhesive-coated net

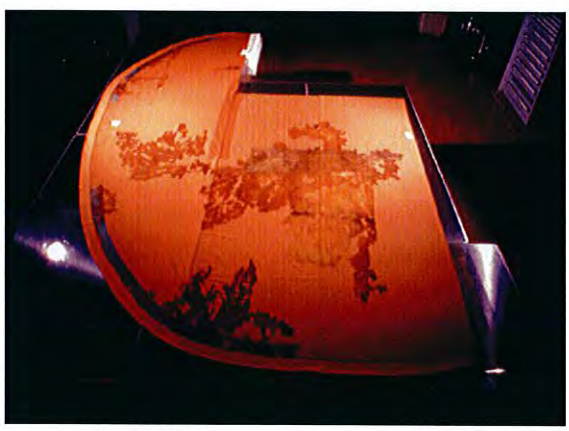

Fig 3. Cloak on new support fabric

Fig 4. The cloak hood where the support fabric and actual edges of the hood correspond

"GO THOU AND DO LIKEWISE"? THE CONSERVATION OF THE EBRINGTON FRIENDLY SOCIETY BANNER

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1.1 Introduction

This paper recounts the history, significance, survival, conservation and display of a rare banner from Ebrington in Gloucestershire, England.

1.2 History of the Banner

The village of Ebrington has a population even today of only 564, approximately the same as a century ago, despite changes in economy and inhabitants. Yet in 1877 the Ebrington Friendly Society took possession of a most unusual painted banner. This is an account of how, since its re-discovery in the 1970s, the banner was conserved and eventually displayed.

In the United Kingdom, painted banners have played a unique role in the history of the labour and trade union movements (Gorman 1985; Gorman 1986). They were used to proclaim a sense of community, identity and visions of a better life and were unfurled on occasions such as May Day marches, miners' galas, picket lines, lock-ins and even at union members' funerals. However, their ownership was not confined to industrial labour movements; rural "Friendly Societies", voluntary associations concerned with self-help against the trials and tribulations of life, also commissioned such banners. As a result, there are few local and social history museums across the UK without a painted banner in their collections.

Despite this widespread use of banners, their manufacture was dominated by one company - George Tutill of 83 City Rd London. Tutill banners have common characteristics (and conservation problems) which are recounted in greater detail elsewhere including this volume (Gorman 1986; Lochhead 1995; Lennard and Lochhead 2003). Most are made of brightly coloured silk, painted on both sides using a special patented formula. They are usually designed as a square to be carried by at least two men employing special harnesses, assisted by others restraining the billowing banner with tapes at the lower corners. The available painted designs, advertised in illustrated catalogues, largely conformed to iconography portraying images of organised labour and self-help, such as the tale of the Good Samaritan, "clasped hands", visiting the sick, support of widows and orphans, or heroes of the labour movement.

The banner purchased from Tuthill by the Ebrington Friendly Society is typical in many aspects. It is made of bright royal blue silk, edged with a deep red cotton fringing. Each side is dominated by a painted roundel, one (the primary) depicting the Good Samaritan (Luke 10:30-37) and the other (the secondary) Aesop's fable of the Bundle of Sticks. Inscribed scrollwork surrounding the roundels proclaims the ownership and sentiments of the Society – "*Ebrington Friendly Society Instituted September 29th 1856*", with (on the primary) "*Go thou and do likewise, Let brotherly love continue*" and (on the secondary) "*Unity is Strength*". What makes the banner extremely unusual is its shape (Viner and Fisher 1999). Instead of the standard 3.5m square hung off a horizontal pole, the Ebrington banner is a swallow-tailed guidon, 448cm long by 178cm high, hung off one upright end, tied with six

woollen tapes to a single carrying pole. It resembles a colour carried by cavalry troops, vast, unwieldy and spectacular.

Research into its history (Viner and Fisher 1999) gives no definitive answer as to why a small village friendly society commissioned such an unusual banner. It seems to have been purchased to celebrate the Society's 21st anniversary in 1877. Reports of the "splendid flag" continued through the 1880s and 1890s, but dwindled as the Society's fortunes waned from 1900 until its dissolution in 1920. The banner was cared for by a Society member, Harry Baker, re-emerging in 1969 when it was displayed at a special Parish Council meeting, having been found by Baker's son amongst his father's effects, carefully stored under his bed in its original box, complete with carrying pole and other accessories. The Ebrington Parish Council decided to acquire it formally (Viner and Fisher 1999; Fisher, 2003).

1.3 History of the Banner's Conservation

At this point, the long conservation history begins. The Parish Council sought advice from the Victoria and Albert Museum on its preservation. In addition to earlier mends, further stitching repairs were advised and carried out by the local Women's Institute (WI) (Fisher, 2003.). Storage presented a problem: the banner is very large, even when stored in its box. It ended up in the attics of local farm houses, ultimately in the care of Connie Guerrier, daughter of a former Ebrington vicar. At her death, confusion over the banner's ownership arose, but once this had been legally settled, the local museum service encouraged the parish to seek professional conservation advice (Fisher, 2003).

Conservators from the Area Museum Council for the South West (AMCSW) provided support and advice, preventive and interventive conservation for registered museums in the area on a non-commercial basis. In June 1995, the Textile Conservation Service was approached by the Director of Cotswold Museums Service, David Viner, about what to do with the Ebrington banner. Initial conservation advice and estimates were given in September, 1995.

Three factors were apparent. Firstly, the shape and design of the main banner was extremely unusual and required further investigation. Secondly, display would not be straightforward, and thirdly, that the costs were beyond the annual conservation budget of Cotswold Museums, even at subsidised rates. Both Ann French (then AMCSW Textile Conservator) and David Viner began to investigate the uniqueness of the banner. This was confirmed by the National Banner Survey (funded by the Heritage Lottery Fund) co-ordinated by the National Museum of Labour History, Manchester, (now the Peoples' History Museum), which has the largest collection of trade union banners in the UK.

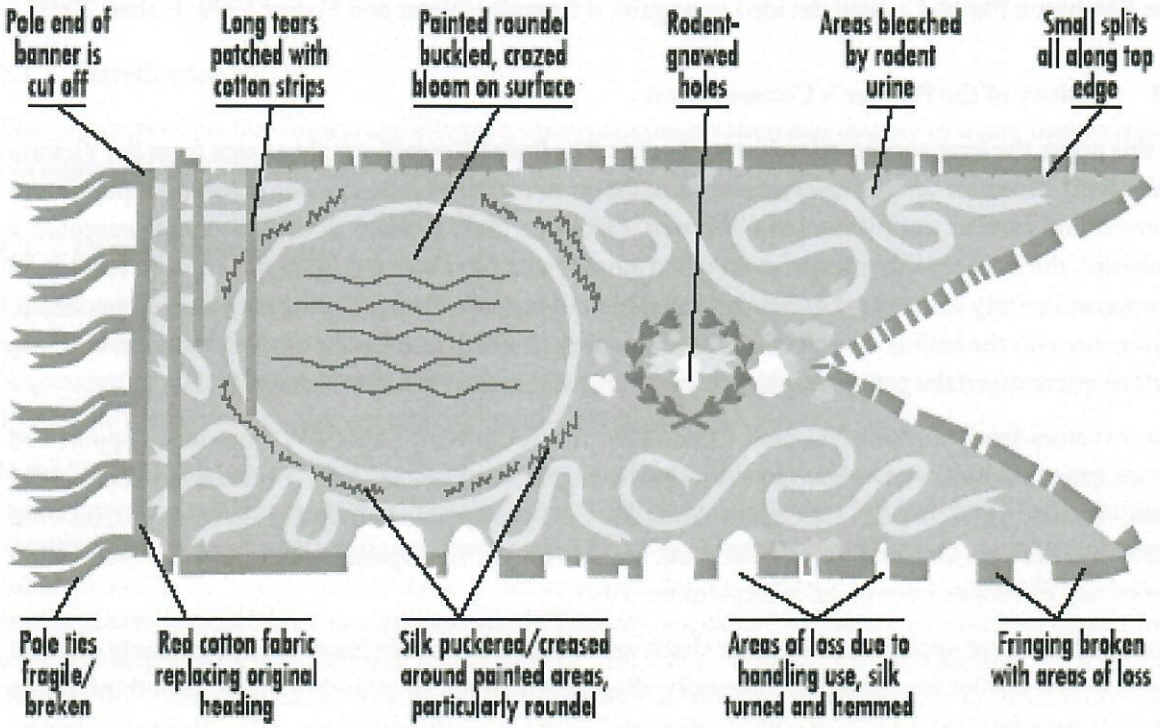
Ebrington Parish Council did not want to relinquish ownership, but were willing to loan the banner to Cotswold Museums as long as they could borrow it for special village occasions. Both sides of the banner must remain accessible, and the display method allow for removal for loan. A large stretch of wall at the Cotswold Countryside Collection in Northleach, Gloucestershire was identified as a possible site.

Initial estimates excluded display costs, but emphasised the need to consider display methods. The hours estimated were 225 with the total cost, excluding materials and work for display, coming to £3,751.00. An average AMCSW museum's annual conservation budget was then about £500-£1000. A long period of fund-raising was anticipated, with the project remaining as a possible AMCSW project until the money was raised.

In early 1997, added impetus came when the AMCSW stopped providing direct conservation services, made its conservation staff redundant and began a programme of grants for conservation projects for

its member museums. However, any work already commissioned would be given special consideration. This galvanised Ebrington Parish Council and Cotswold Museums Service into action; the conservation work was immediately commissioned. Between July 1997 and January 1998, the money was raised, almost entirely due to the energies of one person, Parish Councillor Margaret Fisher. By early 1998, it seemed unlikely that AMCSW Conservators would carry out the work, as both were looking for other employment, but fortuitously the interval between employments allowed Ann French to do so, and to call on Nicola Gentle to help. Conservation was completed between April and June 1998.

2.1 Conservation Treatment - Condition



Although the textile and painted elements of the banner have retained most of their original strength, suppleness and bright colour, some inherent instability, typical of banners where hard-edged paint meets textile (Lochhead 1995; Lennard and Lochhead 2003) has caused splitting throughout. It seems as if the original application of paint has stretched the textile; the roundels were particularly buckled and the surrounding silk uncomfortably puckered.

More significant damage is associated with many years of use and various subsequent repairs. The paint surface is crazed and abraded through handling and rolling. At the pole-edge, the scrollwork is abruptly cut through, suggesting that a section of the banner has been lost from here. Its original heading had been replaced with red cotton fabric, but the six red woollen ties appear contemporary with the banner. Long vertical tears close to this end - no doubt caused by stress during carrying – had been mended with strips of blue fabric. These, and the replacement heading, had been too tightly applied by machine-stitching creating lines of perforation through the silk and one end of the roundel.

Many small splits along the top edge are perhaps caused by the weight of the fringing, but the lower edge has suffered most, presumably because of the way it was held in parade. Several semi-circular areas of damage had been cut away and neatened by hemming, the WI repairs mentioned above (Fisher, 1998). The fringing is generally broken and was coming loose on all sides. Parts are missing, mainly along the lower edge.

Poor storage conditions in various attics added to the banner's deterioration. The paint developed a white bloom which obscured the imagery. Several largish holes have 'gnawed' edges suggesting rodent damage, probably mice. Discolouration where the silk is bleached to faded mauve and the fringe to pink could be caused by rodent urine.

2.2 Treatment

The fringing was temporarily removed, its position where breaks occur being marked with tacking stitches. Repairs to the silk were unpicked; the replacement heading discarded, but the pole ties retained.

Tests were carried out to remove the bloom from the paint. Industrial Methylated Spirits (primary constituent ethanol) was seen to dissolve the paint; White Spirit BS245 (a form of petroleum spirit) partly dissolved the paint and needed too much action. De-ionised water was not effective; saliva removed some of the bloom but took too much working. Staedtler-Mars plastic eraser was found to be very effective with only gentle rubbing.

During removal of the bloom, distortions and creases were gradually relaxed. An ultrasonic humidifier was used for the silk areas which were then put under slight tension with weights. The painted areas were also weighted between filter paper lightly dampened with de-ionised water. A degree of improvement was achieved in the textile, but much of the buckling remained in the roundels.

It had been decided – in agreement with Cotswold Museums and Ebrington Parish Council - that the primary side for display would be the image of the Good Samaritan. Any splits and missing areas, therefore, should be supported with patches applied to the secondary side.

An adhesive support was chosen for the weaknesses where paint meets textile. Polyester crepeline Stabiltex was cast with a film of Beva 371 (ethylene vinyl acetate adhesive) - 1 part to 4 parts White Spirit BS245 - rolled over Teflon-coated glass-cloth. All the scrollwork was supported on a continuous length of the adhesive-coated Stabiltex cut to overlap 1cm onto the silk. This support was "tacked" firstly in place using a spatula iron, then heat-sealed overall with a hand iron. The rodent damage in the clasped hands emblem, the edge of the roundel and the whole top edge of the banner were similarly supported. The long tear through the roundel was given support on both sides.

Long tears, missing areas and holes in the silk were then supported onto a heavyweight habutai silk. Patches of the habotai had been tacked in place with stitching prior to the adhesive supporting, ensuring correct setting overall. The damaged silk was then stitched with laid-couching using fine polyester thread (Skala). The patch edges were turned under and slip-stitched with the same thread, giving a neat finish whenever the secondary side of the banner is displayed.

During treatment, it became apparent that weaknesses in the pole-end area were even more fragile than initially thought, and more adhesive support was applied here.

3. Display

Display of the banner had always been seen as a potential problem. A clear brief from the Parish Council demanded that both sides remain accessible, while the conservators strongly recommended that the banner be displayed in a glazed case.

A providential visit by Nicola Gentle to the AMCSW studio resulted in an extremely successful brainstorming session. The method developed was to surround the banner in a double-layered rectangle of cotton canvas, with the fringing supported in a sleeve of polyester crepeline Stabiltex extending

about 2.5cm between the two pieces of canvas. (The pole edge had been given a new tape heading; the pole ties were encased in Stabiltex.).

The now rectangular banner could be displayed in a case either with both sides showing or with the ability to occasionally turn it to show the secondary side. To add strength across the banner, as essentially it was to hang off its fringe, Stabiltex straps had been stitched at regular vertical intervals beyond the roundel, on alternating sides. A prototype of the display method was presented to David Viner and the Parish Council and a further grant was received.

However, funds were not sufficient to fund a display case at around £10,000. Further complications arose with a re-structuring of Cotswold Museums Service. David Viner took early retirement and his successor was less keen to follow the project through. The other curator closely involved was on long-term sick leave, and the District Council decided to close the museum at Northleach and mothball its collection to cut costs. Between 1998 and 2001, the banner languished in the Museum stores. A visit by Ann and Nicola in early 1999, to re-roll the banner with polyester wadding and calico for long-term storage, confirmed that the conservation was holding up, but that it would really be better stretched on display. By 2001, most people involved suspected that long-term storage was inevitable.

However, Margaret Fisher and the Ebrington Parish Council had not forgotten. When details emerged of the renovation of the old Court House in nearby Chipping Camden by the Peelers' Trust, Margaret immediately went to measure the walls and reserved one above the magistrates' bench. She then ensured that the Parish Council received a grant from the District Council, which included appealing to the full Council Committee when its Arts and Heritage sub-committee rejected the grant on the recommendation of the Museums Service. With a new display site found and funding promised, a case could be built for the banner.

Unfortunately, Ann French was unable to attend the meeting with the case manufacturer (Click Systems) due to new employment commitments. It transpired that the angle of two roof beams across the chosen wall would prevent a deep enough case being built. In Ann's absence, it was decided to commission a smaller case and make the banner fit by wrapping one end around a "pole". Subsequent frantic damage limitation was attempted, requesting Click to adapt the plan so that the banner would be more sympathetically supported around a padded backboard. However, the vocabulary and assumptions of textile conservators do not necessarily correspond with those of a case manufacturer. Neither Ann nor Nicola managed to see the proposed display site beforehand.

In October 2002, Ann took leave and, as Nicola was unavailable, persuaded Sue Stanton, Textile Conservator at the Ashmolean Museum, Oxford, to assist with the installation of the banner. The old Court House was still a building site with renovation behind schedule. However, the carcass of the case had been built and the case fitters were ready. The full implications of poor communication became apparent. The case manufacturer had assumed that the banner could be mounted around the prepared backboard in the vertical position; it could not. Nor, in hindsight, did the case manufacturer understand the proposed hanging system. No-one had bothered to tell the conservators that access to the site was too limited to bring in a correctly sized backboard/stretcher so this would have to be assembled on site. Nor, in turn had the conservators asked about this or whether there would be space to lay the banner flat. There was not.

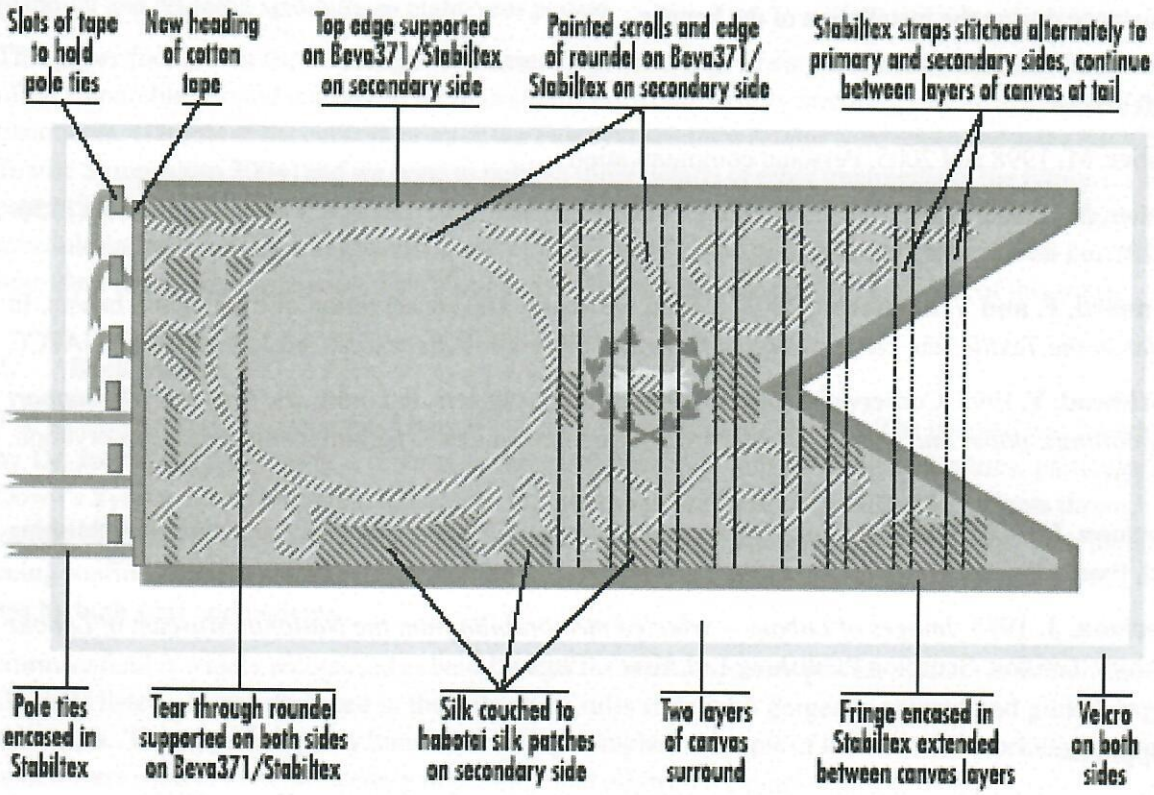
What was available to mount the banner were the on-site assembly backboard comprising three panels of interlocking sheets of 15mm medium-density fibre (MDF) board which the entire team of eight people could not lift, a flat space approximately half the length of the banner, plenty of Velcro™, staple guns and staples, and the materials the banner had been rolled in. The resulting display was a

desperate compromise. The case fitters reduced the weight of the backboard by sawing out the central panels of MDF; commercial acrylic varnish replaced the isolating layers of Moistop on the MDF. Ann and Sue covered the board with the polyester wadding and calico, together with some cotton sateen bought from a local haberdasher, and applied the hook Velcro™.

The banner was then stretched over and around the board. It was then realised that the backboard was taller than the canvas support; for reasons not understood by anyone present, 15cm had been added to the height of the backboard. The lower Velcro™ was in the wrong place and there were only a few areas with MDF behind where Velcro™ could be re-applied 15cm above.

Installing the mounted banner was straightforward in comparison. It was lifted into the case, the fringe adjusted and the glass secured. Through much discussion, and a chance visit from the developer (Bob Wilson), a satisfactory compromise was reached. The surplus space at the bottom of the backboard would be covered by a long storyboard about the banner. Protection against light would be provided by an electronically operated screen for slides and films fitted over the front of the case.

Thirty-three years after its rediscovery, the banner was on display to the local community at last.



4. Conclusions

There are many possible lessons to be learnt by conservators after a project such as the Ebrington banner:

- One can never really lose responsibility for one's work, especially for an object and project of this scale.
- All possible outcomes must be considered before starting a project. Display of the banner had always been identified as an issue and the method evolved was flexible. This enabled the banner to be safely displayed in a different venue and in a way not originally envisaged.

- One must never make assumptions about communication. What seems clear over the telephone is no substitute for a meeting in person on site. The display of the banner would be of far higher standard if that had happened.

The Ebrington banner is conserved and displayed largely because of what it represented to village residents. Essentially they drove the project and prevented the banner from being lost into the black hole of a museum store. One must never under-estimate the power such an object can have over a community.

Acknowledgements

Margaret Fisher without whom this project would have foundered years ago. That the banner is conserved and on display is a tribute to her enthusiasm, and refusal to be defeated. David Viner for initiating and administering much of the conservation programme. Ann Rachael Harwood, once Cotswold Museums' Service Keeper of Social History, for keeping track of everyone and much encouragement. Susan Stanton, Ashmolean Museum, Oxford, for helping display the banner, and providing much moral support in the process. Pearl Mitchell of Ebrington for providing much practical assistance during the installation of the banner.

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Gorman, J. 1985. *Images of Labour – selected memorabilia from the National Museum of Labour History, London.* Scorpion Publishing Ltd, Essex, England.

Suppliers

Habutai silk, cotton canvas and polywadding: Whaleys of Bradford,Harris Court, Great Horton, Bradford BD7 4EQ

Polyester crepeline "Stabiltex": Plastok Associates, 79 Market St,Birkenhead, Wirral, Liverpool L41 6AN

Display Case: Click Systems Ltd, 5 Tanners Drive, Blakelands,Milton Keynes, MK14 5BU

Polyester threads: Perivale Gutermann, Wadsworth Rd, Greenford,MIDDX U36 7JS

Beva 371: Conservation Resources (UK) Ltd, Unit 1, Pony Road, Horspath Industrial Estate, Cowley, Oxfordshire OX4 2RD

Velcro™: MacCulloch and Wallis 22-26 Dering St, London W1R 0BH

NORMANSFIELD THEATRE SCENERY: PROJECT PLANNING AND PRACTICAL SOLUTIONS FOR VULNERABLE PAINTED TEXTILES

Karen Thompson and Jane Wild
Conservators
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1. Introduction

The Textile Conservation Centre (TCC) Conservation Services section has been responsible for the conservation, display and storage of what is thought to be Britain's largest collection of late nineteenth-century painted theatre scenery. The treatment of over 100 items of scenery was the culmination of planning and research spanning an eight-year period.

This paper focuses on the challenges of conserving, handling, storing and installing these large and often vulnerable painted textiles rather than supplying a case history featuring technical details of the treatments. (Details of the consolidation of the False Proscenium Border were presented at the AICCM Textile Symposium 2004 and we hope to publish more details of other treatments in the future.) This paper discusses the vital role that project management played in planning the ever changing work schedule and motivating colleagues to work for many months on often repetitive tasks. It also describes how clear team communication, flexibility and commitment were vital for a project of this scale.

2. Background

The scenery is part of Normansfield Hospital theatre in Teddington, London. The hospital was founded by Dr. John Langdon-Down, a pioneer in the care of people with learning difficulties, particularly Down's Syndrome. His approach focussed on the training and encouragement of patients through a variety of activities which provided opportunities for them to express themselves rather than merely being confined in an asylum environment. To this end the theatre/amusement hall was built in 1877 for use by both staff and patients.

Normansfield is widely recognised as being one of the most important private theatres in Britain and is Grade II listed. It was designed in the Arts and Crafts style with gorgeous painted and gilded stage surrounds. The stage is the only known surviving complete example of its kind with working grooves which were used to hold the scenery in position and allowed for quick changes of set.

The stock scenery was made by a variety of scene painters and is thought to date from c.1870-1930. There are over 100 painted textile pieces, including backdrops, borders, flats and walk-though cloths. Backdrops and borders are rolled cloths which hang from wooden battens. The function of backdrops is self explanatory; borders hang across the top of the stage to create the sky/ceiling effect. Flats are canvases nailed to tall rectangular wooden strainers; some have shaped profile board extensions. They are used at the sides of the stage to create a sense of perspective. Walk-through cloths are hybrids, based on an outsize flat which is extended upwards by a rolled cloth. They feature openings for the actors to pass through. The scenery is painted with a variety of images to create woodland, street, country cottage and rococo room and other indoor scenes. The pieces can be used in a variety of

combinations to create a range of settings. The largest single items measure approximately 6 metres square, with the others being either almost as tall or as wide.

The Theatres Trust commissioned the TCC to undertake a survey of the scenery in 1997. A team of conservators worked on-site documenting, cleaning and packing as many pieces as possible in a six week period and submitted a report including initial proposals for future care. The scenery was then removed to a container in an ex-aircraft hanger whilst its future was decided and the theatre and surrounding buildings underwent restoration and refurbishment.

The hospital was purchased by Laing Homes who undertook to restore the theatre and conserve the scenery as part of a package that included development of the rest of the site for housing. In 2001, they commissioned a TCC consultancy to clarify the future role and conservation needs of the scenery. This resulted in an agreed brief to conserve one set of scenery and reinstate it for static display on the stage and make the rest of the items safe for accessible storage in specially constructed racking units to be housed in the basement of the theatre.

3. Research Phase

Karen Thompson ACR and Ambrose Scott-Moncrieff ACR (freelance paintings conservator) carried out research and testing on a representative selection of items, to determine which set should be conserved for stage display. They refined the conservation approach and selected techniques and materials for treatment.

The scenery was extremely dirty from years of use and unprotected storage in the polluted London environment. It was soiled with dust, cobwebs and particulates from gas lighting. The paint was crumbling, cupping and powdering, rendering it vulnerable. The poor condition of the paint was partly due to the continuous flexing of the canvases from use and due to environmental fluctuations and partly to its composition with a low binder to pigment ratio. Many of the canvases also had tears and areas of loss. All the objects with potential for display required cleaning, paint consolidation and support treatments to stabilise them. The remaining items, destined for accessible storage, required cleaning and some also needed minimal emergency repairs. Conservation techniques and materials were chosen taking into account not only the need to stabilise the objects for their future roles but also health and safety issues, implications for handling and other practicalities of treating such large painted textiles.

The complex issues presented by treating these huge multi-media objects, with water-soluble and cupping paint on flexible canvas substrates which were often mounted on both sides of strainers, required detailed discussion with colleagues both inside and outside the TCC. Input was sought from painting conservators, object conservators and wood conservators as well as textile conservators.

The number and sheer size of the pieces of scenery made space and logistics crucial factors in defining the treatment proposals. It was clear that a standard approach had to be identified to ensure that the work could be completed to an appropriate standard, within budget and in the timescale available. The conservation approach was chosen to ensure that the best possible treatment could be achieved for the maximum number of items within these constraints.

The Street Scene was identified as the most attractive and feasible set to display on stage. Estimates for conservation treatment for this and the sets to be stored were based on the results of initial tests and data collected during the research phase, combined with study of the images and brief condition reports from the 1997 survey. A representative time for cleaning/consolidation/support was worked out per unit area and calculated for the size of each object. This proved to be a very effective means of estimating.

4. Storage and Handling

The practicalities of where to carry out the work and how the items would be stored during conservation also had to be addressed; it was simply not possible to house this many large items within the TCC building. The option of conserving the scenery on-site was considered as this would have reduced the handling involved in transportation. However, this would also have increased the cost of conservation because of staff time spent travelling. It would also have conflicted with the timing of the restoration work on the theatre. Since it appeared that conservation would have to be carried out at the TCC, it was clear that it would be necessary to store the scenery outside the TCC building. As the scenery was to be stored outside in large metal container units located in the grounds of the theatre during building work anyway, a decision was reached to relocate it to two six-metre container units in the car park at Winchester School of Art. This did not provide ideal environmental conditions but was a relatively short-term expedient. It was also considered better to have the pieces in a container close to the TCC where they could be monitored. The scenery was delivered to the TCC by a removal firm rather than art handlers. This proved to be a testing situation as it was difficult to convey the importance of these extremely dirty and damaged canvases and how they needed to be handled with particular care.

Storing items in an outside unit brought new challenges of environmental control and the weather became a significant factor to take into account in the daily TCC routine. The TCC had stressed the significance of providing a stable environment and the containers provided by the client were lined with polystyrene and wood to provide a degree of buffering against the outside environment. However, this proved to be of limited effectiveness as both the temperature and humidity were prone to fluctuations. Air conditioning units were considered but the practicalities of installing them meant this was not feasible. Dehumidifiers were employed inside the units to prevent the RH% from rising above 55% which was important because the scenery was susceptible to further mould growth if the RH% became too high. Thermohygrographs were placed in the units and the readings were checked every day to ensure the environment was within safe limits. High summer temperatures were a concern in one unit but this did not cause a significant problem because a load of treated items was returned to the theatre, and the rest could be housed in the TCC building and the more stable container.

Moving the items was a major undertaking both within the TCC and to and from the container units, an activity that was only possible when fair weather conditions prevailed. Moving sometimes had to be done earlier than planned or delayed because of unpredictable weather changes. Handling and moving tested the conservators and TCC building to their limits. Manoeuvres had to be choreographed to ensure that the scenery was kept as stable as possible and were operations that always required at least three and often more people. A mix of tall, short, strong and petite conservators, clear team briefing and good communication was essential for handling the scenery.

Turning objects during treatment was challenging due to their size and awkward shape. The rolled cloths had to be taken out into the corridor, lifting the ceiling tiles to give maximum height and turning circle, and then returned to the workroom. The fragile nature of the flats meant that they could only be held in certain places when moving them. Labelling of packed items was a key factor in identifying where it was safe to hold them when it was not possible to see their shape and condition. This was crucial to create a foolproof system for TCC staff and the removal firm employed to transport the scenery after conservation.

5. Project Management

Project management was an enormous task. The main team consisted of six full-time conservators working on the project from October 2003 until July 2004, with additional staff and students called in

to help at certain stages of the project. Careful and constant planning was necessary to ensure that all the people involved in the project had sufficient work and financial targets and the completion deadline were met.

Time management was critical. With such a large team working on single items even minor delays in the progress of the work had huge knock-on effects. If a stage of treatment was delayed by a technical problem or lack of materials, four or six people stopping work for half an hour could add up in many lost hours. Flexibility and the ability to think on one's feet were crucial. The ability to adapt the identified plan of action at short notice was a skill that we became quite adept at as the project developed. We also held regular weekly meetings with the whole team to communicate progress to date and discuss any problems.

The sheer size of the objects meant that four or five people had to be working on a single item at times. This had implications in terms of consistency as well as keeping the project moving. It was vital that all members of the team had a consistent approach. While it was important for the project manager to keep an overview of all the work being carried out, the team were also encouraged to self-regulate. They learnt to be critical of each other's work in a constructive way, and to ask questions to clarify details of treatment in order to help to maintain the focus of the entire team.

Good team morale was essential to keep the project moving forward even when the team were faced with weeks of surface cleaning on what seemed to be a never ending list of similar items. It was important to try and assess the morale of the various conservators and, where possible, flexibility was introduced to help keep interest and enthusiasm alive. The teams working on repetitive tasks were varied so they did other activities at times and worked with groups of different people. Team members were given responsibility for co-ordinating particular tasks, which not only helped with morale but also distributed some of the management responsibilities.

6. Documentation

In the early stages of the project, the need for a slightly different approach to documentation was required. This went beyond the normal thorough recording of condition and treatment to include additional information related to tracking the location and the progress of treatment.

It is difficult to imagine losing a four-metre-long piece of theatre scenery but it can be done when it is one of a hundred with some pieces looking very similar. Each item was moved from room to room for treatment and, at one time, there could be up to twenty pieces of scenery circulating the TCC building. A list and brief description of the hundred items was recorded in a portable Progress Summary folder. The location of each item was noted every time it was moved enabling all items to be located accurately.

The progress of the treatment of each piece of scenery was also tracked. Coloured stickers indicated treatment required and completed. It highlighted items destined for storage that were stable but would benefit from further treatment if time permitted. The Progress Summary folder had a cotton strap so that it could be hung in a prominent area or carried from room to room, becoming known affectionately as 'The Handbag'.

Treatment documentation became an invaluable method of communication between team members, which was essential due to the large number of conservators involved in the project. A system was devised whereby conservators could express their progress to the rest of the team using a form of non-verbal communication. Initial brief sketches documenting the condition of each piece of scenery were stored in a workroom based folder. The sketch and associated description recorded damaged areas of wood and canvas, the degree of corrosion of metal components and the progress of all stages of surface

cleaning. Melinex™ templates were also used to register how far consolidation treatment had proceeded. These easily accessible systems were fundamental in maintaining a steady flow of work and making sure that aspects of treatment were not accidentally repeated or omitted.

7. Time-Saving Devices

The conservation treatment of a hundred large objects required large quantities of conservation materials. Sufficient preparation time had to be set aside each day to ready the equipment and materials. Alternative processes were developed to reduce the time required and improve the consistency of the materials.

Isinglass was used to consolidate several of the scenery items chosen for display on the stage. It comes in the form of a dry leaf which must be cut into very small pieces and cutting it by hand is a difficult and time-consuming task. A coffee grinder was found to be very effective at chopping the Isinglass. The grinder achieved a much finer consistency and reduced labour time by what would have added up to days when spread over the whole project. Up to four conservators at a time worked on consolidation of the large rolled cloths. The consolidant solution needed to be kept warm and at a constant temperature. Baby bottle warmers provided an excellent bain-marie system. They were small and sufficiently compact for each conservator to have one close by on a trolley for easy access when working on these large objects. They also proved to be safer than the hotplates that have been used on previous occasions.

Adhesive support treatments were required for the back drop and border cloth of the Street Scene, items that would be hung for display on the stage. The treatment required the use of 15 metres of support fabric and adhesive film. A commercially prepared adhesive (Beva™ 2μm) film was chosen because it provided a consistent and strong support for these heavy textiles. Initially it was proposed that the adhesive film be attached to the support fabric using a hand-lining iron. However it became clear that this would be a very time consuming process because of the large amount of fabric. Southampton Art Gallery generously allowed the TCC to use their Willard© heated suction table, which produced excellent results and reduced the preparation time by half.

8. Work On-Site

It was necessary to undertake some of the surface cleaning and emergency repair work on-site at Normansfield because it was not feasible to store all the rolled cloths, mounted on their long battens, and the very large and semi-rigid walk-though cloths in the container units at the TCC. The theatre auditorium provided a large space that allowed work on several items at one time. The rolled cloths were cleaned, re-rolled and prepared for storage. Two eight-metre-long storage boxes were built *in situ* behind the stage to house the rolled cloths. After cleaning and emergency repairs, the walk-through cloths were packed in Tyvek™ and stored behind the stage.

A vertical compacting racking system, incorporating thirty-two sliding units, has been purpose-built to store the flats in the large basement space under the stage that also houses a museum. This racking system provides researchers and other visitors with access to both faces of the many double-sided flats. The TCC was involved in early discussions of proposals for the racking and identified the need for a smooth-running system that would not cause vibration damage to the paint. The flats were to be held in frames each measuring 5m long and 1.5m high and there were two frames to each sliding unit. Unfortunately, the units were designed and built without further consultation. The scenery was found to be too fragile to withstand clamping around all four edges and this, coupled with insufficient access to insert items into the racking, necessitated modification. The solution involved the use of strategically positioned cross braces. The metal frame is lined with Plastazote™ to prevent it from damaging the paint and further strips are used to cushion the metal braces.

Sixty-four fabric covers were made to encase the individual units of the racking and protect the scenery from light and dust. Each measured 5 × 3m and required 640m of fabric in total. The covers were made from unbleached calico with a continuous strip of loop fastener sewn along the top edge and tabs on the lower and side edges. The production of the covers was a major undertaking, due to their size, weight and quantity needed. A space with large tables and industrial sewing machines was required to make the covers. The Fashion Department, conveniently located next to the TCC at Winchester School of Art, proved ideal.

9. Installation of Stage Scenery

As mentioned above, the scenery that was chosen for static display on the stage received full conservation treatment at the TCC. The stage scenery includes the Street Scene set, with four flats and a backdrop, and the False Proscenium set, which includes a border cloth and a pair of hinged flats with functional inbuilt doors. The installation of the scenery on the stage was carried out in collaboration with David Wilmore, a well known theatre consultant who had carried out the restoration of the stage mechanisms. His knowledge of the workings of a Victorian theatre was invaluable in understanding how these huge and unusual items should be displayed on the stage. The installation was an exciting culmination of the many months of work on the project. For installation the flats had to be lifted vertically into their correct orientation. Five people were required to carry this out; a heart-in-mouth moment, as the strainers are not rigid and flex. Once upright the flats could be manoeuvred into position in the original groove system in the rafters.

The Street Scene backdrop and False Proscenium border hung from battens for display. Initially, the plan was to re-attach the cloths to the original wooden battens using hook-loop fasteners thus avoiding the need to nail through the painted fabric. This would also have provided an easily adjustable hanging mechanism. However, based on his prior experience Wilmore advised that hook-loop fasteners would not be sufficient to hold the heavy weight of the rolled cloths. The hoisting action used to raise them into position is an unavoidably jerky movement and could cause the hook-loop fasteners to pull away from each other. The solution involved adding an extension of linen lining fabric to the top of the backdrop and border which was used for nailing them to the battens. This produced a strong method of attachment which did not damage the paint, would not fail over time and was historically accurate.

10. Conclusion

Prior to installation, the refurbished stage had looked magnificent but was lacking something fundamentally important to any theatre – the scenery. Installing the scenery breathed life back into the theatre. Today visitors can see all aspects of a small Victorian theatre in context and imagine how it might have functioned. The full collection of flats is accessible for study in its bespoke storage system.

The theatre and its building are now in the care of the Langdon Down Centre Trust and are the headquarters of the Down's Syndrome Association. The scenery is part of the living museum which is being developed in memory of Dr Langdon-Down and charts the history of the hospital and its patients. Today the theatre hosts many activities including ongoing work involving people with learning disabilities. The TCC hopes to continue working with the custodians in creating displays which will help people to understand the historic scenery.

Conservation of the Normansfield theatre scenery was a complex and challenging project spanning a long period and involving many dedicated individuals. Careful project management, thorough documentation and clear communication have shown what can be achieved on a major and initially quite daunting project. Despite some setbacks and constant technical challenges, excellent team work,

quick thinking, hard work and commitment, as well as a good sense of humour have been key factors in the successful completion of this fascinating project.

Acknowledgements

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Fig.1. Moving scenery to outside storage units

Fig.2. Team work

Fig.3. Storage units for scenery flats

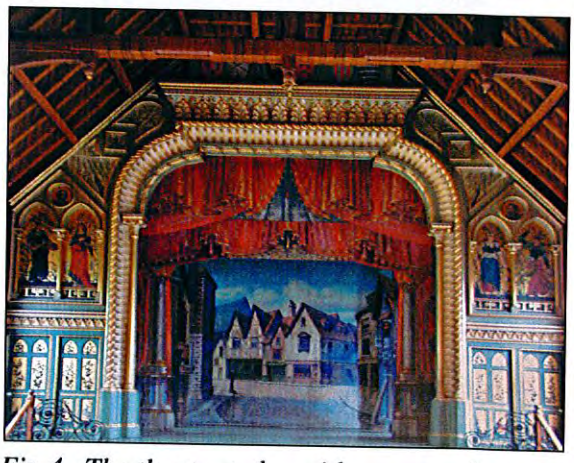

Fig.4. The theatre today with conserved scenery

The *H.M.S. Victory* Fore-Topsail

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1. Introduction

This year sees the bicentenary of the Battle of Trafalgar. The *HMS Victory* fore-topsail is on display at the Historic Dockyard, Portsmouth, for six months until October 2005. It is a unique artefact: arguably Britain's foremost maritime textile treasure, and possibly the only extant early 19th century sail in the world (*Fig. 1*).

At 24m × 16m and weighing nearly half a tonne, the *Victory* sail qualifies as a 'seriously large' textile. The problems of size are compounded by its physical condition. The sail was extensively holed by musket and cannon fire during the Battle, and a long gash was torn through the fabric as a mast smashed to the deck. The need for the sails active preservation was only registered relatively recently; the linen canvas has suffered significant ageing through natural causes in the intervening 200 years.

In 2003, the Conservation Services Section of the Textile Conservation Centre (TCC) was commissioned by Mary Rose Archaeological Services Limited (MRASL), under the direction of Mark Jones, to surface-clean the sail on site at the Historic Dockyard, in readiness for the exhibition (Gill 2003). In addition, they were asked for advice on how the sail should be stored and displayed (Petschek 1993; Gill 2002). At the same time, the Conservation Science Group was asked to assess the physical state of the sail, to inform decisions on the display methodology.

2. Challenges Related to the Cleaning of the Sail

The treatment brief was to remove harmful acidic loose soils from the sail and prepare it for temporary flat storage in an environmentally controlled space. This was straightforward and the nature of the conservation treatment was routine. However, the vast size, weight and fragmentary nature of the sail presented a series of particular challenges:

- handling and moving the sail
- undertaking the work in a space smaller than the dimensions of the sail
- protecting treated areas from re-soiling
- working off site on the second floor of a building with no facilities other than a supply of electricity
- co-ordinating a team of conservators to work simultaneously
- co-ordinating additional support to move the sail at key stages of the project

Meticulous planning was necessary to ensure the efficient completion of the project.

2.1 The Strategy Plan and Project Management

The TCC prepared a treatment proposal and strategy plan which set out key milestones within a specific time frame and defined roles and responsibilities. Conservation materials and equipment were determined, specifications for customized equipment were prepared and ideal environmental conditions within the tented area were specified. Commuting daily between Winchester and Portsmouth, it was estimated that the project would take a team of six conservators five weeks to surface clean the sail.

2.2 The Role Played by MRASL

MRASL played a vital part in this project, working in close collaboration with the TCC. Being based at the Historic Dockyard, MRASL liaised on the TCC's behalf with all other parties involved with the project. This included the Commanding Officer and the Curator of *HMS Victory* and the Maritime Museum. MRASL were delegated the responsibility of improving and monitoring the immediate and long term environmental conditions of the space in which the sail was stored. They also ensured that the space met all health and safety requirements for the conservation team and that the team had access to other essential facilities not available in the Storehouse.

In addition, MRASL ordered all conservation equipment and materials requested by the TCC as well as seeking out and arranging for specialists to fabricate customized items to TCC specifications. They also provided additional man power to move the sail and prepare the work space at various stages of the project.

2.3 Project Management on Site

Careful planning was essential to ensure completion of the project within the estimated time. This included co-ordination of the team of six conservators working simultaneously. A delay of one hour for the team would be the equivalent loss of six hours from the project. For maximum time efficiency, the following arrangements were made:

- A list of support activities was kept up to date each day so if anyone was unable to carry out a task as planned there was an alternative project.
- Car pooling was established to increase the likelihood of everyone starting work at the same time and to save costs.
- Since there was no facility for packed lunches in the Dockyard, tables were pre-booked and lunches ordered in advance.
- Tea breaks were taken in the staff room facility in the adjacent Museum. They were prepared in advance by a conservation team member on a rota basis.
- MRASL support staff were given advance notice when their help was required. This included topping the inflatable tube with air, ordering supplies, helping to roll the sail and re-charging batteries from the breathing apparatus.

2.4 Team morale

The main activity of this five-week project was spent bedecked in Tyvek™ suits, with gloved hands, ear protectors and breathing masks. Each conservator squatted on the floor surface cleaning for up to five hours a day, four day each week in a room with no windows (*Fig. 2*). Consequently, maintaining team moral and full engagement in the project was anticipated to be a challenge. The following strategy was taken.

There was a pool of nine conservators from which the six-strong team could be drawn, therefore no member of the team would work all five weeks. The project manager had a deputy to relieve duties when necessary. Each member of the team would work a maximum of four days on site per week. The fifth day would be spent back at the TCC on other projects. Break times were re-distributed into three half-hour breaks and involved removing all protective gear, leaving the building, exposure to fresh air and verbal communication with fellow human beings.

Each team member understood their role as individuals and as team members. Weekly and daily goals were set. This was helped by the fact that the sail was mapped out into one-metre squares. When a square was cleaned, it was marked off on a large chart. This system made the sense of progress more readily apparent.

2.5 Manoeuvring the Sail During Treatment

The floor area was too small to lay the sail out flat. Therefore it was necessary to devise means of moving it within the confined space and at the same time protecting cleaned areas from becoming re-soiled. The concrete floor of the tented area was lined with heavy duty polythene sheet to reduce airborne contaminants.

The sail was moved as follows. It was laid out as flat as possible; the excess length was gathered at the head end (*Fig. 3.1*). One metre of the full width of the sail was surface-cleaned and covered with a layer of Tyvek™. The process was repeated as far as the gathered section. The other side was accessed by rolling. One metre of the full width of the sail was surface cleaned then rolled on to the next section. The process was repeated as far as the gathered section (*Fig. 3.2*).

The rolled section was dragged back on a cloth sling and surface cleaning and rolling was continued (*Fig.s 3.3* and *3.4*). The rolled sail was covered in Tyvek™.

2.6 Customised Equipment

The 26m roller with diameter of over 50m was customised. An inflatable tube was preferable since it could be deflated making transportation and storage easier than a rigid one. If it were necessary to remove the rolled sail from the building, the tube could be partially or fully deflated to negotiate the stairwell and two flights of stairs. The roller was made by a company who normally manufacture booms for oil spillage control at sea (Vikoma International Ltd.). The tube had a number of internal chambers. Each chamber was inflated separately by means of an air compressor. If the tube developed a leak, it would be easier to locate the hole with the chamber structure.

A sling was made by Banks Sails Ltd. to help to manoeuvre the rolled sail from one side of the room to another. The sling consisted of a 26m × 1.5m wide strip of heavy duty canvas with straps on either side. The sail was rolled onto the sling by a team of twelve people and pulled across the room by the handles of the sling.

2.7 Protecting Conservator and Sail

It was necessary to walk and sit on the sail. To reduce contamination, conservators wore Tyvek™ suits, including foot covers. They worked close to the sail for intense periods of time. Therefore they wore breathing apparatus to filter airborne dust particles and fibres and ear covers to filter the noise generated by six vacuum cleaners which were in use for 4-5 hours daily. Hand signals were used to communicate as it was not possible to hear or even lip-read. To minimize damage to the sail from the

weight of the conservator and equipment everything was positioned on sheets of Plastazote™. Once a full width of the sail had been cleaned it was protected with a sheet of Tyvek™.

2.8 Brief Summary of Treatment

Treatment trials had been undertaken to determine most the effective surface-cleaning procedure prior to the project commencing (Jones & Rowe 2002). The team was well briefed to ensure that everyone was using the same cleaning technique and procedure. To summarise, the treatment involved cleaning all surfaces of the sailcloth and rope with low-powered vacuum suction and gentle mechanical action to remove loose particulate matter. To keep track of areas cleaned, the sail was measured off in one-metre squares. Lengths of string were used across the width of the sail and metre-long strips of Correx™ were used in the other direction.

A combination of the following equipment and techniques were most effective in removing as much as possible of the loose surface soiling from the sailcloth without subjecting the fabrics to undue abrasion. A Vorverk Kobald 130™ Vacuum cleaner was used at one-third power. The adjustable soft head filament was gently passed over the surface of the sail (once or twice depending on the degree of loose soils present), with a regular overlapping linear or circular motion. The process was repeated with a Preservation Equipment Ltd Museum Vac, fitted with the small oval brush attachment, set at three-quarter maximum power. The brush was used in a gentle circular or overlapping linear motion. Statically charged cloths (Dust Bunnies™) were also wiped gently over the surface of the sailcloth, using a light rubbing motion to remove more resistant surface soils.

The rope was cleaned with the Museum Vac™ in combination with a sift bristle brush to dislodge loose soils from the crevices. More robust areas were wiped gently with the Dust Bunny™ cloth. The Dust Bunny™ cloth was not used on the fragile areas of the painted letters located on the front face of the sail, since this would have dislodged the paint.

Throughout the cleaning programme, spot tests (sticky aluminium stub method) were carried out every metre width to check the effectiveness of the soil removal. It was estimated that over 900g of loose soils were collected in the vacuum bags. The debris and stubs were retained and made available to MRASL for further analysis if required. A considerable amount of soil was also removed by the Dust Bunny™ cloths although it was not possible to quantify how much other than by the degree of soiling visible and the equivalent number of cloths used (over 250 cloths, approx. 30 x 30cm, both faces of the cloth).

2.9 Raised Vented Platform

Following TCC specifications, MRASL acquired and installed a raised vented platform on the floor to support the sail and to allow air to circulate freely across both surfaces of the sail. The platform comprised a series of black polyethylene open crates butted up next to each other and covered in a barrier layer of Tyvek™. After installation of the platform, the sail was unrolled across its surface (*Fig. 1*). Since the tented area was large enough to accommodate the width of the sail but not its length, the foot edge of the sail was partially rolled on the inflatable tube, interleaved with Tyvek™. The fragmentary head edge was partially folded back on itself. The entire surface of the sail was covered in a layer of Tyvek™.

The sail remained in storage on the raised vented platform until the next phase of the project. For the past two years, MRASL have monitored the condition of the sail, the inflatable tube and the environment in which it is stored.

2.10 Evaluation

The success and quick pace of the project were largely due to highly detailed planning in advance and a sufficiently large team of experienced and motivated textile conservators. Of equal importance was access to correct protective clothing, sufficient tools and equipment for each team member and use of the customized roller and sling. None of this would have been possible without the full co-operation and support received from MRASL at key stages.

3. Experimental work

The conservators had advised against displaying the sail vertically, as they were concerned about such a large and somewhat fragmentary textile hanging under its own weight. Consequently, the Research Centre was asked to undertake a series of tests to assess the true physical state of the sail and to consider how these results would relate to the conservators display recommendations.

The sail is constructed from bolts of linen (flax) cloth. Flax fibres have good mechanical properties, including a relatively high strength and low extensibility; these factors, combined with the increase in strength observed on wetting, mean that linen is a good choice for the production of sailcloth.

The component fibres of the *Victory* sail have deteriorated over time, leading to a loss in its physical integrity as a whole. The known history of the artefact suggests the general types of degradation to which it may have been exposed - the initial use at sea would have lead to hydrolysis and photochemical reactions, and mechanical damage due to wear and tear; more subtle deterioration, including inevitable attack by micro-organisms, would have occurred over the subsequent two centuries of storage, and the occasional display of the object would give rise to further exposure to light and physical stress.

In order to assess potential problems with the display, storage and handling of the sail, it is necessary to have an understanding of its physical condition. Damage can occur in a variety of ways, the most obvious being the physical rupture of the component fibres, leading to an immediate loss in strength. However, more subtle damage, in the form of slippage, can also affect the object; this slippage can take place over a range of scales - polymer chains within individual fibre cells, cells within the ultimates, fibres within the yarn, and yarns within the weave - and will result in deformation of the object that may or may not be reversible. A series of tests were performed to assess the physical state of the sail and the extent to which the role of the different failure mechanisms would influence decisions regarding handling, display and long-term storage.

3.1 Experimental – Samples

Permission was given to remove yarn samples (of approximate length 5-10cm) from the *Victory* sail, from regions of pre-existing damage, as well as a single piece of sailcloth, largely detached from the bulk, roughly 3 × 4cm in size.

In addition, a range of surrogate materials were employed - these were chosen to simulate the progressive degradation of the sail, and to enable tests to be carried out on larger samples, or with a great number of repetitions, than was possible with the specimens taken from the *Victory* sail itself. These surrogates included: a large section of linen sailcloth from the *Standart* (a modern recreation of the early eighteenth-century flagship of Peter the Great of Russia), which had been used at sea for a similar period to the *Victory* sail itself; modern linen sailcloth supplied by Banks Sails Ltd.; and artificially aged sections of the Banks sailcloth, using regimes chosen to mimic the known history of the sail, as noted above - use at sea (1) and exposure to sunlight (2), followed by almost two centuries of storage (3) and, most

recently, limited exposure to light again during display (4). Similar yarn samples, as well as larger fabric sections, were taken from these surrogates.

The lengths (tensioning the yarns slightly to remove the crimp imposed by the weave structure) and masses of all of the specimens were recorded, after which they were stored at a controlled humidity of approximately 60%. All of the samples were woven with a 'paired warp'; where warp yarns were tested, a single warp from the pair was taken.

3.2 Experimental - Mechanical testing

The *Victory* and surrogate samples were subjected to mechanical testing using an *Instron '4301'*; for yarn specimens, a gauge length of 2.5cm and a 100N load cell was employed, whilst for the fabric sections, a 2.5cm gauge length, 1.5cm width and a 5kN load cell were used. In addition, to determine the effect of the length of the sample on the data, pieces of the *Standart* sailcloth of gauge lengths 10cm and 45cm were assessed. To complement the tests carried out under ambient conditions (23±1°C, 55±2% RH), 'wet' tests were also performed on the yarn specimens - this was achieved by immersing the samples in distilled water for approximately 30 minutes before testing. For the *Victory* sail yarns, four specimens from each sampling location were assessed; for the surrogate materials, six samples were used, as a greater quantity of material was available.

3.3 Experimental - Slippage tests

Slippage tests were performed on the bulk *Victory* sail, and on sections of the *Standart* sail, using a rig developed by Colin Appleyard (Hood Sailmakers). This device enabled a vertical load to be applied to a 10cm width of sailcloth over a period of days or weeks, and for the extension and subsequent relaxation of the cloth to be measured. Although these tests are not strictly non-destructive, as they may lead to permanent deformations of the fabric, the benefits in terms of a greater understanding of the physical condition of the *Victory* sail, and the limited regions in which any irreversible changes would occur, were considered to outweigh the ethical concerns, although to limit any potential damage the tests were restricted to four locations on the *Victory* sail itself. Estimates were made of the typical stresses to which the sail might be subjected, and the applied loads chosen accordingly, up to 8kg.

3.4 Results - Mechanical testing

Tenacities (breaking strength per unit linear density) of the *Victory* and surrogate yarns were calculated, to avoid complications arising from differences in yarn diameters. Individual tenacities were plotted at the corresponding sampling positions on a diagram of the sail (*Fig. 4*) and average values for both the sail and the surrogates were also calculated (*Table 1*). It can be seen that the tenacities of the *Victory* yarns are fairly close and do not vary in a systematic fashion across the sail. The average tabulated values suggest that the sails from the *Victory* and the *Standart* have deteriorated to a similar extent and significantly when compared with the modern, unaged Banks sailcloth. This conclusion is corroborated by the wet tenacities, which show that, whilst the modern material increases with strength on wetting, the degraded fabrics lose strength. Furthermore, it can be seen that the final two stages of the artificial ageing regime yields surrogates with similar physical properties to the *Victory* sail itself. Although the representative nature of the yarns taken from around damaged areas in the *Victory* sail may be questioned, this result lent us some confidence in extrapolating our data to the remnant intact canvas.

To investigate the correlation between the properties of the individual yarns and those of the fabric as a whole, average breaking loads per warp yarn from the individual yarns and from the sailcloth sections were calculated, using the breaking strengths and warp counts (*Table 2*). It can be seen that there is a good correlation between the yarn breaking loads of individual yarns and those of the sailcloth pieces, an important consideration when attempting to extrapolate data derived from yarns to the fabric as a whole. It should be noted that for the *Victory* sail sample, the individual warp yarns used for comparison were taken from the region adjacent to the section used for testing, and were of poor quality when compared to the rest of the sail - the breaking strength is roughly 10% of the average value and suggests that, beyond the general deterioration of the fabric, there may be localised areas in which the sailcloth has weakened to an even greater extent.

Sample length is also a factor that must be considered; as noted above, failure may arise from fibres slipping past each other as well as by catastrophic rupture. In the case of linen, the individual ultimates are roughly 7cm in length, so slippage failure is unlikely to be observed with a 2.5cm gauge length, but will be significant when considering the textile as a whole. The longer (10 and 45cm) fabric sections from the *Standart* sail demonstrate this mechanism, with the breaking strengths falling to 88 and 82% of the value for the 2.5cm section, respectively.

3.5 Results - Slippage tests

When a load is applied to a fabric, the initial effect will be to 'decrimp' the weave structure, straightening those yarns running in the direction of the applied force. Beyond the elastic limit, the extension may be categorised as either primary or secondary creep, the former being reversible and the later irrecoverable. Slippage between the ultimates and within yarns will result in a permanent extension. For the yarns from the *Victory* sail, the recoverable extension due to decrimping, and perhaps the elastic stretch and primary creep of the cellulose polymer, is about 4%.

The bulk slippage tests suggest that a permanent deformation may arise in two ways - as may be expected, it will occur rapidly if the fabric is subjected to a large, short-term loading; it will also occur with smaller loading over prolonged periods (*Table 3*).

3.6 Discussion

Having shown that a good correlation may be drawn between the breaking strengths of individual yarns and that of the bulk fabric, and taking the average warp count and the contribution of slippage failure into account, a rough indication of the maximum load that the sail might bear can be calculated - approximately 150kg / 10cm width. However a variety of further factors must also be considered - the extensive loss of material at the head of the sail, the unpredictable areas of localised weakness and the necessity of including an appropriate safety margin - which lower this to as little as 15kg / 10cm. This, however, is still above the load of approximately 2.3kg / 10cm that the sail might be expected to exert at the head, if allowed to hang under its own weight.

However, this limit should be reduced if the extension of the sail is to be avoided. Although pristine linen can withstand an extension of 2-5% before undergoing permanent deformation, the slippage tests demonstrate that irreversible extension of this sort will occur with loads as low as 2kg / 10cm over prolonged periods, even if the sail is fully supported across the head and the weight evenly distributed.

3.7 Conclusions

Both the direct assessment of the sail by the conservators and the results of the experimental work support the conclusion that undue and prolonged stress should be avoided when handling the sail, and that ideally it should be displayed flat or at a shallow angle, on a suitable solid mount, so that effective loading of the cloth is reduced to a point where further damage will not ensue.

Acknowledgements

The authors would like to thank Lt. Cdr. Frank Nowosielski (Commanding Officer, *HMS Victory*) for permission to publish and the Society for Nautical Research and the Ministry of Defence for supporting the work. We are also indebted to Colin Appleyard (Hood Sailmakers), Peter Goodwin (Keeper and Curator, *HMS Victory*), Mark Jones (Head of Collections, the MRASL). Finally we would like to acknowledge the support of colleagues at the Textile Conservation Centre and the AHRB Research Centre for Textile Conservation and Textile Studies, University of Southampton, notably Nell Hoare for permission to publish, Amber Rowe (Head of Conservation Services) and Paul Wyeth (Conservation Scientist and Senior Lecturer) for their support and editorial input.

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Tables

Table 1: **Calculated average tenacities (cN.tex-1) for warp yarn samples from the *Victory* sail and surrogate materials.**

Sample	Standard Test		Wet Test	
	Tenacity	Std. Dev.	Tenacity	Std. Dev.
Victory Sail	**5.1**	**2.5**	**2.4**	**0.6**
Standard Sail	**3.0**	**0.6**	**1.0**	**0.2**
Banks Sailcloth	**17.6**	**2.1**	**19.2**	**0.7**
Artificially Aged (1)	**14.4**	**1.6**	-	-
Artificially Aged (2)	**6.9**	**0.9**	-	-
Artificially Aged (3)	**5.1**	**0.4**	-	-
Artificially Aged (4)	**3.4**	**0.2**	-	-

Table 2: **Derived mechanical properties for sailcloth sections: *(a)* sailcloth breaking loads and warp densities; *(b)* average breaking loads per yarn, derived from both yarn and cloth tests.**

Source	*(a)* Physical Properties of Sailcloth Sections			*(b)* Average Breaking Load per Yarn / N	
	Breaking Load / N	Std. Dev.	Warps / cm	Yarn	Cloth
Victory Sail	**24**	**—**	**21.6**	**0.4**	**0.7**
Standard Sail	**147**	**56**	**23.0**	**4.5**	**4.3**
Banks Sailcloth	**831**	**47**	**19.8**	**27.7**	**28.0**

Table 3: **Results of slippage tests, noting the total load applied, the duration of the experiment, and both the maximum extension observed and the residual extension after the removal of the load.**

Maximum Load / kg	Period of Loading / days	Maximum Extension / %	Extension on Relaxation / %
8	**5**	**6.1**	**1.7**
5	**7**	**4.4**	**1.4**
4	**5**	**3.9**	**0.5**
2	**21**	**3.2**	**1.5**

Fig.1. The sail laid out on the platform after surface-cleaning

Fig.2. Conservators cleaning the sail – overall view

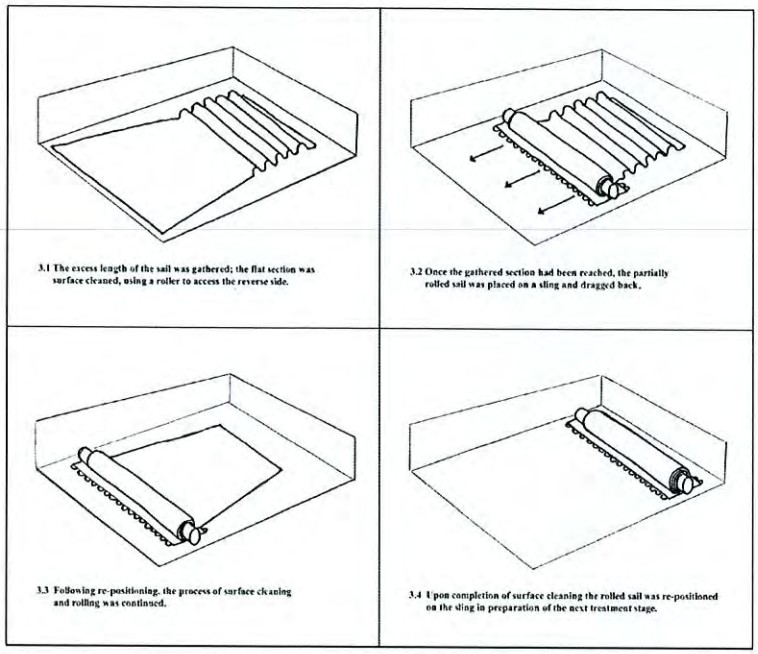

Fig.3.1-3.4. Manoeuvring the sail during treatment

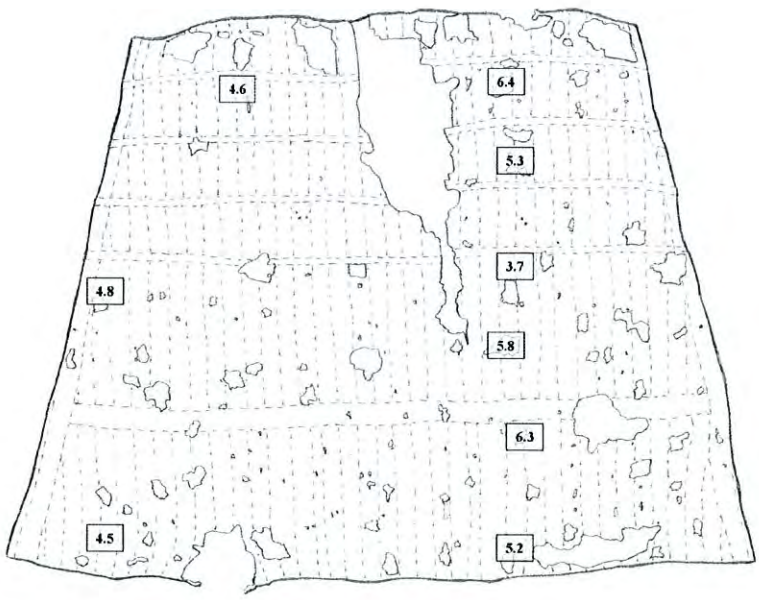

Fig.4. Diagram of the sail, with tenacities (cN.tex-1) at selected sampling positions across it.

Moving the Immoveable Carpets

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1. Introduction

This paper deals with handling carpets in three situations, calling for similar but different approaches:

1. The removal of a large nineteenth-century Agra carpet, laid in the Waterloo Chamber in Windsor Castle, to the Lower yard for treatment.
2. Redesigning the handling of the State Room carpets in Buckingham Palace, which are lifted and reinstated each year for the summer opening.
3. Lifting and reinstating a nineteenth-century octagonal carpet from the Octagon Room, Basildon Park, for temporary storage during filming of *Pride and Prejudice*.

2. The Agra Carpet, Waterloo Chamber, Windsor Castle

This is a very large carpet made for Queen Victoria. It measures approximately 26 × 14 metres and was reputed, in her time, to be the largest hand knotted carpet in the world. The Waterloo Chamber is where all big receptions, plays and dinners are held. The carpet has suffered years of parties, handling and bad repair treatments and was very dirty, but not damaged in the Windsor fire. We were asked to clean and repair it.

2.1 Preparation

It was decided that the best available space for the treatment to be undertaken in was the Rolls Royce garage, where the carpet could be laid out flat. It is situated in the Lower Yard at Windsor Castle, approx 500 yards from the Waterloo Chamber. For the treatment to be undertaken it was necessary to construct a platform, which would give ground clearance in case of flooding, support during cleaning and allow better air circulation for drying, as well as enable repairs to the edges and ends of the carpet without moving it. Once the platform was built, the carpet was brought down from the Castle. The problems we faced for the transportation were: the size and weight of the roll, winding corridors and distance - and resistance to new ideas, such as protective covering. The Waterloo Chamber is on the ground floor of Windsor Castle, but access to it is through several curving corridors and staircases. Conservation considerations had to take second place to health & safety requirements.

The carpet was rolled pile inward on its weft to allow for handling, as to roll on the warp, which is preferable, would have created too large a roll. Due to the size and weight of the carpet, fifty to sixty people were required to carry it onto the site. The porters were mainly Coldstream Guardsmen under the supervision of a corporal and the Castle Superintendent.

2.2 Moving and Turning

When we built the platform, we had deliberately left the centre section open, so that the carpet could be carried in a straight line from the yard and laid down onto the platform as easily as possible. Once it had arrived, the centre section was put in place. The carpet was moved to one side of the platform and unrolled and, after light surface cleaning, pH and dye fastness tests, mapping and photography, the carpet was turned. It was judged that the risks of turning the carpet were outweighed by the benefits of being able to work on the back, so that the acid pollution could be properly treated and sound support treatments could be employed.

The rolling and removal of the carpet had been under the supervision of the Castle Carpet Layer and had received no support or protective covering. Now in our charge for the rolling, the carpet needed some sort of support, particularly to protect the lead edge of the roll, which tends to get crushed. A rigid roller was not possible due to the length. It was felt that 80 feet of joined rigid roller might cause more damage than no roller. Also the convolutions of the route back and the diameter of the roller needed to be taken into consideration. Eventually we used plumbers blue plastic water pipe and pipe insulation, which made up to about 5 cm in diameter.

The carpet was turned without stress to it and came out flat, using a method that had been tried on smaller carpets, but never on one this size. This entailed interleaving the carpet with polythene and rolling and backrolling with 12 to 15 people. **(FIGS)**

2.3 Protection, Monitoring and Cleaning

After the carpet was turned, the back was vacuumed, using Miele vacuum cleaners with a crevice nozzle at low suction, approximately 800 watts through net; rolls of green garden netting were used to make the process of vacuuming so large an area easier. After vacuuming, the carpet was divided into one-metre sections, numbered, tagged and marked by string; damage and stains were flagged, mapped and photographed. We have found that this detailed method of mapping is invaluable for monitoring the progress and scheduling of treatment. It is easy to get lost, or to lose details on so large a carpet.

It was clear that the carpet should be covered at all times, except when being treated, to protect it from ultraviolet light and high lux levels. Clean calico covers were used, which could be removed in sections to expose only areas being treated.

The wet-cleaning method employed a Prochem M20A upholstery cleaning machine with a customised low pressure water pump, delivering a 0.02% solution of non-ionic detergent for the wash pass and clean water for the rinse pass, while a 220vacc 60 cycle vacuum motor removed the waste water. The wet-cleaning was carried out through net in eight-square-metre sections. After wet-cleaning, each section was blotted and left to dry, assisted by cool fans.

Temperature & humidity were of high concern due to the roof being uninsulated and having a large part of its surface area glazed. There were also concerns about strong fluctuations, particularly increases in temperature from the sun and humidity from the cleaning. A "Climate Check" device (hygrometer/ thermometer) was placed on the carpet and monitored every working hour of the period to help determine work programming and record events for future assessment. It is worth noting that, although it got very hot, the RH monitored during the cleaning showed that there was no change beyond the fluctuations in the weather - this has been our experience in other venues when using this cleaning method.

2.4 Remedial Work

The carpet suffered from tears, holes, splits, wear and old adhesive repairs. The edges had suffered considerably from bad handling and wear. After old damaging repairs and adhesive had been removed, the holes, tears and broken wefts were supported onto linen holland patches, secured with couching and infilled, introducing new warps and wefts. Where needed, new knots were introduced to obtain visual continuity and protect the carpet. The edges are particularly vulnerable, so it was decided to attach one-metre widths of linen to the edges and to support-stitch diagonally along the length to give the carpet some support when pulled and straightened. Woollen galloons, made up to match the field colour of the carpet, were attached to the very edge to give added support and looked very smart. The side cords were overcast; although this is a restoration technique it was felt that it would act as a barrier against inevitable wear and 'frame' the carpet.

After treatment on the back was completed, the carpet was turned pile-up. The front was then subjected to the same mapping, flagging, dry and wet-cleaning as the back and the repairs on the front were finished.

2.5 Finishing

When the treatment was complete, the carpet was rolled up for transport back to the Castle. It was carried up using the same route and methods as before (there is nothing like appointments with fifty Coldstream Guards to encourage keeping to deadlines!).

3. Lifting and Relaying the State Room Carpets at Buckingham Palace

The State Room carpets have to be taken up to allow powerloom carpets to be laid for public access to the state apartments each summer and then relayed in the autumn when the Court returns from its summer break. The carpets consist of five very large carpets, three Axminster and two Oriental, the largest being approx 17m x 7m. The lifting and relaying of these and four smaller (approximately 6m^2) carpets is undertaken by up to twelve porters. Traditional carpet layers' methods of floating (or shaking, flapping and kicking) have been used to straighten the inevitably very crooked and bunchy carpets, which has resulted in serious damage.

I was asked to observe the relaying of the stateroom carpets after the 2002 Summer Opening, with a view to understanding how the damage caused by this might be lessened. I had three aspects I particularly wanted to look at: support, handling and positioning.

3.1 Difficulties

I was only able to observe the reinstatement in 2002. Conservation advice had previously been given as to the type of rollers needed for carrying and storage, and these seemed very adequate. The use of large cotton sheeting covering the whole carpet and rolled up with the carpet had been recommended, but the original reason for this seems to have been lost and the way they were now being used was causing much difficulty. The carpets were unrolled with the cotton sheet on top, which meant that it was difficult to see what was happening and resulted in the carpets being re-laid with much distortion.

Once the carpets had been carried into the appropriate room and unrolled, they were often very poorly aligned, distorted and creased. Bringing them back into position and flattening out the creases appeared to be the cause of many of the tears at the edges and added to the embrittlement of the foundation in the centre. The method used to straighten the carpets was lifting and flapping, pushing the creases across

them and pulling and kicking the edges to make them lay straight. The general lack of organisation was also a factor in the damage caused, whilst the scheduling for the whole operation could be much improved to lessen the potential for damage.

3.2 Solutions

3.2.1 Lifting Prior to the Opening

When rolling up the carpets, care was taken to mark exactly where the leading edge should be laid. Before starting, the corners and the centre point of the ends were marked with removable adhesive tape or masking tape. Difficult areas, such as where the design on the carpet meets the pillars, were photographed for reference.

Planning for each carpet is essential, especially as for human reasons we tend to forget what we have done before. Each of the rooms has its own difficulties, for instance in the Blue Drawing Room it is not possible to roll the carpet fully from one end of the room to the other because the gap between the pilasters at one end is narrower than the roller length. The cotton covers were abandoned. Carpets are difficult to roll straight due to their own distortions, so time and care at the commencement of the rolling saved time and damage later. The use of nylon interlining to pad and compensate for the differing thickness of the carpets was a very successful innovation.

3.2.2 Re-laying

Time and care were to be taken to see that the leading edge of the carpet was laid exactly to the marks made on the floor before the carpet was rolled. The carpets could be adjusted during the unrolling, as the carpets were re-rolled onto polythene sheets which were then used to support adjustment of the distortions.

4. Lifting and Reinstating the Octagon Carpet at Basildon Park

The carpet is approximately 10.3m across and the room measures only 10.7 m across. The carpet needed to be rolled onto a rigid roller, before being removed from the room and lowering over the balcony to the ground floor to be stored for the duration if the filming of *Pride and Prejudice*.

The problems faced were the size and the octagonal shape of the room, because a rigid roller the width of the widest point of the carpet could not be used, and secondly how to get a heavy rolled carpet out of the house, over a balcony and down to the ground floor, and moved into its storage room, which had a large fixed marble table in its path.

The positive aspects were a really helpful team of National Trust volunteers, great house staff and two forklift trucks. The problems having been thoroughly discussed on a previous visit, I was only involved in the raising and relaying of the carpet, unfortunately not the fork lift truck episode which I would have enjoyed.

4.1 Planning

It was necessary to estimate the weight of the carpet in order to know which specification of lifting device was needed. Fortunately, I remembered that West Wycombe House had an Axminster hearth rug in the Saloon, which the Area Conservator was able to weigh and provide the useful information that an average nineteenth-century Axminster carpet weighs approximately 3.16kg per square metre.

I was invited to assess the carpet rolling and agreed be on site for the lifting and again for the reinstatement in the autumn. It was to be rolled along the warp onto a rigid roller and packed, then placed onto three

trolleys, so that once rolled it could be turned inside the Octagonal Room around to the right orientation to exit out of the door, rather than turning the unsupported carpet around before rolling.

4.2 Lifting

The obvious problem was that the length of the roller meant that the carpet could only be rolled in the central thirteen-foot area; the thoughtful Basildon team had provided a template of felt and two bamboo sticks to enable me to practise. After measuring to ensure that we could turn the roller after rolling the carpet, the first third was folded back and placed pile-down. The team had not done this before, but the handling improved as they practised and learned to lift the carpet chest-high together, then walk it back whilst laying it down flat. That happened more easily in the unrolling.

Next, corners cut from the redundant underfelt were placed to square the octagon, to pad out the missing corners and allow for a better roll. To start the roll on a carpet, it is necessary to bring the end over the roller and tuck it underneath it very evenly, otherwise the carpet will roll crookedly. Attempting this method on carpets six or seven metres wide with eight or ten people presents much difficulty, as they tend to start unevenly and at different speeds. One of the Buckingham Palace innovations consists of laying a length of nylon interlining beneath the end of the carpet, which makes it possible to roll the roller into the interlining. This automatically offers up the end of the carpet onto the roller without sliding. By ensuring that the roller was laid against the end of the carpet and carefully moved back to the edge of the interlining, the porters have been able to start the rolling straight without difficulty. It also ensures that the roller is covered.

The end of the carpet was turned back and nylon Sarril curtain interlining was laid beside the carpet and along the edges of the felt corners to keep them in place. The carpet end was then put back and the roller set parallel to it, then carefully rolled to the edge of the interlining. The interlining was then brought over the roller and rolled into the underfelt. This action picked up the edge of the carpet and rolled it evenly onto the roller. This method has been found to be very much easier for a team of people and safer for the carpet than starting a tight roll with the end of the carpet.

The main areas of wear often cause much of the distortion by making carpets roll crookedly, as there is often a tendency to pull the rolled carpet to tighten the inevitable bagging which occurs with rolling. This may be the cause of so much distortion when unrolling the carpet again. Nylon Sarril was therefore used to pad areas distorted by wear. Later, where the bagging was worse, bubble wrap was used; this was acceptable for the short period of time that the carpet was to be stored but is not advisable for longer periods because of the possible build-up of humidity.

The carpet was then rolled to the fold, lifted back and rolled again to the fold. The unrolled section was lifted over and concertinaed onto the polythene, which had been placed beneath the carpet. The carpet was then pulled back to the other end of the central section, straightened and the roll completed. A further length of polyester interlining was placed beneath this end and the carpet was rolled into this, giving a firm support in order to prevent unrolling whilst it was lifted down to the ground floor. It was then rolled into a calico sheet and secured with Velcro straps. Finally it was put onto piano wheels to enable it to be removed from the room. It is worth noting that, by the nature of the exercise, the carpet was rolled pile outward.

4.3 Reinstating

The relaying was rather more complex than the lifting. It was decided that the opportunity should be taken to give the carpet a quarter turn, which would enable the pile of the carpet to run with the visitor traffic.

In front of the window is a long radiator, which prevented the roller from rolling past, so the first part of the carpet had to be unrolled off-centre. Polythene was laid onto the floor and the first section of the carpet unrolled, then concertinaed onto the polythene sheet. The carpet and the polythene were then pushed to reposition it to enable the next section to be unrolled. A second polythene sheet was placed on top of the carpet and over the roll and a second shorter roller was used to roll up this unrolled section with the polythene sheet inside. This was then lifted over the unrolled section. The first section with the polythene interleaving was pulled out to lie pile-up. The second section was unrolled onto it and then lifted and carried over to its position.

The carpet was now lying pile-up but needed to be correctly positioned with each edge approximately 10cm from the wall and the central axis of the star design lying exactly on the axis of the door to the central line of the window. This took considerable manoeuvring, consisting of re-rolling the carpet onto the polythene sheet, moving to straighten out the folds caused by adjustments of position and stringing the axis to ensure the correct position. This was all accomplished with the help of very patient National Trust volunteers.

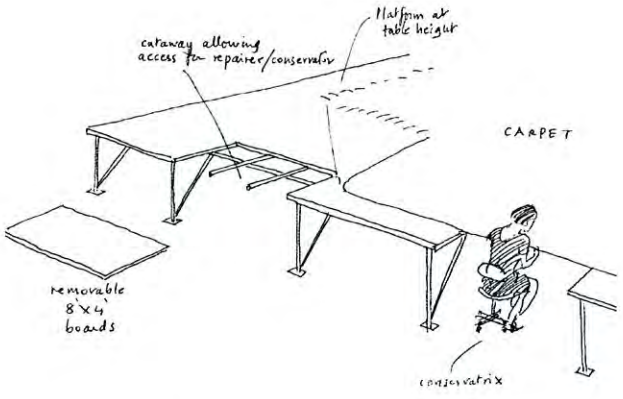

Diagram 1. Proposal for scaffolding to enable repair work at edges of Agra carpet.

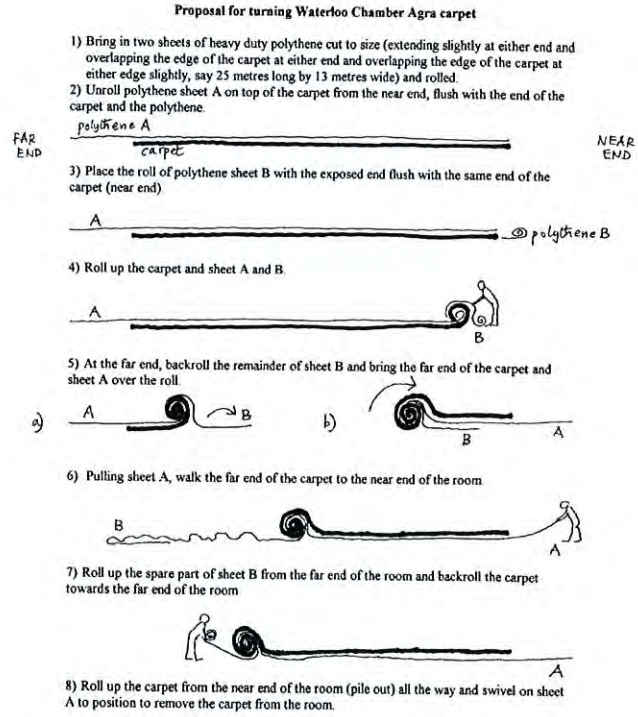

Diagram 2. Proposal for turning the Waterloo Chamber Agra carpet.

Fig.1. The Agra carpet is carried to the Rolls Royce garage for conservation

Fig.2. The Agra carpet is turned, using polythene sheeting

The scientific evaluation of damage to tapestries to enable treatment prioritisation

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1. Introduction

Tapestry weave is arguably the simplest of textile structures. However, tapestries are considered among the most valuable of textile objects because of their material, pictorial and symbolic content. Like all textiles they are vulnerable to damage and loss over time, and as such are seen as an invaluable but diminishing resource. Tapestries particularly, unlike costume, are designed to be static; they are placed on a wall and only very rarely moved. This means that degradation processes can occur unnoticed, slowly reducing the mechanical integrity of objects with no visible effect. Textiles may look in good condition even when they are in fact very degraded. This is quite different to ceramics, for example, which are either broken or not, or metals, which can have undergone various degrees of visible deformation or corrosion. One of the main criteria for the viability or integrity of tapestries is that when hung they can support their own weight, so this invisible damage can be a huge problem with both estimating for conservation work and for prioritising treatments. Although conservators can give excellent visual assessments it has not been possible to accurately evaluate chemical stability or mechanical strength. In the modern textile industry, standards have been developed for tensile strength measurement, but these are destructive tests, and the sample size required for reliable results is so great that these could never be considered for valuable historic tapestries.

2. Monitoring of Damage in Historic Tapestries

An opportunity arose in 2002 for researching methods for monitoring damage in historic tapestries. This came about from a European Commission initiative to fund research in the area of conservation. A consortium came together including eight European institutions representing the UK, Spain and Belgium, and comprising of textile curators, textile scientists, analysts specialising in dyes and metal threads, and textile conservators. This group submitted a proposal that was successful in securing funding of •1.3 million. The aim of MODHT (Monitoring of Damage in Historic Tapestries) is to develop a suite of tests requiring minute samples to inform conservators' condition assessments. The project is divided into six work packages (WP's).

2.1 WP1 Model Tapestries

It was desirable to relate all the measured parameters to tensile strength, and as this is not possible to measure directly with historic tapestries, it was decided to make model tapestries for experimentation. It was important that the models were as close as possible to the historic versions. This was a challenging project in itself, requiring a research from documentary sources, results from previous dye studies, sourcing materials, carrying out historically correct but often unpleasant dyeings, deciding on the weaving method, producing samples for the curators to approve, and eventually weaving up 47 strips, 15cm x 2m long. This process took over two years in total and has been comprehensively documented. Half of each model tapestry strip was exposed to accelerated light ageing and the tensile strength measured before and after ageing.

2.2 WP2 Field Campaigns

A list of tapestries from each of the three countries that were considered suitable for the project was prepared by consortium curators. The criteria for selection was based on incidence of parallel sets of tapestries in different locations, conspicuously good or bad condition, and whether there was good documentary evidence for a display and repair history. Once the group of tapestries for study was agreed, the whole group embarked upon sampling 'campaigns' and a total of 600 small samples of threads from seventeen 16th and 17th century tapestries were collected. Extensive curatorial reports were produced outlining where the tapestries had been, in what years, and how they had been displayed and repaired. This was possible because all of the collections were very well documented historically.

2.3 WP3 Metal Threads

Metal threads were treated separately from the main textile analysis because of the different nature of the damage; corrosion rather than organic degradation. The metal threads were inspected by optical microscopy and scanning electron microscopy, prepared in cross-section and analysed by a variety of spectroscopic methods including mass spectrometry (MS). In these investigations a number of unusual and very complex structures were found, involving the twisting of two, and sometimes three, metal threads together. Two protocols have been developed, depending on available resources and the level of information required. Samples of the silk core of the metal threads have also been analysed in WP4.

2.4 WP4 Wool and Silk

The largest part of the project has been the analysis of wool and silk. A number of different but complementary techniques have been used. The methods were improved and refined using the model tapestry samples, of which there was an abundant supply, before application to the historic samples. The model samples were also large enough for tensile strength testing, which allowed the analysis to be correlated to the loss of strength of the models after ageing. The main methods were size exclusion chromatography (SEC) of silk which has been optimised and refined, calibrated amino acid analysis, x-ray photoelectron spectroscopy (XPS), secondary ion mass spectrometry (SIMS)and a variety of thermal techniques such as differential scanning calorimetry (DSC) and thermogravimetric analysis (TGA). As well as these main techniques, a range of other methods have been applied, each having relative advantages and disadvantages. Each method gives slightly different information, but markers of damage have been identified and a protocol has been developed whereby the maximum information can be derived from the smallest number of tiny samples, and for the lowest cost.

2.5 WP5 Dyes and Mordants

As well as damage to the structure of the tapestry the other obvious 'damage' is the loss of image due to the fading of the dyes. This aspect of damage monitoring is being researched using high performance liquid chromatography (HPLC), and HPLC coupled with MS. A much less intense light-ageing regime is being applied to the model tapestries for this research, as the ageing applied for strength loss destroys virtually all of the dye material. This research is not just dye identification, but assessment of dye degradation products and their formation during ageing. The assessment of loss of colour/fading is also being carried out using reflectance spectroscopy. Mordant analysis has been by XRF, XPS and ToF/SIMS.

2.6 WP6 Compilation of parameters

Perhaps the most important part of the project is where the information from all of the research is correlated and disseminated. Interim papers were presented at the TCC conference in Winchester 2004 *Prioritising Interventive Treatments for Textile Materials* and the project was discussed in the keynote paper at the 1st AHRB/TCC Annual Conference *Analysis of Ancient and Historic Textiles*, 2004 (postprints to be published).

A workshop has been held and a website created to disseminate information: **http://www.hrp.org.uk/webcode/content.asp?ID=706**

Papers are to be found within these Preprints which provide full details of the analytical techniques carried out on the sample materials, and the conclusions and evaluation regarding their individual value in enabling treatment prioritisation.

3. Conclusion

This has been a really exciting project with which to be involved, and more has been learnt than anticipated, due to the openness and generosity of the partners from the beginning. The decision to use woven model tapestries rather than yarns has been validated, as the results would otherwise have given different conclusions. It was with some surprise that we found that silk tapestry weave starts off stronger than the equivalent wool sample, although as expected the silk degrades more quickly with light ageing. As large areas of many tapestries are silk, especially in the load-bearing pictorial elements, this is extremely important. The experimental work also revealed that the strength of a large newly woven tapestry could be calculated as being able to support a weight equivalent to one and a half London double-decker buses! This puts in perspective the fact that now many tapestries are so weak that they can hardly support their own weight of some 50-100 kilograms (~100-200lbs)! The project has attracted a huge amount of interest, with gallery talks, presentations and visits from both public and professional visitors.

We have developed analytical protocols that will enhance the ability of conservators to evaluate the condition of tapestries and make informed decisions on display and treatment proposals. Some are simple and less expensive; some are more informative and more costly. Considering the cost of fully conserving a set of tapestries, or even a single tapestry, the amount spent on analysis to enable decision-making constitutes such a small percentage of the overall treatment cost that it is justified in helping to keep these increasingly rare objects on public display.

Acknowledgements

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The success of the project is mainly as a result of the enthusiasm and cooperation of the excellent team.

References

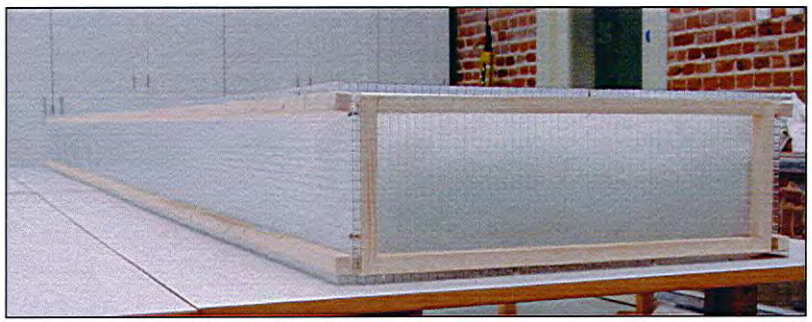
While writing this, the project is still in progress and many of the results have not yet been published. However, details of publications will be posted on the MODHT website: **http://www.hrp.org.uk/webcode/content.asp?ID=706**

Poster: Packing Objects for Transport: the Lapierre Canopy, Hardwick Hall

Claire Golbourn
National Trust Textile Conservation Studio

Packing Objects for Transport
Lapierre Canopy - Hardwick Hall, The National Trust
Use of Polycarbonate Boxes

Boxes designed and made by:
Tankerdale Workshop (Furniture Conservators),
Johnson's Barns,
Waterworks Road,
Petersfield,
Hampshire.
Tel: 01730 233922
Fax: 01730 233922



Conservation treatment carried out by:
Textile Conservation Studio,
The National Trust,
Malthouse Barn,
The Street,
GU32 2BY Oulton,
Norwich. NR11 6AF.
Tel: 01263 735878
Fax: 01263 738910

Advantages of Polycarbonate Boxes

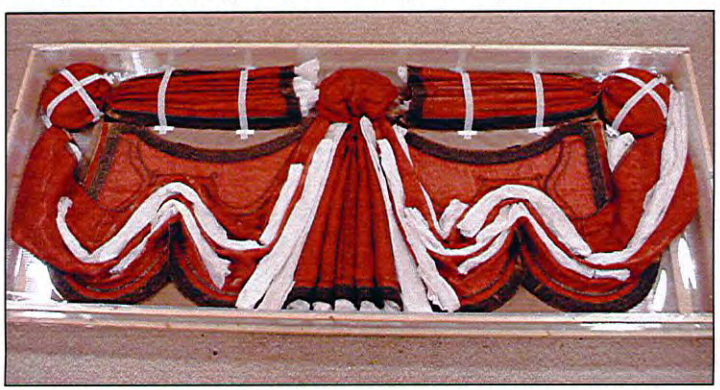
- Lightweight
- Rigid Construction
- Collapsible for Storage
- Reusable - the inside can be cleaned for reuse
- Tape and velcro can be attached and removed from the polycarbonate sheets

Construction Details

- Wooden frame for stability, with polycarbonate sheets attached to the inside to keep it light in weight.
- Inside the box the walls are flat with no sharp edges

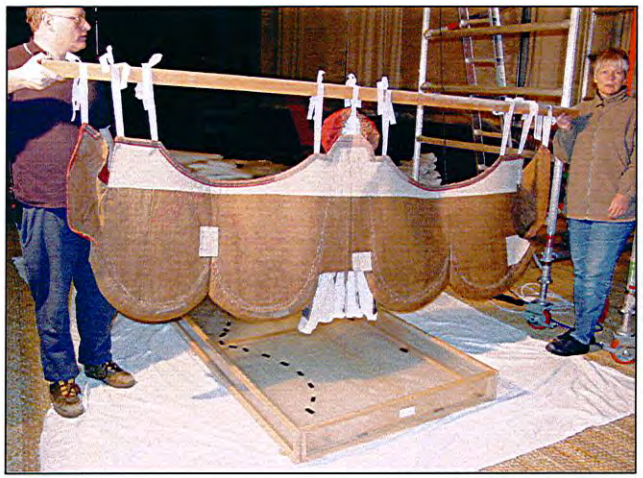
Packing of Outer Valance and Corner Puffs and Skirts

- Melinex layer is attached to the bottom of the box with Velcro.
  This allows the object to be lifted from the box with a support layer underneath.
- Valance is laid in box and Velcro tabs are attached to the Melinex corresponding with Velcro on the valance.
- The corner puffs and skirts are held in place with nylon tape over the object and stuck to the Melinex.
- Polyester wadding shapes, sausages and puffs are made to fill the voids.



Reinstatement of the Outer Valance

- The valance is attached to a batten.
- The valance is winched up to the scaffolding.
- The batten is held above the cornice while the valance is attached to the Velcro.



The conserved Lapierre canopy in situ.